Seven-Year-Olds' Imaginative Engagement with Play in Non-Virtual and Virtual Contexts

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2018

Under the supervision of Professor Dale Hay

A thesis submitted to the School of Psychology, Cardiff University, in partial fulfilment of the requirement for the degree of Doctor of Philosophy

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Acknowledgments

Firstly, I would like to thank my supervisor Professor Dale Hay. Dale, thank you for all of the opportunities that you have opened up for me and for all of your support in completing this thesis. Beyond that, thank you for helping me grow as a person, for taking the time to give me advice whenever I have needed it, and for all of our conversations about our shared enjoyment of fictional worlds. I would also like to thank Dr Katherine Shelton and Dr Mark Johansen for all of your input. Your encouragement and perspectives have made this thesis what it is.

Thank you to the Cardiff Child Development Team for collecting the data that has been used for all investigations in this thesis. In particular, I would like to thank Vikki and Rhiannon for mentoring and teaching me so much during my summer internships. Thank you Charli R for the above, and also for doing the reliability coding for Chapters 4 and 5. An additional thank you to Rhiannon for translating the Welsh cases for me. Thank you also to Becky, Kelsey, and Charli F for always listening and cheering me up in the midst of my statistics and writing woes.

I would like to thank a group of friends who have supported me all the way, but particularly over the periods when I have struggled. Thank you Jack, Carys, Connor R, Tom K, Halima, Tom W, Sophie, Georgia, Connor P, Char, and Pinder, for being there all the times I needed you, and all the other times in between. I feel incredibly lucky and proud to know you all. Thank you to my Psychology friends: Maisy, Beth, Amy C, Nat, Hannah, Guto and Lucy for all your support, advice, and never-ending supply of laughter. Amy P, I cannot express enough gratitude for your ability to manage being a mentor and a colleague, whilst also being one of my closest friends. Thank you for everything over the past four years. I could not have done it without you, and I would not have wanted this experience to have been any other way.

I owe a great deal of thanks to my family. Thank you mum and dad for always supporting and believing in me. Nadiyah and Imran, thank you for the above, for always picking up the phone when I was feeling needy, and for always sending pictures of Dusty when I needed them. I am incredibly grateful to have the family that I do.

Finally, I would like to thank the families, and in particular the children, who gave their time to be a part of the Cardiff Child Development Study. Thank you for providing an insight into your play, imagination and fictional worlds.

Contributions to the Cardiff Child Development Study

The Cardiff Child Development Study (CCDS) is a prospective longitudinal study that is the source of all data analysed in this thesis. Recruitment for the study began in 2006, and the last stage of data collection ended in 2015. I joined the study in 2013 as an undergraduate intern and contributed to the study in coding data and attending home-visits at the childhood assessment (Wave 6) in order to entertain any siblings so that they did not distract the first-born child. In this section, the contributions that I have made to the CCDS since beginning my PhD in 2015 are detailed.

In relation to the data analysed and coded for the investigations contained within this thesis, I transcribed 97% of the speech and 100% of the behaviour from the free play task (Chapters 4 and 6), and I transcribed 97% of children's speech as they played a bespoke video game (Chapters 5 and 6). I coded 100% of children's verbal and non-verbal engagement with the play frame (Chapter 4), 100% of children's immersion in the video game (Chapter 5), and 100% of children's references to internal states in both activities (Chapter 6). In collaboration with colleagues I constructed the executive function variables from the raw data sets for analyses within this thesis (Chapters 4, 5, and 6), that have since also been used for other projects.

I also contributed to the data from the CCDS on other projects outside of this thesis. I provided reliability coding for 32% of mothers' and children's use of internal state language during mother-child interaction tasks at three different assessments. I additionally provided reliability coding for 20% of children's engagement in pretend play at a simulated birthday party when children were 12 and 33 months of age. I provided further reliability coding for 20% of children's speech in relation to a costumed bear who attended the simulated birthday party when the children were 33 months of age. I have also provided reliability coding for 25% of cases on a project investigating children's use of a tool (a mallet) in a video game designed for the study. Finally, I took responsibility for finalising the data files for the questionnaires collected at the childhood assessment from the caregivers and teachers ready for analysis.

I also contributed to the CCDS in a variety of administration tasks. In collaboration with colleagues, I contacted families to collect missing sibling questionnaires, I was involved in the debriefing of the families following the childhood assessment, and I assisted in the relocation of all CCDS confidential data and equipment. I completed a variety of audits of all confidential data held by the CCDS, and I am responsible for ensuring that the data is regularly backed up. I promoted the CCDS, and Cardiff University, at a variety of public engagement events. Finally, I inducted summer interns and volunteers on the ethics of working with confidential data and mentored them on observation coding or transcribing speech.

Dissemination of Findings

The work contained in this thesis was presented at academic conferences throughout the period of my PhD. An early version of Chapter 5 was presented at The 18th European Conference on Developmental Psychology (ECDP) in September 2017. An early version of Chapter 4 and some of the data from Chapter 6 was presented at The British Psychological Society (BPS) Developmental Psychology Section Annual Conference in September 2017. An early version of Chapter 3, alongside the data from Chapters 4 and 6 were presented at the Longitudinal Developmental Science: From Birkenhead to Bangalore conference in October 2017 at the University of Liverpool. Finally, Chapter 6 was presented at The British Psychological Society (BPS) Developmental Psychology Section Annual Conference in September 2018 as a part of a symposium on imagination.

Summary

This thesis focuses on the imaginative activities that are present in middle childhood, and how children engage in the fictional worlds created during play in non-virtual and virtual activities. This was investigated in the context of the Cardiff Child Development Study, a UK-based prospective longitudinal study of first-born children.

In Chapter 3, I analysed questionnaire data on children's play activities. The children were reported by caregivers' as enjoying a variety of playful and imaginative activities, including activities previously considered to be absent at this age, or neglected in previous research. Gender differences were reported for some activities, supporting those found in existing literature.

In Chapters 4 and 5, I developed coding schemes of children's engagement with the fictional world (play frame) created when children played with Playmobil figures, and their immersion in the virtual world of a bespoke video game. Children's engagement with the play frame was considered to be in the role of an actor, manager, or narrator of the play. Children's engagement with the video game was considered to reflect their immersive engagement with the virtual world or functional engagement with the mechanics of the game. Boys were more engaged in the role of an actor in the play frame and more immersed with the virtual world than girls.

In Chapter 6, I examined links between the virtual and non-virtual tasks. Positive associations were found between children's engagement as an actor and their immersion, even when controlling for gender. Children's references to the internal states of the fictional characters were also compared as an indication of their engagement with the fictional worlds, and were associated across contexts when controlling for receptive vocabulary and gender.

These findings add to knowledge regarding imagination in childhood, in supporting that children's engagement in fictional worlds represents an expression of an imaginative characteristic.

Glossary of terms used in the thesis

Affordance. The properties of an object that suggest to a person the possible interactions they can have with the object (Gibson, 1979). For example, a cup with a *handle* affords the behaviour of *holding* the cup.

Imagination. A form of human thought that involves experiences that are removed from reality (Runco & Pina, 2013). For example, ruminations; fantasies; the production of creating outcomes; pretend play (Lyon, 2013; Singer & Singer, 2005; Taylor, 2013).

Immersion. The degree of cognitive and emotional involvement that an individual has with the virtual world and content of a video game (Cairns, Cox, & Nordin, 2014; Jennet, 2010).

Internal state language. Terms used to describe a person's thoughts, feelings, and desires (Bretherton & Beeghly, 1982).

Middle childhood. In this thesis, the middle childhood period refers to 7 to 11 years old.

Paracosm. A specific type of fictional world that contains imaginary societies, cultures, or languages (Cohen & Mackieth, 1991). These worlds are sustained for a prolonged time period, not just one play session.

Play frame. The fictional world that is created during pretend play (Kane & Furth, 1993).

Pretend play. Behaviour in which an individual playfully distorts reality (Fein, 1981).

Video game. In this thesis, video games refer to games played on a computer or games console that contain a plot, narrative and characters. This does not refer to 'casual games' played on mobile phones or tablets.

Chapter 1.

Introduction

When children engage in various forms of playful and imaginative activities, they create fictional worlds in which such activities occur (Cairns, Cox, & Nordin, 2014; Harris, 2000; Lillard, 2013). The aims of the investigations within this thesis were to explore the presence of playful and imaginative activities in the middle childhood period, an age which is somewhat neglected in this literature, and the ways which children at this age engage in the fictional worlds created during play with toy figures and whilst playing a bespoke video game. This was explored in the context of the Cardiff Child Development Study; a prospective longitudinal study of first born children from a community sample in Wales, United Kingdom.

In this chapter, I will review the literature in terms of what constitutes imagination, particularly in the childhood period. Additionally, I will review the rationale for investigating individual variation in children's imagination, children's engagement with fictional worlds in their pretend play and whilst playing video games.

1.1. Imagination

1.1.1. What is imagination?

Imagination is regarded as a form of human thought that involves experiences that are somewhat removed from reality (Runco & Pina, 2013). These experiences are considered to be cognitive representations of objects, emotions, or situations that are not perceptually available (Carlson & White, 2013). Therefore such experiences are characterised as originating from the senses and memory, but are reshaped into novel thoughts that include ruminations about alternative, possible, past or future events, fantasies, rehearsals for social interactions, and the production of creative outcomes (Lyon, 2013; Singer & Singer, 2005; Taylor, 2013). Imagination is also likened to the *narrative* mode, a form of thought representing our sensory experiences that are expressed as a story (Bruner, 1986).

Further insights into the nature of imagination have emerged from research into the brains *default mode network* (for reviews, see Agnati, Guidolin, Battisin, Pagoni, & Fuxe, 2013; Buckner, Andrews-Hanna, & Schacter, 2008). This network of inter-connected brain areas has been found to be associated with individuals being left to think undirected, with thinking of past and possible future events, and when considering hypothetical social interactions (Buckner et al., 2008; Mullay & Maguire, 2014). In research specifically investigating imagination, scores on a measure of imagination that captured aspects of memory, future thinking, imagery and other imaginative activities, were also associated with measures of creativity. Further, scores on this measure of imagination were also related to brain volumes within the default mode network in a cohort of 80 non-clinical adults (Jung, Flores, & Hunter, 2016). Therefore, neuroimaging research investigating the default mode network supports the notion that imagination involves experiences removed from the current reality, including thoughts about the past, present, and non-real situations (Lyon, 2013; Runco & Pina, 2013; Singer & Singer, 2005; Taylor, 2013).

However, some investigators argue that the concept of imagination may be better understood in terms of different components that comprise imagination. For example, aspects of imagination related to hypothetical ruminations, counterfactual reasoning, pretend play and reading fiction are considered to comprise the sub-category of *propositional imagination* (Foley, 2013; Nichols, 2006a). Within this sub-category of imagination, it is argued that there are further subcomponents; for example, activities such as engaging with fiction are regarded as a form of *supposition imagination*, whilst activities relating to engaging in pretend play or perspective taking have been characterised as *enactment imagination* (Goldman 2006a, 2006b).

1.2. Imagination in Childhood

During childhood, imagination is viewed as having a central role in various forms of play, pretence, and engagement with stories (March, Li, & Quinones, 2016). While some investigators have been tentative in suggesting that the imaginative thoughts and play of children are precursors to adult imaginative thought (e.g., Singer & Singer, 1990), others are more assured in stating that the type of imagination present in childhood is the same as that present in adulthood (e.g., Harris, 2000). Imaginative thought is expressed first in pretend play interactions with adults, before being expressed as a part of children's own solitary or peer play (Singer & Singer, 1990). A number of children also show evidence of having imaginary friends as an ongoing part of their play and non-play activities, which is distinctly separate from a role they enact or portray onto a specific toy during one instance of play (Taylor, 1999). In some cases, children elaborate beyond creating just imaginary companions by creating imagined societies, cultures, and worlds, termed *paracosms* (Cohen & MacKeith, 1991, see Section 1.3 below). The creation of such paracosms, although present in children as young as three years old, are most common between the ages of seven and twelve, a period in which most scholars argue that imagination moves ‘underground’ (Cohen & MacKeith, 1991; Singer & Singer, 1990).

In the middle childhood period, some theorists consider imaginative play to be absent (Piaget, 1962), although others suggest that overt fantasy play continues into the middle childhood period (Smith & Lillard, 2012), transforms into private thought (Singer & Singer, 1990), or is expressed in other contexts such as board games, computer games, theatre, or in the creation of paracosms (Cohen & MacKeith, 1991; Singer & Singer, 1990). However, there is currently a paucity of research investigating children’s imagination and imaginative play in the middle childhood period, prompting a call for more research in this area (Lillard, 2014). Therefore, Chapter 3 of this thesis will include an in-depth review and investigation of the presence of playful and imaginative activities, including a discussion of why such activities can be considered as playful or imaginative, in the middle childhood period.

1.2.1. Imagination and children’s play

Much of the research in children’s imagination focuses on their imaginative *play* (Singer & Singer, 2013). As stated above, an in-depth review of the forms of playful activities present in the middle childhood period, including their imaginative play, will be the main focus of Chapter 3 of this thesis. However, in the following sections, I will review the imaginative components of children’s play and associations with other constructs that are considered to be a part of imagination.

Pretend play emerges at around 12 to 18 months of age, reaching a peak at around three to five years. Thereafter, pretend play is thought to decline, although it is becoming increasingly acknowledged that pretend play may continue into adulthood (see Lillard 2014; 2017 for reviews). For example, activities such as 'cosplay' are a popular pastime for some adults (see Peeples, Yen, & Weigle, 2018). Pretend play is considered an imaginative activity, as it is one in which children exhibit an ability to represent and alter reality through transforming objects, creating fictional characters, objects, and scenes, in addition to narrating elaborate plot lines (Fein, 1981; Lillard et al., 2013; Sachet & Mottweiler, 2013; Singer & Singer, 1990; Taylor, 2013). Therefore, pretend play is considered to provide a context for practicing the cognitive skills important for creative development (Sachet & Mottweiler, 2013; Taylor, 2013). Children's language is a particular aspect of children's pretend play that is crucial in determining how imaginative or creative it is (Singer & Singer, 1990). Therefore the period of middle childhood, in which children are verbally fluent, is likely to be a time in which the imaginative components of children's play can be readily identified.

Pretend play has long been regarded as a crucial component of imagination and one that has a positive impact on development. Vygotsky (1967) regarded pretend play as imagination in action, involving the separation of physical reality from a novel imaginary situation. Further, Vygotsky argued that pretend play is the upper limit of the *zone of proximal development* which reflects the limit of what a child can do alone and the possibilities of what the child is capable of with instruction. This allows the child to behave in a developmentally advanced way. Piaget's (1962) views align with Vygotsky's in terms of pretend play reflecting a child intentionally separating reality from an imagined situation. Piaget (1962) theorised that in symbolic (pretend) play, children use imagination as a tool to make transformation within the play which increases in complexity with age. However, Piaget (1962) considered pretend play to be a form of *assimilation*, the application of past experience to the present, in order to adapt to the social world and regulate arousal states. Piaget considered pretend play as having developed when the capacity for imaginative thought had matured to be a constructive tool for the child's life. More recently, although pretend play is associated with concepts associated with the imagination such as language development and the creation of elaborate narratives, the associations with other constructs such as creativity, theory of mind and problem solving are inconsistent (for a review, see Lillard et al., 2013). Therefore, further research is needed in relation to children's play in relation to other components of imagination in the middle childhood period in particular, as this age range is one in which imaginative play has been considered to be absent (Piaget, 1962).

1.2.2. Imagination and children's interactions with technology

Children's pretend play is considered as a reflection of their developing imagination, is positively associated with other expressions of their imagination, and is largely encouraged. Contrastingly, concerns have been raised in the mainstream media as to the effects that technology has on children's imaginations (for example, Bernstein, 2016). Therefore the effect of new technology is noted as an avenue of future research in this literature (Lillard, 2014; Singer & Singer; 2005; 2013). In particular, some researchers advocate that playing video games limits imagination and creativity as playing video games involves an adherence to pre-set rules (Valkenburg, 2001). Furthermore, the restrictions of software and hardware in video games (e.g., on-screen displays) limits children's generation of their own 'images' (Cordes & Miller, 2000; Levin & Rosenquest, 2001).

However, these arguments are contested, in that children's imagination is not necessarily dependent on 'passive consumption' of activities, but is more influenced by the motivations of the child (Goldstein, Buckingham, & Brougére, 2005). Additionally, others argue that video games can promote children's problem solving abilities (Valkenburg, 2001), the creation of shared meanings in social play (Goldstein et al., 2005), divergent thinking (Resnick, 2006), and provide a source material for children to explore in their own play (Götz, Lemish, Aidman, & Moon, 2005).

Investigations of the association between children's use of technologies and imagination and creativity have yielded mixed findings. Some researchers found no relationship between children's use of technology, largely video games, and imagination. In relation to video games, Silvern and Williamson (1987) assessed four- to six-year-olds' aggression, fantasy and prosocial behaviour in their pretend play before and after playing *Space Invaders*. Although playing the video game resulted in increased aggression, there were no effects of exposure to the video game on the children's fantasy play. Additionally, in a study of children between the ages of six and ten, no differences were found in performance on a problem solving task when the task was presented as a board game or as a video game, though this study did not include any direct measures of imagination or creativity (Ko, 2002). Further, in observations of children aged from three to five years playing with audio-augmented and non-augmented 'rescue' toys (firefighters and police officers), there were no differences found in regards to whether the child played with the toy in exploratory, practice or pretend styles (Bergen, 2005). Similarly, there were no differences between the groups who played with the different toys in terms of the time spent pretend playing according to specific themes, though children who played with the augmented toys were more likely to play in a theme that matched the affordance of the toy (a rescue theme) and imitate the audio augmentations.

However, other research, particularly in older children, found positive associations between technology and children's imagination and creativity. In research investigating seven- and eleven-year-old children with and without a diagnosis of autism, a programmable 'construction' toy, compared to the similar non-augmented toy *LEGO*, led to more cooperative and parallel play (Farr, Yuill, & Raffle, 2010). This was argued to be due to the nature of such 'smart' toys allowing for more pathways to social interaction. For example, in a study of children aged between six and eleven years, free play with audio-augmented Playmobil figures led to more co-operation amongst peers, more storytelling and more creativity in the narratives of the play compared to non-augmented versions of the same toys (Yuill, Hinske, Williams, & Leith, 2014). In relation to 'smart storytelling toys', toys augmented with technology in order to facilitate child-driven storytelling, children aged between five and eight using *StoryMat*, a soft play mat that supports storytelling by recording and recalling their stories, made more imaginative transformations using the technology-augmented toy as compared to a control passive toy (Cassell & Ryokai, 2001). Similarly, another smart storytelling toy, consisting of plush toys and backgrounds that communicate with a computer, led to increased talkativeness and creativity during storytelling in children aged five and six compared to a passive toy (Kara, Aydin, & Cagiltay, 2013). Therefore, children's interactions with technology, particularly traditional toys augmented with technology, can serve to facilitate children's creativity during play as well as in their storytelling.

Children's increased engagement with technology and video games may be due to their underlying preferences for engaging in fantasy-related play. Greenberg, Sherry, Lachlan, Lucas, and Holmstrom (2010) demonstrated that a motivation for playing video games as a form of engaging in fantasy play was present, but only for children aged nine to eleven years old, compared to adolescents and young adults. Additionally, this motivation was more common in boys than in girls. It is similarly argued that gender differences in children's engagement with different genres of video games emerges from existing gendered preferences in their pretend play

(Subrahmanyam, Kraut, Greenfield, & Gross, 2001). This suggests that there may additionally be effects of children's imagination and creativity on their interactions with technology. Therefore, research that investigates the characteristics of the children, in terms of their environment and imagination, and how this interacts with their use of technology is beneficial in updating the classic theories of imagination and pretend play to incorporate the activities present in the modern day lives of children in the middle childhood period. In addition, adopting this approach allows for a synthesis of the theoretical perspectives of developmental psychologists, play researchers, and human-computer-interaction scholars.

1.3. The Fictional Worlds Created in Children's Imaginative Activities

As highlighted in Section 1.2, when children engage in repeated imagined activities, this can lead to the creation of a *paracosm*: an imaginary world that sustains a child's interest for a prolonged period that has a unique, and imaginary, history and culture (Cohen & MacKeith, 1991). Fictional worlds rich in a unique history, culture and even language have been noted in many works of fiction such as Tolkien's *Middle Earth* or the Bronte's *Gondaliand* (Dodds, 1923; see also Manguel & Guadalupi, 2000, for a compilation of imaginary worlds in fictional work). The creation of such paracosms are most common between the ages of seven and twelve, and in creative individuals (Cohen & MacKeith, 1991; Root-Bernstein & Root-Bernstein, 2006; Taylor, Mottweiler, Aguiar, Naylor, & Levernier, 2018). There are mixed findings in relation to gender; studies in which adults recollect on their childhood indicate paracosms are more common in boys (Cohen & MacKeith, 1991; Root-Bernstein & Root-Bernstein, 2006), whereas one study in which children were interviewed found paracosms to be more common in girls (Taylor et al., 2018). However, it must be noted that the source of data for most of these investigations, other than Taylor and colleagues (2018) study, were from individuals recollecting their childhood paracosms or explorations of fictional worlds in literature, and so these conclusions must be met with caution.

Fictional worlds are also argued to be created during children's imaginative play, and though they may not necessarily meet the criteria to be considered as a paracosm, these fictional worlds are the context in which every day pretend play occurs (Bretherton, 1984; Garvey, 1991; Kane & Furth, 1993). These fictional worlds are arguably explored by children in other forms of play such as when creating forts, tree-houses and 'dens' (Taylor, Mottweiler, Naylor, & Levernier, 2015). Such fictional worlds are thought to be created when individuals read fiction, watch movies or television, act out characters in live-action role play or the theatre, and when they play video games (Bateson, 1955; Cairns et al., 2014; Harris, 2000; Lillard, 2013; Taylor et al., 2015; Weisberg, 2016). Children are able to differentiate between, and keep a track of, the different characters and events that form parts of the imagined worlds, indicating that they do not create a strict dichotomy between reality and fictional worlds in general, but that the fictional worlds created are represented distinctly from each other (see Weisberg, 2013).

In relation to the fictional worlds created during imaginative activities, individuals can become increasingly *engaged*, *transported*, *absorbed* or *immersed* within the fictional worlds (Brown & Cairns, 2004; Harris, 2000; Liao & Gendler, 2011). For example, fictional worlds are noted to elicit emotional reactions to the imagined content in fiction (Harris, 2000), movies (Bateson, 1955), and video games (Cairns et al., 2014). In the childhood period, similar emotional reactions to imagined content are noted in pretend play (Harris, 2000) and in interactions with imaginary companions (Taylor, 1999). Parents often refer to these events in terms of their children being frightened of imaginary 'monsters under the bed'. These parallels between the absorption in the fictional worlds created in children's play and other works of fiction are considered as reflecting our perspectives shifting to be within such imagined worlds, such that the content is processed in a similar way to how content in the real world is processed (for reviews, see Goldman, 2006a; Harris, 2000; and see Section 1.3.1 below).

1.3.1. Theories of Pretend Play and the Representation of Fictional Worlds

The focus of the investigations contained within this thesis are on the playful and imaginative activities present in the middle childhood period, and how children engage in these activities in relation to their creation of imagined worlds. In the following sections, the influential theories of pretence will be briefly detailed, with a focus on how children's engagement in fictional worlds is addressed in them for the purpose of providing a theoretical background to the investigations in this thesis. Piaget and Vygotsky's influential work, which was highlighted in Section 1.2, will be further detailed in Chapter 3 of this thesis where the literature on how play, including pretend play, has been defined. However, their theories of symbolic play are not included in the following sections as Piaget (1962) considered this form of play to be absent in middle childhood and neither theory referenced children's engagement with the fictional worlds created in play (Piaget, 1962; Vygotsky,1967).

1.3.1.1. The 'flagging' and simulation theories of pretence (Harris, 2000)

According to this theory, when children engage in pretend play, they stop attempting to understand behaviour or speech as necessarily being relevant to the real environment and instead process this according to the pretend episode (Harris, 2000). In order to guide this, children are considered to compose mental 'flags' that inform them of the rules and conditions of the pretend episode. For example, *'for the duration of this play episode, pretend that...yellow bricks are bananas'* (Harris, 2000, pg. 22). Accordingly, when the pretend play ends, the flags and related information are stored in memory and stop guiding the child's behaviour. Further, children are assumed to recognise that the pretend episodes are not occurring in the real world, but within a pretend framework that children shift their perspectives to be within. With respect to activities such as role play, this shift is reflected in their language, mood, and behaviour as being appropriate to this adopted role (Harris, 2000).

Children's emotional reactions to the content of fictional worlds can be explained in relation to simulation theory (Harris, 2000; Goldman, 2006b). With the example of role play, children input the make-believe situation into their own knowledge and planning systems, with the output translated into pretend behaviour within the make-believe world (Harris, 2000). A similar process is theorised to occur in order to understand the internal states of others. Individuals adopt the perspective of the other person and feed this input into their own mental processes in order to predict what their behaviour or internal states would be in the other person's situation. In relation to emotional reactions to the fictional worlds, pretend situations are argued to be inputted into our emotional and our knowledge systems, such that we have emotional reactions to fictional events in a similar manner to real ones (Goldman, 2006a, 2006b). Supporting this, studies suggest that imagining specific scenarios trigger the emotional system to produce the psychological and physiological experience of emotions (for reviews, see Nichols, 2006a, 2006b; Harris, 2000). Figure 1.1 depicts this argument as a flow diagram. An event is evaluated in two ways: whether it is real or fictitious, and whether the implications of the event are genuine or not, which can all trigger an emotional reaction. Further, such emotional reactions can be attenuated by reminding ourselves that the input is a fictional one (Harris, 2000, represented as the dashed line in Figure 1.1). Indeed, as children and adults engage in emotionally charged content, phrases such as *"it's only a film*, *it's not real"* are not uncommon. An important implication of this theory is that such reactions to, and processing of fictional events are not restricted to a period in childhood, but are present throughout the life span, as indicated by the literature.

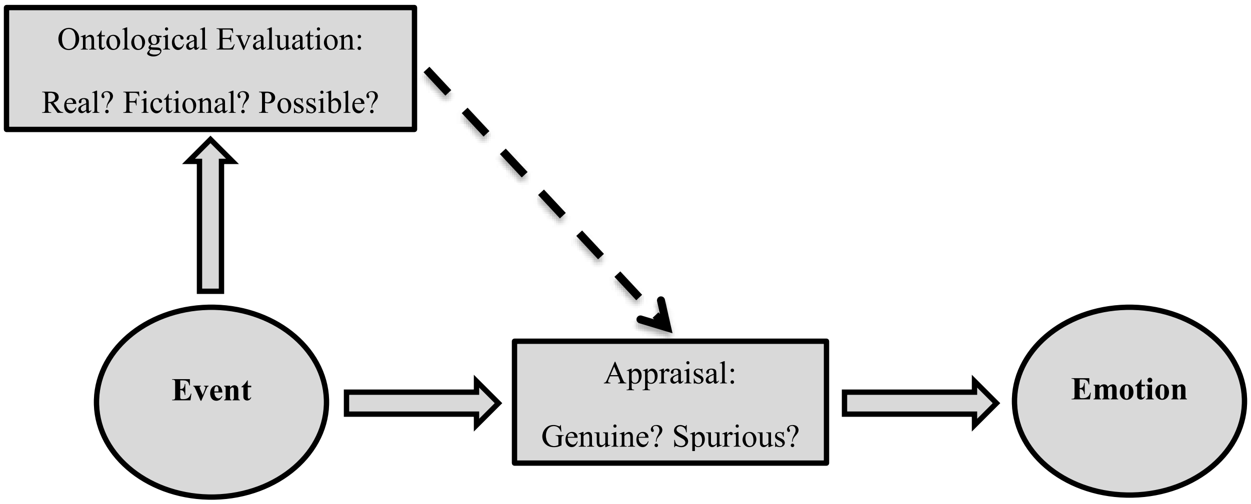

Figure 1.1. Harris' (2000, pg. 83) model of how an individual processes a fictional event. The dashed line has been added to illustrate how the emotional reaction can be attenuated by a reminder that the event is fictional.

However, Harris' (2000) view of pretence and the flagging theory were critiqued on the basis that it does not account for the presence of pretend sounds and speech in children's pretend play (Friedman, 2013). Although not discussed in the original account, Friedman (2013) highlights that it is unclear according to this model whether sound effects and pretend speech are a consequence of certain 'flagged' material, or whether they are instead themselves 'flagged' as make-believe representations; this is not the case for other theories detailed below.

1.3.1.2. The representational theories of pretence (Leslie, 1987; Perner, 1991)

1.3.1.2.1. Pretend play as metarepresentation (Leslie, 1987)

Leslie (1987) argued that during pretence, children must decouple the primary representation (e.g., a banana) of an object from a pretend representation, or *metarepresentation*, (e.g., a banana as a telephone), in order to act in a pretend manner without altering the primary representation of the object in any way (see Figure 1.2). Therefore, when a child encounters a banana in the future, they will not mistakenly interact with it as if it was a telephone. This latter argument was considered as a further defining feature of pretending, in terms of the child intentionally acting *as if* one object is another (that the banana is a telephone), but is doing so whilst understanding the actual reality (that the banana is still a banana), and they are not erroneously perceiving an object *as if* it is something else (that the banana is actually a telephone). According to this model, pretence indicates children's emerging ability to understand and manipulate their own and others' cognition, as well as the ability to decouple the primary representation from the metarepresentation. Therefore, the capacity to engage in pretend play emerges from children employing the innate concept of pretend, and can be viewed as an early manifestation of *theory of mind* (Friedman & Leslie, 2007; Leslie, 1987, 2002). This argument that the *capacity to pretend* emerges alongside a child employing the *concept of pretend*, at around 18 to 24 months, is evidenced by the close relationship between the appearance of solitary pretence, social pretend play, and the ability to recognise pretence in others (Friedman & Leslie, 2007; Leslie, 2002).

In relation to imagined and fictional worlds, Lillard (2001) labelled the decoupled pretend world as the *Twin Earth*, which arises from metarepresentations and is the 'frame' in which role plays and other pretend activities occur. Further, it could be considered that any representation, other than a primary representation, is fictional in nature. Therefore, other metarepresentations necessary for planning, hypothetical reasoning, and counterfactual reasoning also create fictional worlds (Weisberg, 2016).

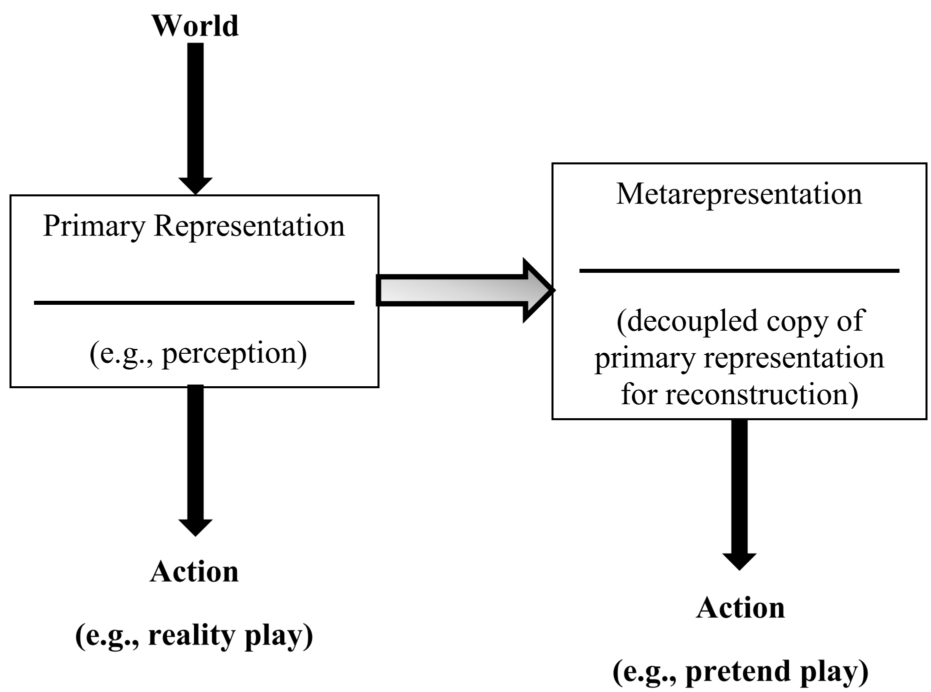

Figure 1.2. Leslie's (1987) general model for pretend play.

However, this cognitive theory of pretence has received several criticisms. Firstly, the view that the concept of pretend is one that is innate is contradictory to other claims that the acquisition of such concepts are a result of learning about minds and mental states in the pre-school years (see Friedman, 2013). Further, it is also argued that children can engage in their own and other's pretend play without an insight into the mental state concept *pretend*, directly contradicting Leslie's (1987) theory (see Harris, 2000).

1.3.1.2.2. Pretend play as secondary representation (Perner, 1991)

In a similar view to Leslie's (1987), Perner (1991) argued that children hold *primary representations* of the real world and *metarepresentations* where something represents something else, and critically, there is an understanding of this distinction. However, Perner (1991) argues that a prerequisite for metarepresentation is *secondary representations*:

representations of the world as it *could* be, which is critical to our ability to think about the past, future, and for hypothetical reasoning. Therefore, in order for one to be aware of their metarepresentations, they must also understand what happened (held as a primary representation), and what should have happened (the secondary representation) which emerge in a developmental sequence. Further, and in contradiction to Leslie's (1987) view, Perner (1991) argued that pretend play does not rely on an understanding of the concept of pretence, but only a representation of the world as different than it is in reality. Therefore, pretend play relies on the child's ability to hold a primary representation (this is a banana) and a secondary representation (this banana *could* be used as a telephone), and is the behavioural output of that secondary representation (use banana *as if* it is a telephone). This does not rely on a metarepresentation (I am pretending that the banana is a telephone), which according to Perner (1991) emerges after the appearance of pretend play.

Therefore in this view, the representations of the fictional worlds in pretend play are not as a separately reconstructed representation as in Leslie's (1987, see Figure 1.2) model, but are as secondary representations, that are causally linked to the primary representations. This representation is still considered as fictional in the sense of being a non-real representation of the real world (Perner, 1991; Perner & Brandl, 2009; Weisberg, 2016).

1.3.1.3. The 'behaving-as-if' theory of pretence (Nichols & Stich, 2000, 2003)

Finally, Nichols and Stich (2000, 2003) argue that the architecture of the cognitive mind includes three functionally separate representational states: Beliefs, desires and *possible worlds* (see Figure 1.3). The *possible worlds* state is considered as the cognitive 'workspace' in which pretence occurs, as it contains representations of the world according to a set of assumptions that are not necessarily believed or desired to be true. Information is inferred from representations stored in the *belief* state, which contains information about the real world, (Nichols & Stich, 2003), through a sub-structure which filters the information to allow established pretence representations in the *possible worlds* state not to be 'overwritten' by those in the *belief* state (the *UpDater*). A final component, labelled the *Script Elaborator*, fills in the details that cannot be inferred from either the *possible worlds* or *belief* states. The behaviour of pretence arises out of a desire to behave in accordance with the information contained within the *possible worlds* state, which is accessed through the *belief* state, of how they should behave in the pretend scenario.

A key difference between Nichols and Stich's (2000, 2003) theory and the *metarepresentational theory* (Leslie, 1987) is that the former does not postulate that it is necessary for a child to have the concept of pretend in order to engage in pretence. Nichols and Stich (2000) argue that the observation that the co-emergence of solitary pretence, social pretend, and the recognition of pretence in others is not necessarily evidence of the emerging concept of pretend. For example, recognising the pretence of others could reflect the child's understanding of the *behaviour* of pretending as opposed to reflecting their understanding of the more abstract concept of pretence. Therefore, Nichols and Stich (2000, 2003) regard children's early understanding of pretence to reflect "*behaving in a way that would be appropriate if p (the non-real situation) were the case"* (pg. 139).

The fictional worlds created in play are captured within the *possible worlds* state. In relation to how the content of these worlds are responded to and represented, the information in the *possible worlds* state and the *belief* state is stored in the same 'code'. Because of this, the cognitive systems, including the affective system, receives input from them both and so responds to that input in the same way. This therefore results in children engaging and responding to fictional worlds similar to how they would in reality (Nichols, 2006b; Nichols & Stich, 2003).

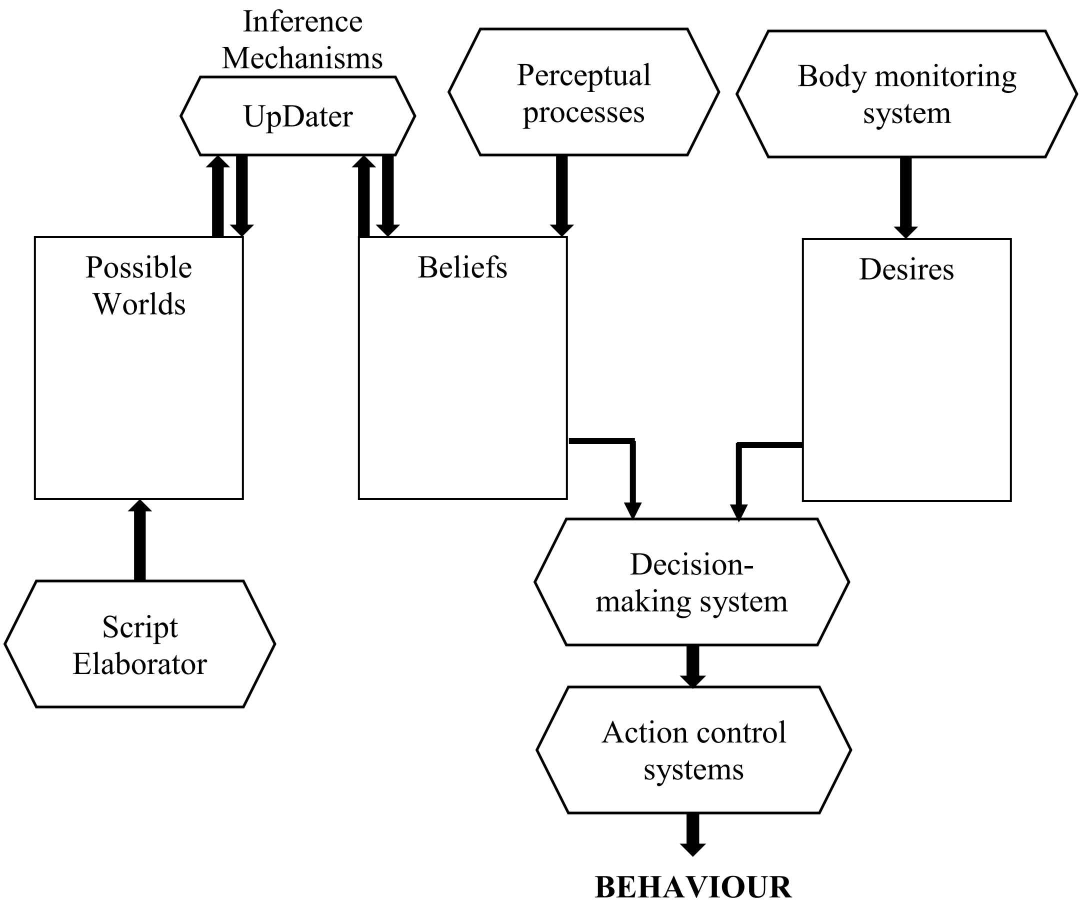

Figure 1.3. Nichols & Stich's (2000, 2003) theory of pretence.

However, an issue of this theory in terms of the claim that it is the understanding of the behaviour of pretending that leads to the recognition of pretence in others is that the behaviours associated with pretence encompass much more than simply pretend actions (Friedman & Leslie, 2007; Rakoczy, Tomasello, & Striano, 2004). For example, how would children be able to distinguish another person intentionally acting 'as-if' an object is something else compared to that person making a mistake (Leslie, 1987)? To address this, Rakoczy and colleagues (2004) revised Nichols and Stich's (2000, 2003) hypothesis and proposed that young children are able to distinguish between these two different forms of *acting-as-if* behaviours through whether the agent has an *intention* to actually perform an action. If there is an intention to perform a real, non-pretend action, such as in erroneous *as-if* behaviours, then the child does not consider such actions as pretence.

However even in this revised 'acting-as-if' theory, Friedman and Leslie (2007) and Friedman (2013) argue that a fundamental issue is that there is no specification as to what behaviour is considered appropriate if a non-real situation were actually real. In a similar criticism to Harris' (2000) theory, the presence of certain sound effects during children's play presents a problem, as they are not appropriate if the child is acting as if a pretend idea is real. For example sound effects such as an engine noise when playing with a car or a sizzling noise when playing at cooking, would not be produced if a child were acting with a real car or in a real kitchen, as those noises would be generated by the objects themselves. On the other hand, Friedman and Leslie (2007) argue that the metarepresentational theory can explain the use of sound effects as they are contained within the concept of pretending. Therefore whilst these theories have been influential in informing avenues of research in pretend play, no single theory has emerged as explaining pretence representation without facing criticisms.

1.3.2. Engagement with the play frame

The literature regarding the ways in which children engage with the fictional world created during play, which is referred to as the *play frame* (Kane & Furth, 1993), will be explored in Chapter 4 of this thesis. In the following section, the rationale for investigating individual variation in children's engagement with the play frame as an aspect of their imagination will be explored.

As highlighted in Section 1.2, engaging in pretend play is a childhood activity in which imagination plays a central role, particularly in terms of the creation of fictional scenes, plots, and characters. Therefore, early imaginative play, which precedes activities such as reading fiction and playing games, may allow children to understand the distinction between reality and fantasy, which then provides children with the means to understand this distinction in other imaginative activities (for a review, see Weisberg, 2013). Consequently, it could be regarded that individuals who are more cognitively engaged with the fictional world created during pretend play engage in other imaginative activities in a similar way. Supporting this, children vary in the extent to which they become absorbed in role play, and those adults reported as having an imaginary companion in childhood were more likely to become absorbed in their own fantasies (Harris, 2000; Kidd, Rogers, & Rogers, 2010). Therefore, in order to understand more regarding the construct of imagination in the middle childhood period, there is a need for research to explore the different ways in which children engage with fictional worlds created in their play, and the extent to which this is associated with their engagement in other imaginative activities.

1.3.3. Immersion in virtual worlds

The literature on children's engagement, or *immersion*, in the virtual worlds created as they play video games will be examined in detail in Chapter 5 of this thesis. However, in the following section I will provide a rationale for investigating children's engagement with the virtual world of a video game as a reflection of their imagination.

In the context of playing video games, interacting with the virtual environment and game characters can be a prominent component of the experience. For example, in games such as *Tamagotchi* where an individual interacts with and nurtures a virtual character, the presence of interactions between the artificial characters and real children is apparent (Subrahmanyam et al., 2001). These interactions are observed to stimulate similar emotions and reactions present in interactions with real people (Subrahmanyam et al., 2001), which is similarly observed in individuals playing with a wider selection of video games (e.g., Brown & Cairns, 2004; Calleja, 2011; Ermi & Mäyrä, 2007). With respect to an individual's immersion in the virtual environment of video games, it may be imagination that allows us to mentally detach ourselves from the present moment to engage in the virtual world (Calleja, 2011). Supporting this claim, qualitative research in older children highlights children's imaginative capacity as being critical for becoming immersed in a virtual world (Hannaford, 2012; Søndergaard, 2013). However, more research is needed to establish whether immersion in a virtual world can be considered an aspect of imagination. In doing so, the extent to which the processes of engaging with the play frame and becoming immersed in a virtual world can be considered as analogous and a characteristic of certain children can be established. If this is the case, the theories described in Section 1.3.1 must be able to incorporate this aspect of children's imagination in the modern world into their models.

It could be argued that virtual worlds elicited from video games are not truly 'fictional' because the worlds were created by an external individual. Therefore virtual worlds are less comparable to the 'play frame' described in other forms of play which are directly created by the child and is under their control (Lillard, 2013; Weisberg, 2013). Indeed, according to Goldman's (2006a) differentiation, engaging with the virtual environment of a video game would be theorised to be related to *supposition imagination*, whilst engaging with the play frame would be related to *enactment imagination* (see Section 1.1.1). However, the fictional worlds of video games, stories, and television or movies can be considered as fictional as the world being represented is still not the real world (Lillard, 2013). Further, although children may appear to create the fictional worlds of their pretend play from nothing, these fictional worlds and general pretence draws on themes, plots and actions that are experienced by the child either directly, or through other media such as stories or television (Desmond, 2001; Galda, 1984; Singer & Singer, 1990; Weisberg, 2016).

A further difference of note between the fictional worlds created in pretend play and from video games is that in pretend play, when a child transforms an object, or imagines something is there when it is not, the action itself indicates the pretence of a situation. Further, in the creation of a fictional world in play, children have to explicitly state the premises or rules of the fictional world, particularly in the case of joint pretence, and *imagine* that this is the case (Giffin, 1984; Weisberg, 2016). Therefore the dichotomy between what is real and what is pretend is explicit, particularly as the fictional world is represented only in the mind. This is not the case for video games with realistic graphical properties that create a visual depiction of the fictional world, and consequently the dichotomy between what is real and what is not may be less clear (Weisberg, 2013). Therefore, it could be considered that children are more likely be engaged in the virtual world of a video games as if it is real because they are less clear on whether it is a representation of the real world or the fictional one. Further, it could be theorised that if engagement in fictional worlds during pretend play trains children to understand the fantasy-reality distinction, then those who engaged in more pretend play would be better able to understand the distinction when playing video games with realistic graphical properties (Weisberg, 2013).

1.4. Imagination as a Characteristic

Although imagination can be regarded as a form of human thought that is theorised to be central to certain activities in childhood (see Section 1.2), certain children are regarded as more ‘imaginative’ than others (Singer, 1973). For example, children who have higher scores on measures of an *imaginative/fantasy disposition* or *fantasy orientation* demonstrate increased creativity in storytelling (Pulaski, 1973; Singer, 1973), are more likely to have imaginary companions (Bouldin, 2006), have increased affective empathy (Brown, Thibodeau, Pierucci, & Gilpin, 2017), are better able to regulate emotions (Gilpin, Brown, & Pierucci, 2015), but do not differ according to gender (Carlson & Taylor, 2005). Further, Tower (1985) developed an 'imaginativeness scale' in which teachers rated pre-school aged children for their imaginativeness in block play, dramatic play, prop play, and art, which showed good internal consistency as a global scale (α=.78). Those rated as more imaginative were more lively, concentrated and tolerated frustration better, were more attractive to others and were more joyful. Additionally, Singer and Singer (1990) reported stability in children's play being rated as imaginative, as captured by the introduction of elements of pretend and make believe to their play, from three to four years of age. Therefore, there are converging findings from the literature supporting the conclusion that imagination is a stable characteristic or 'trait' in which children may vary.

Further support for this notion comes from research investigating imaginary companions (for an in-depth review into imaginary companions, see Taylor, 1999). As noted above, children's predisposition for fantasy associated with having imaginary companions (Carlson & Taylor, 2005; Singer, 1973). In childhood, those who have imaginary companions, as compared to those without, show more imaginativeness and emotionality in their spontaneous play (Singer & Singer, 1990); attribute mental states to their friends more (Davis, Meins, & Fernyhough, 2014); demonstrate better emotion understanding and theory of mind (Giménez-Dasí, Pons, & Bender, 2016; Taylor, 1999); engage in more private speech (Davis, Meins, & Fernyhough, 2013); have better language abilities (Singer & Singer, 1990); and tell richer narratives (Trionfi & Reese, 2009). Additionally, in research with adolescents and adults recollecting whether they had an imaginary companion in childhood, those with imaginary companions were rated as being more creative (Kidd et al., 2010; Schaefer, 1969), more aware of their own internal states (Gleason, Jarudi, & Cheek, 2003), more likely to become *absorbed* in their recollections and imaginings (Kidd et al., 2010), and scored higher on other general measures of imagination such as imagery and vivid dreams (Firth, Alderson-Day, Woods, & Fernyhough, 2015; Gleason et al., 2003). Therefore, on the basis of these converging findings, the presence of an imaginary companion is considered to reflect a child's general imaginative capacity that is stable into adulthood, supporting the conclusion that imagination can be viewed as a trait in childhood that may vary across individuals (Singer & Singer, 1990).

It could also be the case that there are individual differences in different 'components' of imagination. For example, in relation to engagement in pretend play, Wolf and Grollman (1982) identified children's imaginative play style to be either *independent* of the physical environment or *dependent* on transforming physical objects in the child's environment, indicating that children may approach the same imaginative activity in different ways. Further, Harris (2000) noted that children vary in the extent to which they become *absorbed* in role play, even when prompted to do so. Finally, research in relation to the concept of a fantasy orientation (see above) shows that this may comprise orthogonal sub-components relating to fantasy-orientated cognitions, interactions with toys and games, pretence and belief in fantastical entities (Pierucci, O'Brien, McInnis, Gilpin, & Barber, 2014). However, whether such subtle differences extend to other imaginative activities is currently unclear. Therefore, further investigations as to whether there are similarities in the ways in which children engage in different imaginative activities in the middle childhood period are warranted. In particular, whether there are similarities in children's engagement with fictional worlds created in different contexts of play as a reflection of their underlying imaginations.

1.5. Why Children's Engagement in Fictional Worlds is Important

1.5.1. Play therapy and play-based education

Play, and forms of pretend play, are used with children from the ages of two to thirteen as a form of therapy and mental health intervention around the world, and are effective in improving outcomes for children with various emotional and behavioural difficulties (see Bratton, Ray, Rhine, & Jones, 2005; Singer & Singer, 1990). In relation to learning and education, the extent to which children's pretend play is beneficial in relation to problem solving, creativity, intelligence, and learning in general is unclear (Lillard, 2013; Lillard et al., 2013).

One reason for these inconsistent findings could be related to the different ways in which play occurs. For example, Zosh and colleagues (2018) argued that guided play with an adult, as opposed to free play, is a rich context for the learning and development. However, an alternate reason could be that children learn from or respond to pretend play differently due to differences in their engagement with the fictional worlds created in play. For example, Lillard (2013) argued that engaging in fictional worlds confers learning due to the ability to rehearse facts about the real worlds within a fictional one, and because information is better learned in fictional worlds as it allows for more flexible thinking. Therefore, if children differ in their engagement with the imagined worlds created in the course of play, and by extension, the course of play therapies and play-based education, then research investigating such differences have important implications for their effectiveness.

1.5.2. Digital technologies, video games, and virtual realities in therapies and education

The use of technology as a method of treating and monitoring symptoms of mental ill-health is becoming a popular method for conditions such as Alzheimer's disease (Chinner, Blane, Lancaster, Hinds, & Koychev, 2018), post-traumatic stress disorder (Holmgård & Karstoft, 2016), and social phobias (Klinger et al., 2005). Additionally, video games are being increasingly used for training certain skills, such as empathy (Kral et al., 2018), and also in educational settings to teach content (Barclay & Bowers, 2018; Cheng, Shet, & Anneta, 2015).

One factor related to the effectiveness of video games as a context for learning is how engaged or immersed they are with the game, where higher engagement with the game is associated with higher learning outcomes of the content (Barclay & Bowers, 2018; Cheng et al., 2015; Hamari et al., 2016). Therefore, if there are individual differences present in how children engage in fictional worlds, then such findings have important implications for the effectiveness of virtual environments and video games used for therapy and education.

1.6. Summary of the Introduction and Research Questions for the Thesis

In the literature reviewed in this introduction, it is clear that children's play, and pretend play in particular, is a prominent imaginative activity engaged in during the childhood period. Although there are early assertions that pretend play is absent in the middle childhood period, the literature reviewed indicates that this may not be the case, and indeed there may different forms of imaginative play at this age, for example playing video games. This review highlights that when children engage in imaginative activities, fictional worlds are created in which such activities occur and children may vary in the extent to which they are imaginatively engaged in these fictional worlds.

However, there are several gaps in the literature that warrant further investigation and are the focus of the research investigations within this thesis. The overall aims of the investigations contained within this thesis are to identify the presence of playful and imaginative activities in the middle childhood period, and to explore and describe the ways in which children engaged in the fictional worlds created in non-virtual and virtual play activities as a reflection of their imagination. These aims were pursued in the context of the Cardiff Child Development Study, a longitudinal study of firstborn children. Before addressing the first research question, the general method of the Cardiff Child Development Study, in particular the middle childhood Wave 6 sample, will be detailed in Chapter 2. In order to address the overall aims of this thesis, the research questions explored in the empirical chapters of the thesis are:

1.6.1. What imaginative activities are present in the middle childhood period?

As highlighted in Section 1.1, the presence of imaginative activities and play in the middle childhood period is an area of research in need of further investigation. In Chapter 3 of this thesis, I will review the imaginative and playful activities present in the middle childhood period. Following this, the playful and imaginative activities enjoyed by the seven-year-old children who are a part of the Cardiff Child Development Study will be reported.

1.6.2. Are there individual differences in children's engagement with the play frame when playing with toys?

As highlighted in Section 1.4, imagination is regarded as a characteristic in which certain children may vary, and as noted in Section 1.3, children's engagement in the fictional world created during play (the play frame) may be influenced by children's imagination. Therefore in Chapter 4, I will review how engagement with the play frame can be measured in order to inform the development of a coding scheme of children's speech and behaviour that measures imaginative engagement with the play frame. I will establish other sources of individual variation that must be controlled, as they may also affect children's engagement with the play frame. Following this, children's engagement with the play frame will be described and explored in order to identify different styles of engaging with the fictional world.

1.6.3. Are there individual differences in children's immersion within a video game?

As highlighted in Section 1.3.3, there is theoretical and qualitative support for the notions that children's immersion in the virtual world of a video game is related to their imagination. Therefore in Chapter 5, I will review how immersion in video games has been measured in order to inform the development of a coding scheme of children's speech that measures their immersion as they play a bespoke video game. I will review other sources of individual variation that may be associated with children's immersion. Following this, children's immersion within the video game will be explored in relation to these sources of individual variation.

1.6.4. Is there consistency in children's forms of engagement with fictional worlds across the real and virtual contexts of play?

In the final empirical chapter of this thesis, I will explore the extent to which children's engagement with the play frame and immersion in the virtual world of the video game are associated with one another. If these styles of engagement reflect an underlying imaginative characteristic of certain children, then it would be expected that there would be associations between these styles in terms of similar behaviours being expressed in both contexts. Additionally, I will explore children's attributions of internal states to the fictional characters in the game as an additional indication of their engagement with the fictional worlds of both contexts. As highlighted in Section 1.4 the use of internal state language is associated with other aspects of imagination, such as having an imaginary friend. Further, in Section 1.3 it was noted that commenting on the internal states of others reflects an individual's consideration of another's perspective. Therefore, referring to the internal states of characters within the fictional worlds may reflect the children adopting a perspective within the fictional world.

1.7. The Approach of the Thesis

The motivation underlying the research questions of this thesis stem from my own interests as to whether children's engagement with video games is an activity in which they can express their imagination. In seeking to understand this, I began with the third research question (Section 1.6.3, Chapter 5) investigating children's engagement, referred to as immersion, when playing a bespoke video game. When engaging with the literature in this area, the assumption that children's immersion could be related to their imagination had been noted in theory and qualitative research, in terms of being a mechanism by which individuals detach from the real world to engage in the virtual one (Calleja, 2011; Hannaford, 2012; Søndergaard, 2013; see Section 1.3.3). However, imagination in this literature had been referred to in a general sense with little definition or measurement of the concept. Therefore, I chose to make use of other tasks that were a part of the Cardiff Child Development Study and investigate children's engagement when playing with toy figures as an aspect of their imagination (Section 1.6.3, Chapter 4), and compare this with their immersion in the virtual world of the video game (Section 1.6.3, Chapter 6). This strategy was chosen as imagination has been regarded as having a central role in children's play, and is an established domain in which imagination has been studied, and therefore investigating children's engagement with pretend play provides an opportunity to operationalise imagination (March et al., 2016; see Sections 1.2 & 1.2.1). To support this, individuals' engagement and absorption in their pretend play and fantasies has been found to be associated with their imagination (Harris, 2000; Kidd et al., 2010; see Section 1.3.2). More specifically, Tower's (1985; see Section 1.4) 'imaginativeness scale' was considered to reflect the degree to which children were 'overly absorbed', or engaged, in their pretend play. Therefore, there is an evidence base for using children's engagement with pretend play as an indicator of their imagination. However, it should be noted that this is only one aspect of imagination (see Section 1.1) that was chosen due to the constraints of the original purpose of the Cardiff Child Development Study not being a study of imagination. When engaging with the literature in pretend play, I noted further similarities in relation to immersion in a video game, and the notion of children's engagement with the play frame (Kane & Furth, 1993; see Section 1.3.2). Of particular note in relation to engagement with the play frame, as opposed to engagement with pretend play in general, is that there is conceptual similarity between the play frame and the virtual world of a video game (see Sections 1.3.1 and 1.3.2). Both are the context for play in which there are non-real scenes, plots, and characters (Lillard, 2013). Further, these fictional contexts of play have been noted to elicit emotional reactions from children as if the contexts are real (Harris, 2000), particularly in relation to their verbal interactions with virtual and fictional characters. Thus, immersion could be considered as more analogous to engaging specifically with the play frame, as opposed to general engagement with play. Therefore, the approach taken in thesis was to begin with a theoretical overview and empirical investigation of children's engagement in the play frame, as a reference to compare the investigation of children's immersion with the video game.

In approaching the investigations in this way, it was necessary to then measure both children's engagement in the play frame and children's immersion in the video game in a manner to allow for an analysis of whether they were associated. If a correlation is present, it would provide exploratory evidence of a link between immersion and imagination. However, this may not reflect a distinct relation between these two concepts, as other factors might explain this association. Because the data used in this thesis was from an existing study in which data-collection had been completed, the measurement of children's engagement in these two contexts was constrained to be in the form of observations of children's speech and behaviour. Therefore, coding schemes were developed to map children's speech and behaviour from video footage as they engaged in the activities with the expectations that emerged from the relevant theory and literature. To aid in the process of statistical comparison of children's engagement in the two activities, the data were first reduced using statistical methods of cluster and principal components analyses. These were deemed as appropriate exploratory techniques to categorise the data from the coding schemes in meaningful ways that mapped onto the relevant constructs. Further, the nature of the variables that were created from these analyses allow for statistical investigation of associations (correlations) between the concepts, whilst taking into account other potential confounds such as age, gender, executive function, and language ability. Therefore, the overall approach of the thesis was exploratory in nature, to investigate whether there were similarities present in children's expression of their imagination in two play activities.

Chapter 2.

General Method of the Cardiff Child Development Study

The aim of the present chapter is to introduce the overall methodology of the Cardiff Child Development Study (CCDS) with particular focus on the childhood assessment which is the source of the data analysed in this thesis. This includes information regarding the design of the study, recruitment information, demographic characteristics and the procedures used at each stage of data collection in the CCDS.

2.1. Design

The CCDS is a prospective longitudinal study of first-time parents and their children. Parents were interviewed during the third trimester of pregnancy and the families were followed up when the infants were a mean age of 6, 12, 21, 33 and 84 months (Waves 1 to 6, respectively). The CCDS was funded by the Medical Research Council (MRC) grants G0400086 and MR/J013366/1. Ethical approval for the procedures used in the CCDS was granted by the National Health Service (NHS) Multi-Centre Research Ethics Committee and the Cardiff University School of Psychology Research Ethics Committee.

2.2. Participants

2.2.1. Recruitment

Three-hundred and thirty-two first time mothers were recruited between the 1st of November 2005 and the 31st of July 2007 from antenatal clinics in two NHS trusts in the South Wales Area. To further increase the representativeness of the sample, NHS midwifery teams supporting pregnant women at high social risk recruited additional participants into the study.

During recruitment, primiparous women and their accompanying family members, identified by the clinic receptionist, were approached by trained researchers in the hospital or clinics. Families were given a brief explanation of the CCDS and what their enrolment in the study would entail. Those who expressed an interest were given a leaflet containing further details and were invited to watch a recruitment DVD that described the study procedures. Families were asked to provide contact details so that an administrator could contact them to arrange an appointment for those who had decided to take part in the CCDS. This appointment was scheduled for the third trimester of pregnancy and became Wave 1 of the CCDS. Translators were employed to allow the inclusion of participants whose first-language was not English and for those who were hearing impaired. There were no exclusion criteria used in the initial assessment, other than miscarriage or infant death.

2.2.2. Demographic Characteristics

The final sample recruited for the CCDS is nationally representative; it did not differ significantly on demographic characteristics with the participants in the UK Millennium Cohort Study, the most recent survey of a nationally representative birth cohort in the UK (Kiernan, personal communication, 2009). The full demographic characteristics of the sample are displayed in Table 2.1.

Demographic information was collected by interview or questionnaire during the pregnancy and six month assessments (Waves 1 and 2 respectively). The social class of the family was categorised according to the Standard Occupational Classification 2000 (SOC2000; Elias, McKnight, & Kinshett, 1999), dichotomised as either working class or middle class. The mother's educational achievement was recorded and dichotomised to reflect either achieving or not achieving basic education qualifications; five or more General Certificated of Second Education (GCSES) at grades A* to C or equivalent. Information was also gathered regarding whether the mother was in a stable relationship with a partner, their marital status, the mother's age at their first birth, and the mother's ethnicity.

A sociodemographic adversity score was created using a principal components analysis (PCA) comprising of maternal risk factors for social adversity (Perra, Phillips, Fyfield, Waters, & Hay, 2015). The score included mothers not achieving basic educational levels, the mother being 19 years or younger at the child's birth, the mother being legally unmarried during pregnancy, and the mother being classified as working class. The PCA using the polychoric correlation matrix confirmed that these items contributed to a single component, which explained approximately 77% of the shared variance in these risk factors for social adversity. Positive scores on this measure indicate a higher than average exposure to sociodemographic adversity.

Table 2.1. Demographic characteristics for the participants of the CCDS.

Demographic characteristic	Full sample of the CCDS (*N*=332)	Sample of the CCDS seen in the home at the childhood assessment (*N*=272)
Mother's mean age at birth	28.15 (*SD* 6.35, range 16.09 – 42.99)	28.48 (*SD* 6.23, range 16.09 – 42.18)
Father's mean age at birth	30.81 (*SD* 6.82, range 15.62 – 30.81)	31.26 (*SD* 6.71, range 15.62 – 56.67)
Social Class (%):		
Middle class	50.90%	54.40%
Working class	49.10%	45.60%
Mothers Highest Educational Achievement (%):		
No qualifications	5.10%	4.00%
Fewer than 5 GCSEs A* - C	16.60%	15.80%
More than 5 GCSEs A* - C	13.90%	13.20%
A-levels	11.70%	10.70%
Undergraduate degree	28.00%	29.00%
Postgraduate degree	24.70%	27.20%
Mother's Relationship Status at Birth of Child (%):		
Married	50.30%	52.60%
Cohabiting	33.70%	33.50%
In relationship with father, not living together	6.30%	5.10%
Single	9.60%	8.80%
Mother's Ethnicity (%):		
British	92.70%	93.50%
Other European	3.50%	2.70%
Bangladeshi, Indian, Pakistani	1.60%	1.50%
South East Asian	0.30%	0.40%
Mixed race	0.60%	0.80%
Other	1.30%	1.20%
Child's Sex (%):		
Male	56.80%	56.60%
Female	43.20%	43.40%
Mean Sociodemographic Adversity	.00 (*SD* .99, range -.95 – 2.51)	-.07 (*SD* .98, range -.95 – 2.51)

Note. The families seen in the home at the Wave 6 assessment did not significantly differ on any of the demographic characteristics as compared to the full sample.

2.2.3. The Childhood Sample (Wave 6)

The data used for the investigations within this thesis were collected at the childhood assessment when the children were a target age of seven years old (see Section 2.3.6). Figure 2.1 details the participation of the full CCDS sample recruited in pregnancy to the 272 (81.93%) families that were seen in the home at the childhood assessment and are included in the investigations for all the chapters of this thesis. The sociodemographic adversity score for the sample seen in the home at the childhood assessment (M=-.07, $t(330) = 2.56$, $p > 0.05$) did not differ significantly from the sample recruited in pregnancy (see Table 2.1).

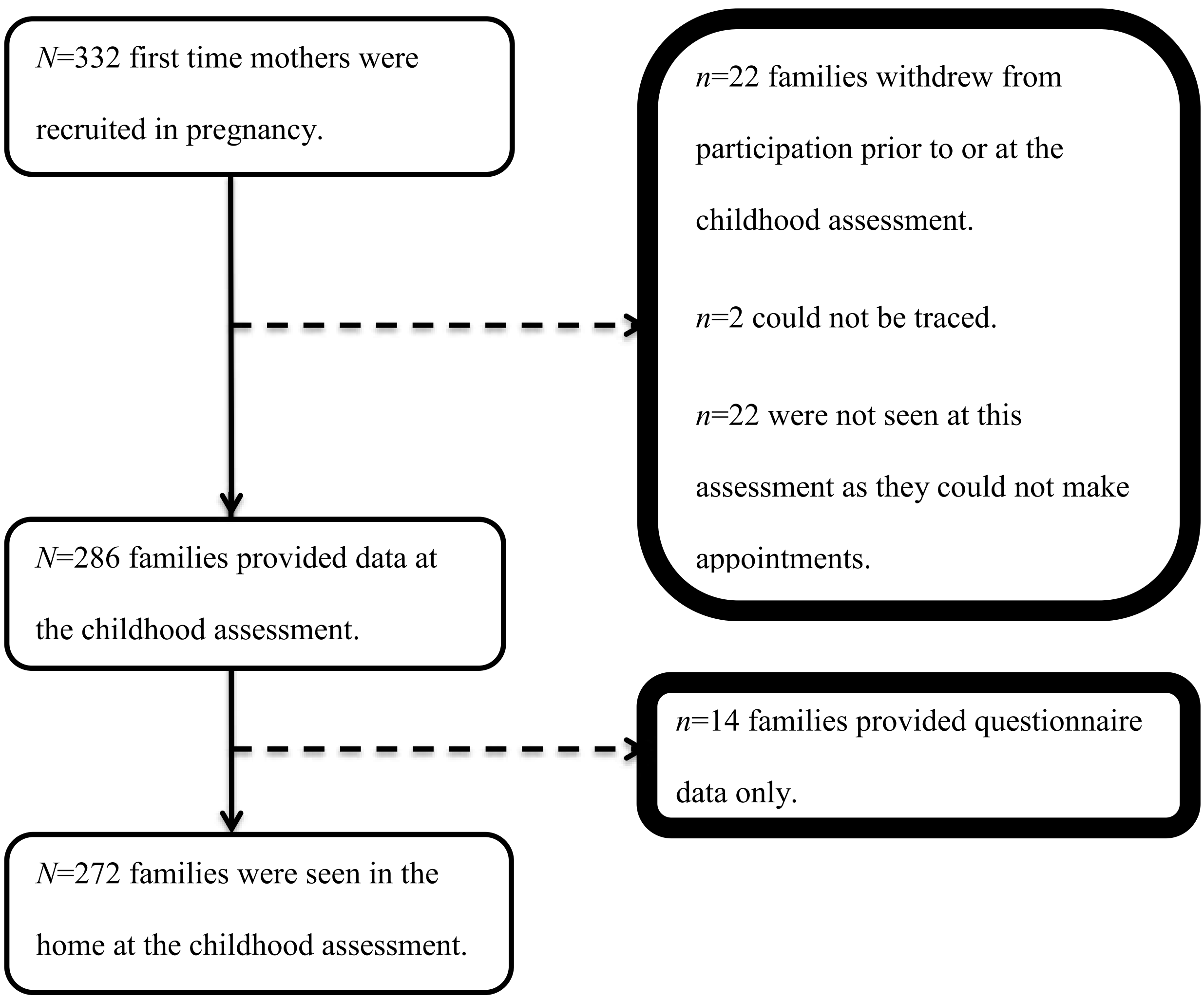

Figure 2.1. Progression of the CCDS sample from recruitment to the childhood assessment.

2.3. Procedure

The CCDS contained assessments at six different time points in an alternating series of home and laboratory visits (see Figure 2.2). The procedure at each assessment included a combination of interviews, questionnaires and various observations. Ethical approval for all procedures was approved by the National Health Service (NHS) Multi-Centre Research Ethics Committee and the Cardiff University School of Psychology Research Ethics Committee.

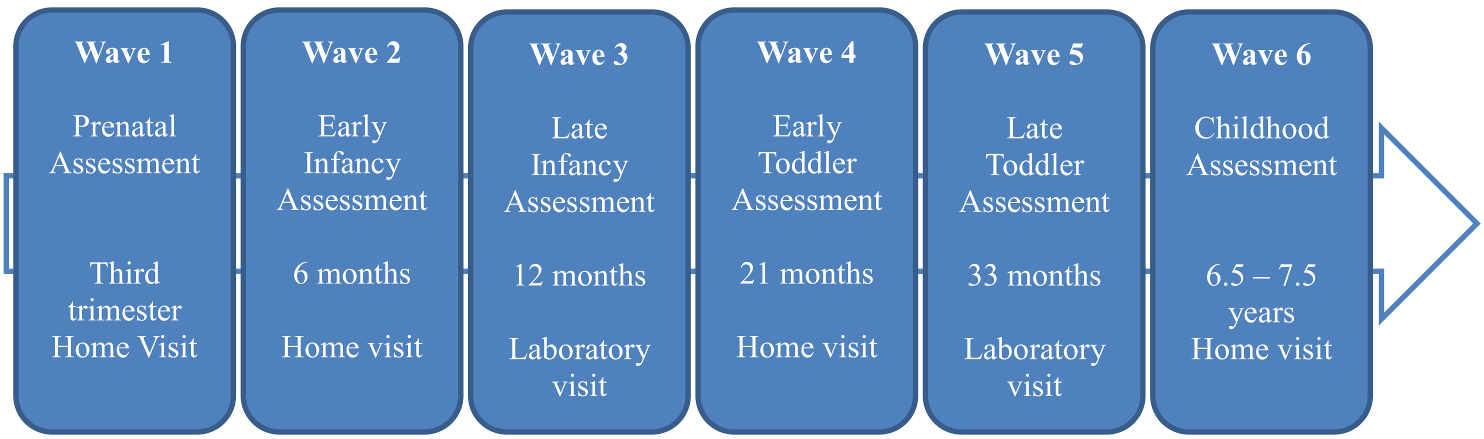

Figure 2.2. Summary of the Cardiff Child Development Study procedure.

2.3.1. Wave 1: The Prenatal Assessment

Families were visited in the home by two trained researchers in the third trimester of pregnancy. The researcher conducted the Schedules for Clinical Assessment in Neuropsychiatry (SCAN; Wing et al., 1990) interview with the mothers and fathers in separate rooms. The interviews lasted on average two hours and collected information regarding the parents' sociodemographic information, education, social support, employment, antisocial behaviour, their own mental health and their family history of mental health problems. Following the interview, parents were given questionnaires covering their general health, lifestyle, life events, relationship quality, fertility history, behavioural history and substance use to complete and return at their convenience. A £20 gift voucher was given to the families as a compensation for their time.

2.3.2. Wave 2: The Early Infancy Assessment

Families were visited in the home when the infants were a target age of 6 months (*M*=6.55). In the two-hour visit, one researcher interviewed the mother using the SCAN to assess the mother's mental health symptoms between Waves 1 and 2. Additionally, mothers were asked about their experience of labour, and current support as well as any changes in their relationship, education, or living environment. Questionnaires were given to the mother, father and for a third informant to complete including questions relating to their general health, lifestyle, life events, relationships, family structure, and the infant's behaviour to be completed at their convenience. In addition to the questionnaire and interview data collected from the families, a battery of cognitive and affective tasks was conducted in addition to interaction activities between the infants and primary caregiver (88% mothers). A £20 gift voucher was given to the families to compensate for their time.

2.3.3. Wave 3: The Late Infancy Assessment

At a target age of 12 months (*M*=12.82), families were invited to the laboratory at the School of Psychology, Cardiff University, to attend a simulated birthday party. For each testing session, three families were invited to the laboratory. Infants were initially assessed individually on a battery of social, cognitive, and emotional tasks in the presence of their caregivers (90% mothers). During this time, caregivers who attended the session were given questionnaires regarding the infant's development to complete. Following this, the families who attended the session were observed together during a simulated birthday party which comprised of a teddy bears picnic, a 'birthday lady', and a researcher dressed as a bear. The families were then left in the room for a further 20 minutes for an assessment of peer interaction. At the end of the session, infants were presented with a wrapped gift of a picture book, and caregivers were given a £20 gift voucher for their time.

2.3.4. Wave 4: The Early Toddler Assessment

Families were visited in the home for a two hour assessment at a target age of 21 months (*M*=20.60). An interview was conducted with the caregiver to collect information regarding updates of education achievements, employment information and any subsequent pregnancies and births. Following this interview, two parent-child interaction tasks were completed and the parents invited a similar peer to the house for observations of peer interaction. Parent questionnaires were given to the families which included questions regarding family structure, health, lifestyle, life events, relationships, and their toddler's behaviour. An additional questionnaire was completed by a third informant that included questions about the toddler's behaviour. At the end of the assessment, the child and the peer were presented with a gift of art materials, and families were given a £20 gift voucher for their time.

2.3.5. Wave 5: The Late Toddler Assessment

At a target age of 33 months (*M*=33.60), families were once again invited to the laboratory at the School of Psychology, Cardiff University, to attend a simulated birthday party. Three families were invited to the session, in a similar procedure to Wave 3. Children initially completed a battery of age-appropriate social and cognitive tasks, in addition to two parent-child interaction tasks. Following this, the families who attended together were observed in a replication of the birthday party procedure used at Wave 3. At the end of the session, infants were presented with a small gift, and caregivers were given a £20 gift voucher for their time.

2.3.6. Wave 6: The Childhood Assessment

At a target age of seven years old (*M*=6.96), families were visited in the home once again for 2 two-hour assessments (see Section 2.4, and Figure 2.3 for further details). At this assessment, the primary caregiver (90.40% mothers) was interviewed using the SCAN and the Preschool Age Psychiatric Assessment (PAPA; Egger & Angold, 2004). During this time, a second researcher completed a battery of social, emotional, and cognitive tasks with the child, preferably in a separate room from the interview. If possible, a third research assistant kept any younger siblings occupied in order to prevent them from interrupting the interviews or assessments. Following this, the focal child, their caregiver, and any siblings present took part in a series of interaction tasks. Questionnaires were left for the mother and father including questions relating to their general health, life events, lifestyle, relationship, family structure, and their firstborn child's behaviour. Additional questionnaires regarding the child's behaviour were completed by a third informant and the child's teacher. At the end of the session, the child was given a £10 book voucher, and the caregiver was given a £20 gift voucher for their time.

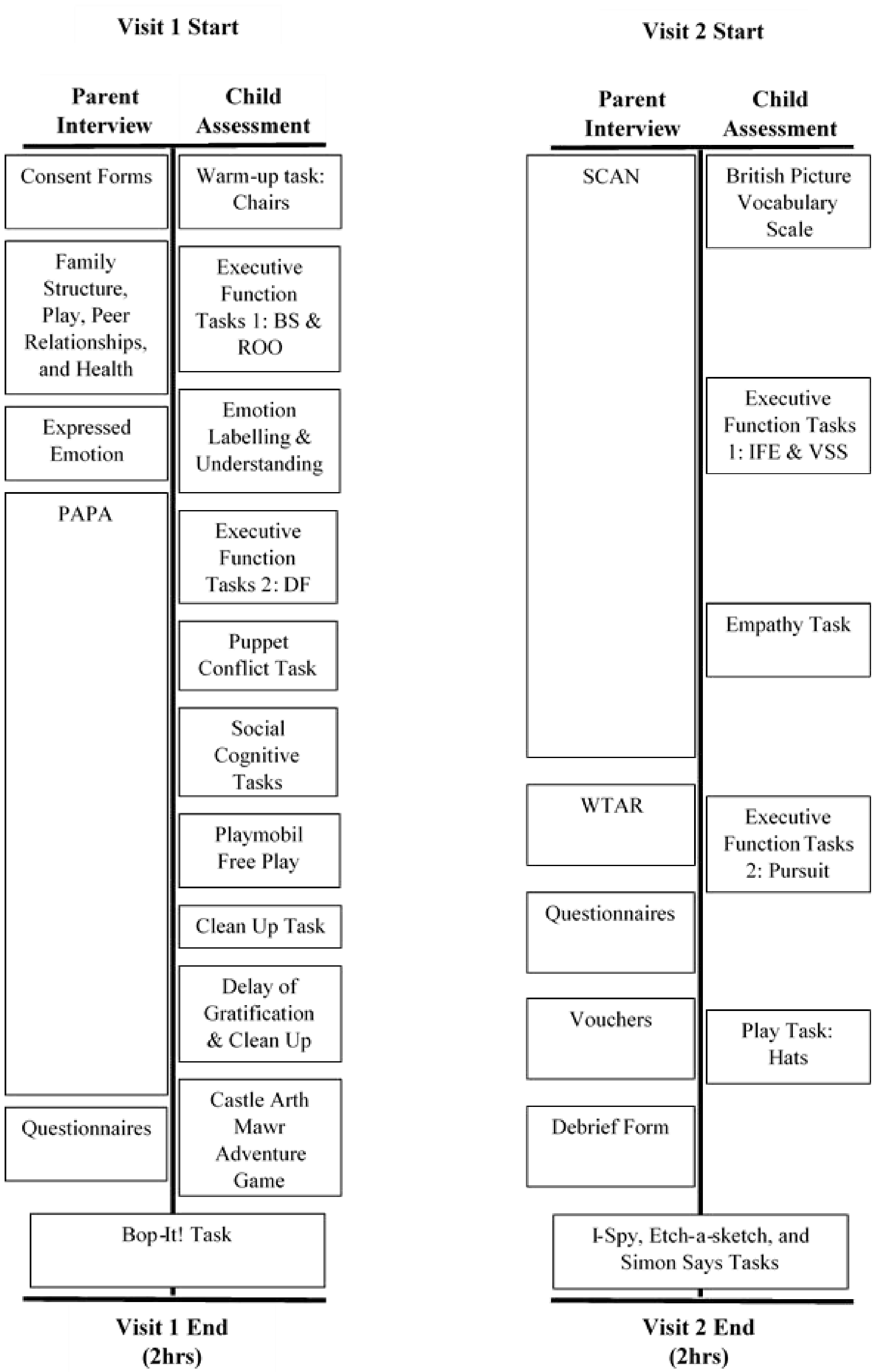

Figure 2.3. Timeline of the procedure at the childhood assessment

2.4. Measures

All measures used for the analyses within this thesis, other than sociodemographic information (see Section 2.2.2) were collected during the childhood assessment in the home (see Figure 2.3); details of the measures used in this investigation follow.

2.4.1. Family Structure, Play, Peer Relationships, and Health

As a part of the caregiver interview, a series of questions were asked regarding the families' home environment, their family structure and relationship, the children's play and peer relationships, and a brief developmental assessment. Of particular interest for this thesis is the section related to children's play and peer relationships in which the caregiver was asked to identify "What kind of things does [child's name] like to do" from a choice of 18 specified activities. These activities included outside play, climbing frames, swinging, sliding, ball games, hide & seek, play with dolls, action figures, trucks/cars/trains, playing house, dress-up, draw and paint, clay/playdough, build, board games, read alone, video/computer games and Playmobil figures (see Appendix 1). The caregiver was also asked to report the frequency of time their child spent watching television, playing video games and being read to by the caregiver.

2.4.2. Executive Function: Amsterdam Neuropsychological Tasks (ANT; de Sonneville, 1999)

The ANT (de Sonneville, 1999) are a computerised set of well-validated tasks designed to measure executive functioning previously used in population-based samples (Brunnekreef et al., 2007). Six tasks from the ANT were used at this assessment and all were presented on a laptop with the child responding using a mouse. For each task, the experimenter gave instructions alongside an example, the child was given a practice trial and then the test trials began.

Response organisation objects (ROO). In this task, children were asked to hold the mouse with the forefinger of each hand on the respective buttons of the mouse. The task consists of three parts. In part 1 (compatible condition) children were presented with a fixation cross on the screen, a red ball appeared on either side of the cross, and children were asked to click the same side of the mouse on which the ball appeared. For example, if the red ball appeared on the left side of the cross, then they should click the left button on the mouse. In part 2 (incompatible condition), a white ball appeared on either side of the fixation cross and children were asked to click the opposite side of the mouse on which the ball appeared. For example, if the white ball appeared on the left side of the cross, then they should click the right button on the mouse. In part 3 (mixed condition), children were presented with both the red and white ball, and were asked to respond by clicking the appropriate sides of the mouse as they were trained to for the previous two parts. The difference in the mean reaction times (ms) between parts 2 and 1 reflect a measure of *response inhibition*. The difference in the mean reaction times (ms) between the compatible trials of parts 3 and 1 reflect a measure of *cognitive flexibility*. A lower difference in the reaction times between the trials of the two parts reflects better response inhibition and cognitive flexibility respectively (for further information regarding the construction of this variable, see Paine, Pearce, van Goozen, de Sonneville, & Hay, 2018).

Visuospatial sequencing (VSS). In this task, children were presented with 9 circles on the screen presented in a square matrix. Following a beep, a computer animated hand pointed to a sequence of the circles that gradually increased in the number of targets and the complexity of the sequence. The child was asked to replicate this sequence of circles, with the total number of correctly identified targets in the correct order indicating their *working memory* (for further information regarding the construction of this variable, see Paine et al., 2018).

Pursuit (PU). For this task, each child was presented with a green star that moved around the screen in all directions, at a constant speed, but in a random pattern for five minutes. Children we asked to 'catch' the star with the cursor as it moved around the screen using the mouse. The mean deviation (mm) from the star over the course of the task reflects a measure of *visuomotor coordination* or *fine motor control* (for further information regarding the construction of this variable, see Huijbregts, Swaab, & de Sonneville, 2010).

2.4.3. Playmobil Free Play Task

Children were administered a standardised battery of social-cognitive tasks enacted using Playmobil figures designed to assess four aspects of their social processing (See Paine et al., 2018, for more details). These stories were enacted using Playmobil figures depicting fictional scenarios at home, in the bedroom and at school (see Figure 2.4). Following this, the children were given the opportunity to play with the Playmobil in any way that they would like to for at least three minutes. Experimenters were encouraged not to prompt the children's pretend play and only interact with the play at the child's request.

Figure 2.4. The Playmobil figures and settings available for the Playmobil free play task.

2.4.4. Castell Arth Mawr Adventure Game (CAMGame; Hay et al., 2017)

Children played a bespoke first-person adventure game modified from the commercially available game The Elder Scrolls V: Skyrim (Bethesda, 2011) using the Skyrim: Creation Kit (Bethesda, 2012). The game narrative, which was inspired by the Robbers Cave experiment (Sherif, Harvey, White, Hood & Sherif, 1949), consisted of 11 “scenes” involving a child being on a school trip to a castle with the teacher and classmates from a primary school, identified by the red school sweatshirts being worn. As the child proceeded through the game, rival children from the blue school were introduced who were competing to find treasure that had been buried somewhere in the castle. The children were presented with a series of emotional challenges that might provoke prosocial behaviour, fear-related behaviours, or aggressive responses in the form of using a mallet they had been given (for further details regarding these challenges and the game narrative, see Hay et al., 2017; Appendix 2; and https://youtu.be/SpixvsHypg8 for a video demonstration of the CAMGame).

The children were told that in the game they could pretend they were on a school trip to a castle, and they had to stop and listen to the characters in the game as they would provide instructions regarding where to go and what to do. The children's choices in reaction to specific events in the game were coded by the researcher during the testing session. The children's speech and facial expressions were video-recorded using the webcam on the laptop. Additionally, the child's game play was recorded using *Fraps* (Beepa, 2013) software which captured the child's progression through the video game. Children played the game on an Alienware™ laptop using an Xbox™ controller with the right trigger coloured in purple and the left analogue stick coloured white to correspond with instructions given by the game. Instructions of how to use the controller were given by the researcher before the child began playing the game, though these were repeated as a part of the narrative.

2.4.5. Verbal Ability: British Picture Vocabulary Scale (BPVS; Dunn & Dunn, 2009)

Children's receptive vocabulary was assessed using the British Picture Vocabulary Scale (BPVS; Dunn & Dunn, 2009). In this task, the researcher said a word and the child chose the one picture out of four options representing the meaning of the word. Children's receptive vocabulary (an estimate of their verbal IQ) was calculated by normalising the data based on their age to produce a standardised score.

2.5. Statistical Power

The investigations within this thesis were conducted in the context of a study that had already been completed. Therefore, sensitivity power analyses were conducted using *G*Power 3.13* (Faul, Erdfelder, Lang, & Buchner, 2007) to determine the effect sizes that we have the statistical power to detect based on the *N*=272 families that were seen in the home at the childhood assessment. Table 2.2 presents the results of the sensitivity power analyses for the commonly used statistical tests in this thesis. Based on these analyses, the childhood sample of the CCDS is sufficiently powered to detect small to medium effects (Cohen, 1988; Faul et al., 2007).

Table 2.2. Results of sensitivity power analyses for the statistical tests used in the thesis.

Statistical Test	Input Parameters	Estimated effect size
t-test (one sample)	$\alpha = 0.05$ Power (1-β err prob) = 0.80 Total *N* = 272	*d* = .17 (small)
t-test (two sample)	$\alpha = 0.05$ Power (1-β err prob) = 0.80 Total *N1* = 118 Total *N2* = 154	*d* = .34 (small to medium)
Correlation	$\alpha = 0.05$ Power (1-β err prob) = 0.80 Total *N* = 272	*r* = .17 (small to medium)
Linear Regression	$\alpha = 0.05$ Power (1-β err prob) = 0.80 Total *N* = 272 Number of predictors = 5	$f^2 = .05$ (small to medium)
Repeated Measures ANOVA	$\alpha = 0.05$ Power (1-β err prob) = 0.80 Total *N* = 272 Number of groups = 4 Number of measurements = 11 Corr among rep measures = .5 (default) Nonsphericity correction = 1 (default)	*f* = .06 (small to medium)
One-way ANOVA	$\alpha = 0.05$ Power (1-β err prob) = 0.80 Total *N* = 272 Number of groups = 4	*f* = .20 (small to medium)

Note. Interpretations of effect sizes are based on Cohen's (1988) recommendations. Group sizes for the two-sample t-tests reflect the *n* of girls and boys seen at Wave 6. Input parameters reflect the maximum variables and groups used in the subsequent chapters.

Chapter 3.

An Exploration of the Playful and Imaginative Activities Present in the Middle Childhood Period

3.1. Introduction

In order to establish the playful and imaginative activities that children engage in during the middle childhood period, it is necessary to define the activities that can be classified as play. In the present chapter, I review how play is defined in previous theory and research. The activities present in the middle childhood period will then be explored in terms of their presence in previous research. Only studies that investigated children in non-clinical samples between the ages of 7 and 10 are included in this review. The literature search was conducted using the Web of Science database, in addition to examining the reference lists of relevant articles and authors in the field.

3.1.1. What is Play?

Although children's play is studied extensively, a definition as to what play is has not yet reached consensus (for a review, see Lillard, 2014). In order to continue the scientific investigation as to what activities can be considered as 'play', it is important to ensure that the definition does not encompass so broad a definition that the label loses meaning (Burghardt, 2010; Vandenberg, 1982). Indeed, it is widely accepted that children's play appears in many different forms that are not mutually exclusive from one another. For example solitary play, social play, imaginary or symbolic play, games with rules, language play, rough-and-tumble play and construction play (Bateson, 2010; Burghardt, 2010).

3.1.1.1. Behavioural Elements of Play

Piaget (1962), amongst others, argued that children's play could be characterised according to cognitive and behavioural components. It was Piaget's view that all behaviours that are repeated for one's own pleasure are susceptible to becoming a form of play. Piaget argued that play could be categorised as either sensorimotor play, symbolic play, or games with rules. Sensorimotor play involves individuals' repetitive interactions with their own body or an object for no evident function. In symbolic play, an individual holds and uses a make-believe representation to stand as an absent object. Piaget (1962) argued, based on observations of children including his own, this form of play does not appear until the second year of life (Piaget, 1962, pg. 142) and thereafter "from the age of four to seven...symbolic games...begin to lose their importance," (Piaget, 1962, pg. 135). Finally, as children's symbolic play becomes more social in nature, the inclusion of rules becomes necessary and so the play develops into games with rules.

However, the categorisation of play according to behavioural criteria has been criticised as not clearly defining the distinction between what can be regarded as play and non-play behaviours (Lillard, 2014). For example, one of the key features of symbolic play is that it contains a cognitive component in the form of a representation of an absent or pretend object, which distinguishes the behaviour as play and cannot be directly observed (Leslie, 1987; Piaget, 1962; Vygotsky, 1967). Therefore, when considering whether activities engaged in by children are play, factors other than the behaviour of the child should be taken into account.

3.1.1.2. Motivational Elements of Play

In a seminal review, Rubin, Fein and Vandenberg (1983) noted six common features that differentiate play behaviours from non-play behaviours according to the motivations underlying them. Firstly, play is regarded to be intrinsically motivated, serving neither physical nor social drives (Garvey, 1991; Klinger, 1971). Secondly, play is characterised by the behaviour itself and not towards a goal imposed internally or externally and is therefore both spontaneous and voluntary (Garvey, 1991; Klinger, 1971). Thirdly, the behaviours are motivated and directed by one's own desires and intentions, not by the properties of the objects being played with. Fourth, play behaviours are not a serious re-enactment of the situations they resemble, but instead are non-literal behaviours that require an 'as if' representation (Garvey, 1991). Fifth, play behaviours are flexible in so far as they are not dictated by externally imposed rules (Klinger, 1971). Finally, play is an active activity purposefully engaged in by a child (Garvey 1991). An additional motivation commonly noted to underlie play, not explicitly mentioned by Rubin and colleagues (1983), is that play is something that is enjoyable for an individual (Garvey, 1991; Piaget, 1962). This last characteristic is noteworthy, as it reflects the value that children themselves place on play: "Playing is fun!" (Downey, Hayes, & O'Neill, 2007, pg. 15).

However, several issues emerge when characterising play according to these features. Rubin and colleagues (1983) note that characterising play according to the presence of non-literal representations excludes anything other than symbolic or pretend play behaviours. Similarly, characterising play as not being dictated by rules disregards Piaget's (1962) and

Vygotsky's (1967) observations that early play behaviours are developmentally linked with games with rules. Additionally, forms of sociodramatic or role-play contain rules governing behaviours appropriate to the roles undertaken (Garvey, 1991). Finally, although such motivational criteria are helpful in better understanding the concept of play, they fall short of translating into observational criteria to aid in distinguishing between play and non-play behaviours.

3.1.1.3. Contextual Elements of Play

In addition to play being characterised by the internal motivations and the external behavioural manifestations, the context in which the activity occurs is argued to be an important factor in determining what is regarded as play (Rubin et al., 1983). Firstly, the physical context of the behaviour is important in characterising the activity as play in highlighting that the behaviour is non-literal. For example the behaviour of sipping from an empty cup (A), accompanied by expressions of positive affect (B), occurring in an environment with an array of tea-party themed toys (C), is more likely to be characterised as play than if the same actions occurred at a dining table (see Figure 3.1). In addition to the environmental context in which the play occurs, Bateson (1955) argued that children indicate what should be considered as 'play' and what is 'not play' using verbal and non-verbal signals, termed *metacommunication* (see Section 4.1.1 for further information). These signals serve to indicate that the activities occurring in this *frame*, or context, are to be characterised as play. Such signals are also studied in non-human animals in the context of play-fighting, for example face-pawing in dogs, suggesting that the interpretations of whether behaviour is play is not dependent on language (Bekoff, 1972). Finally, the cultural context in which behaviours occur influence whether the activities are categorised as play. In some cultures, play is not regarded to be valuable for the child's development and so is engaged in relatively little (for a review, see Bornstein, 2007). Therefore, behaviours that are characterised as play in cultures that endorse the value of such activities may not be classified as play in cultures that do not. Therefore it becomes apparent that identifying activities as being a form of play relies on considering the behaviour, motivation and context of the activity.

3.1.1.4. Studying Play

Figure 3.1. Children's play can be characterised according to their (A) behaviour, (B) internal motivations, and/or (C) surrounding context.

As summarised thus far, characterising the activities regarded as play involves investigating children's behaviour, their internal motivations and the surrounding context of the activity (see Figure 3.1). However, motivations underlying children's behaviours are not directly observable and must be deduced from prior reports, children's language or their expressions of emotion. These latter elements in particular, language and emotion, can be identified based on observations of children and coded to indicate whether certain activities are indeed play. Therefore in order to study play in children's lives in a manner that has the potential to capture children's behaviours, motivations and the surrounding context, an approach that incorporates multiple methods of investigating is necessary.

3.1.2. What Forms of Play and Other Imaginative Activities are Present in Middle Childhood?

3.1.2.1. Physical and Rough-and-Tumble Play

Locomotor, *physical* and *exercise play* are among many terms used to describe the engagement in physical activity within a playful context (for a review of the function of physical play, see Pellegrini, 2010). Such activities are distinct from pure exercise in that they are accompanied by positive affect, can involve novel sequences of motor behaviour, and occur for no apparent purpose or goal (Pellegrini, 2010; Rubin et al., 1983). This form of play in humans is most likely to occur in outdoor settings in activities such as running, swinging and climbing (Garvey, 1991; Pellegrini, 2010), though it is notable that analogous activities are observed and investigated in non-human animals (Smith, 2007). Additionally, even forms of exercise could be regarded as a form of play if they are engaged in for enjoyment or are accompanied by an imagined premise. For example, *"Zombies, run!"* is an interactive smartphone app that turns jogging into a fictional game where the runner is a survivor of a zombie epidemic.

Physical play emerges after the first year of life, peaks around the ages of four and five, before declining during the primary school years (Pellegrini, 2010). *Rough-and-tumble play* is an activity often included as a form of physical play in the form of play fighting (Garvey, 1991; Pellegrini, 2007). Although it is argued that rough-and-tumble play should be considered as a separate activity from other forms of physical play due to a core social component (Pellegrini, 2007), the study of this activity in middle childhood often does not differentiate between the two activities, and so are reviewed together.

In observations of children aged between 5 and 10, rough-and-tumble play accounts for 11% of children's playground behaviours (Pellegrini, 1989). However, in observations of only eight-year-old children in the playground, this figure was reduced to 6.8% (Boulton, 1992). Blatchford, Baines, and Pellegrini (2003) included observations of 'vigorous play' (cartwheels, spinning, running) in their study of 7-8 year-olds, and additionally looked for instances of rough-and-tumble behaviour within other play activities. They found that vigorous play accounted for approximately 12% of their playground activities, and that rough-and-tumble behaviours were most common within these vigorous activities and additionally within their fantasy play. In Case-Smith and Kuhaneck's (2008) surveys of children's play preferences, whilst parents reported that their children's preferences for rough-and-tumble play decreased between 3 and 7, motor/physical play was fairly stable across these ages and remained one of the more preferred activities at ages 6 and 7. However, in this study the category gross motor play also included activities that would better be categorised as games with rules, and it may have been these activities that lead to the high preference reports at these older ages. In summary, despite Pellegrini's (2007; 2010) statement that physical play and rough-and-tumble play are separate activities that should be considered as such, the research of these activities in middle childhood is mixed in terms of whether they are differentiated. Therefore, the prevalence of physical play separate from rough-and-tumble play in middle childhood is currently unclear, warranting further investigation.

3.1.2.2. Fantasy, Symbolic and Pretend Play

Pretend play, *symbolic play*, and *fantasy play* are terms used interchangeably, but can be defined as 'behaviour in a simulative, nonliteral, or "as if" mode,' in which an individual playfully distorts reality (Fein, 1981, pg. 1096). Garvey (1974) argues this form of play can occur in either a social context where there is interaction with a play partner, or be solitary in nature regardless of whether a play partner is present. However, Piaget (1962) contended that all pretend activities can be social to an extent, as even solitary pretend play could be considered as performances to an imaginary other. As highlighted in Section 3.1.1.1, Piaget (1962) argued pretend play emerges when children reach the age of two as a form of *assimilating* experiences into their present behaviour, and thereafter declines between the ages of four and seven. Despite this assertion, there is increasing support for the notion that play continues beyond this age (e.g., Lillard, 2014; Singer & Singer, 2005; see Section 1.2). Singer and Singer (1990) argue that one function of pretend play in middle childhood, is to enable children to better deal with school content and to form peer groups. However, there is a paucity of research investigating children's play beyond six years of age (Lillard, 2014), in particular, whether pretend play is indeed absent in this period and if so, what activities replace it.

A summary of the published work on pretend play in non-clinical samples of children aged from six to ten is summarised in Table 3.1. Of the thirty-one studies included in this review, six administered standardised assessments of non-social pretend play using the Affect in Play Scale (APS; Russ, 2004), or the Affect in Play Scale-Preschool Version (APS-P; Kaugars & Russ, 2009). These tasks involve presenting the child with a puppet in the APS or a wider variety of toys in the APS-P for five minutes, which are then coded to categorise their affect and the quality of the fantasy created (Chessa, di Riso, Delvecchio, Salcuni, & Lis, 2011; Russ, 2004).

Although the findings from this research are valuable in that they demonstrate children in middle childhood are *able* to engage in pretend play that is more complex than younger children's pretence, they do not indicate the extent to which older children choose to spontaneously engage in such activities.

The remaining 24 studies involved experimental and naturalistic observations of children in the home and in school, interviews with children, or surveys of caregivers. In the first instance, these studies show that children in the middle childhood period report pretence as an activity that they enjoy engaging in and consider as play (Howard, Miles, Rees-Davies, & Bertenshaw, 2017). Supporting this claim, in large scale observations of children's playtime, children in the middle childhood period engaged in pretend play between 6% - 11% of their time on the playground (Blatchford et al., 2003; Boulton, 1992). In other contexts, children between the ages of 6 to 10 were observed naturally engaging in pretend play in the home with siblings and peers (e.g., Cutting & Dunn, 2006; Howe, Petrakos, & Rinaldi, 1998; Leach, Howe, & Dehart, 2015, 2016), in addition to experimental contexts (Adams et al., 2017; Yuill et al., 2014), and in other settings (Flannery & Watson, 1993; Roberts, Stagnitti, Brown, & Bhopti, 2018). Therefore, it emerges from the literature of pretend play in the middle childhood period that, in contrast to Piaget's (1962) claim based on his observations, children do engage in this form of imaginative activity.

Table 3.1. A review of the literature published between 1900 and 2018 on pretend play in children aged between six and ten years.

Author(s)	Sample information	Pretend play measures	Results
Adams, Rincón, Puyo, Cruz, Medina, Cook, & Encarnação (2017)	*N*=30 Age range: 3-8 (*n*=12 six to eight-year-olds) Non-clinical sample Design: Cross-sectional Country: Canada	Observed children's play with conventional toys and unstructured materials. Children used a robot to handle the objects, or handled the objects conventionally in a counterbalanced design. Behaviour coded as: a) Functional play b) Pretend play c) No play	No differences in any of the forms of play in children aged six and above between the robot and non-robot conditions. No significant differences in the duration of pretend play across the age groups.
Blatchford, Baines, & Pellegrini (2003)	*N*=129 Age range: 7- 8 Non-clinical sample Design: Cross-sectional Country: United Kingdom	Observations of children's playground activities coded for: a) Social interaction (solitary, parallel, social) b) Type of activity (conversation, vigorous play, sedentary play, fantasy play, chasing/catching/seeking, racing, ball games, jump skipping, games with materials, verbal games, other, nothing) c) Behaviour (Onlooker, unoccupied, disputing, tease/taunt, rough-and-tumble play, aggression, positive affection, distress, disciplined, other)	Activities summarised into three categories: Conversation, Play (vigorous, sedentary and fantasy), Games. Play and games each accounted for a 1/3 of children's playtime activities. Fantasy play in particular accounted for just over 11% of children's playtime activities. Boys found to be more likely to engage in fantasy play. Social activities more common than parallel or solitary ones. Though sex differences emerged, with boys spending more in social, and girls more in solitary and parallel. Mixed-sex play groups were uncommon.

Author(s)	Sample information	Pretend play measures	Results
Boulton (1992; study 1)	*N*=86 children from two classes 8-year-old class (*n*=43) 11-year-old class (*n*=43) Classes from two urban middle schools. Intake predominantly white-working class children. Design: Cross-sectional Country: United Kingdom	Observations of children's playground activities coded as: Sociable, rule games, rough-and-tumble play, fantasy play, solitary, other.	Fantasy play accounted for 6.8% of the playground time of the 8 year olds, and was completely absent in the 11 year olds. 8-year-old girls spent more time (14.6%) than boys (6.8%) engaged in fantasy play. Boys spent more time in solitary play than girls.
Case-Smith & Kuhaneck (2008)	*N*=166 parents Age range: 3 – 7 (*n*=46 6-7) Developmental delay group compared to 'typically developing' group. Design: Between-groups Country: United States	Parents of children asked to report on children's play preferences: a) Gross motor b) Rough and tumble play c) Video and computer games d) Drawing and colouring e) Construction f) Reading and watching television g) Pretend play h) Dolls or character figures i) Object exploration	Age related differences significant for rough and tumble play (highest at 5 years then decreased), video and computer game play (increased from 3-years-old to be highest at 7 years), and pretend play (low scores at youngest and oldest ages with highest preferences at 4 and 5). No overall gender differences found. In 'typical development' group, most preferred activity was gross motor play, followed by drawing and colouring, reading and watching television, construction, rough-and-tumble play, video and computer games, dolls, pretend play and object play.

Author(s)	Sample information	Pretend play measures	Results
Chessa, di Riso, Delvecchio, Salcuni, & Lis (2011)	*N*=519 Mean age: 7.96 (range: 6 –10) Non-clinical sample Design: Cross-sectional Country: Italy	Affect in Play Scale	The results of factor analysis indicated the best fit for the data was a two factor solution: A cognitive factor including organisation, elaboration, imagination and comfort; and an affective factor including the variability and frequency of affective themes.
Coplan, Ooi, & Rose-Krasnor (2015)	*N*=290 Mean age: 10.20 (range: 9 – 12) Non-clinical sample Design: Cross-sectional Country: Canada	Children's social participation behaviours during recess observed using the Play Observation Scale	A majority of the children were observed spending most of their time engaged in social interactions with peers. Non-social children (identified by cluster analysis) displayed higher levels of internalising problems and peer difficulties.
Cutting & Dunn (2006)	*N*=43 focal children and their older sibling Mean age of focal child: 4.16 years (range: 3.52 – 4.62 years) Mean age of older sibling: 7.05 years (range: 5.0 – 10.5 years) Design: Between-groups Country: United Kingdom	Twenty minute observations of the child interacting in the home with the sibling coded for: a) Cooperative pretense b) Conflict c) Communication/Bids for attention	Positive relationship quality with sibling associated with cooperative pretense. Cooperative pretense higher with sibling than with similar aged peer.

Author(s)	Sample information	Pretend play measures	Results
Delvecchio, di Riso, Li, Lis, & Mazzeschi (2016)	*N*=333 Mean age: 8.24 years (range 6 – 10) Non-clinical sample Design: Cross-sectional Country: Italy	Affect in Play Scale: Preschool version Affect in Play Scale: Preschool extended version	Children played with the materials for both play assessments at the same level of organisation, imagination and elaboration. Therefore the use of the APS-P is a valid measure for school aged children.
Delvecchio, Li, Pazzagli, Lis & Mazzeschi (2016)	*N*=538 Mean age: 6.61 years (range 4 – 10) Non-clinical sample Design: Cross-sectional Country: Italy	Affect in Play Scale: Preschool version Affect in Play Scale: Preschool extended version	Older children more able to organise their play, design a plot, produce complex stories, have more of a coherent narrative, use pretense/fantasy to transform objects, and add novel elements and ideas. Older children also expressed and used a larger amount of affective expressions in their play.
Doyle, Ceschin, Tessier, & Doehring (1991)	*N*=118 Mean age of grade one children (*N*=67): 6.83 years Design: Cross-sectional Country: Canada	Free play task with a selection of toys (including blocks, Playmobil figures, doctor's kit etc.) coded for: a) Mode of play (social or solitary) b) Role transformations c) Object transformations d) Nature of non-pretend activities	Children from middle-class backgrounds pretended significantly more and for longer than those from lower class backgrounds. When controlling for SES and cognitive skills, amount and duration of social pretend play did not increase with age.

Author(s)	Sample information	Pretend play measures	Results
Eckler & Weininger (1989)	*N*=50 Age range: 4 – 8 Children identified as being enthusiastic players based upon an interview. Design: Cross-sectional Country: Canada	Non-social pretend play task with experimenter coded for: a) Number of propositions b) Story grammar c) Level of complexity	Structural parallels found between pretend play and narratives Age related to the length of play. Evidence of the existence of play preferences found.
Eifferman (1971)	*N*=~14,000 (Exact *N* not reported) Age range: 6 – 14 Classes from 14 schools Design: Cross-sectional Country: Israel	Observations of children's playground and out-of-school play activities coded to record: a) Games with rules b) Competitive games with rules c) Symbolic play d) Practice play	Symbolic play low from the ages of 6-8 and remains so. Games with rules appear to increase in frequency until the age of 9-10, and thereafter appear to decline. Practice play appears to increase between the ages of 9-12.
Flannery & Watson (1993)	*N*=66 Age range: 4 – 8 Sample from one private day-care Design: Cross-sectional Country: United States	Observations of children's free play coded for: a) Type of activity (no play, non-fantasy play, or fantasy play) b) Theme (removal from reality & unfamiliarity)	Children grouped into high, average, and low fantasy players using a cluster analysis. Indicates there are individual differences in those who engage in fantasy play. High-fantasy players considered themselves accepted more by their peers, whereas the teachers considered them as less accepted.

Author(s)	Sample information	Pretend play measures	Results
Henning, Cordier, Wilkes-Gillan, & Falkmer (2016)	*N*=10 (5 ASD children, 5 Non-clinical) Mean age of non-clinical sample: 6.8 years Design: Between-groups Country: Not stated	Test of Playfulness during dyadic sessions	Children within each dyad displayed similar play skills to each other on the elements of the Test of Playfulness.
Hoffman & Russ (2012)	*N*=61 Mean age: 7.4 years (range: 5-10) Non-clinical sample Design: Cross-sectional Country: United States	Affect in Play Scale	Cognitive processes of pretend play related to divergent thinking. Positive affect in pretend play related to creativity during storytelling. Emotion regulation positively related to pretend play.
Hoffman & Russ (2016)	*N*=42 Age range: 5 – 8 years Non-clinical sample Design: Cross-sectional Country: United States	Affect in Play Scale	A story based intervention protocol improved children's pretend play skills.
Howard, Miles, Rees-Davies, & Bertenshaw (2017)	*N*=38 Mean age: 9.22 years (range: 7 – 11 years) Country: United Kingdom	Interviews of children in focus groups to identify: a) What, where and with whom children play b) Explore how children feel about their play	Children described activities including singing, rough-and-tumble, school work, toys, literacy, arts, games, sports, outdoor, electronics and pretense as play. Children discussed playing at home and at school in comparable amounts. Positive emotions associated with play.

Author(s)	Sample information	Pretend play measures	Results
Howe, Petrakos, & Rinaldi (1998)	*N*=40 sibling dyads Mean age of focal child: 5.75 years Mean age of older siblings (*n*=20): 7.1 years Design: Between-groups Country: Canada	Free play task with farm yard toys coded for: a) Enactments of pretend play b) Negotiations strategies used between the sibling dyads c) Internal state language (ISL) d) Sibling relationship quality	Pretend enactment negatively associated with sibling's reports of positive rapport in their relationship.
Howe, Rinaldi, Jennings, & Petrakos (2002)	*N*=40 sibling dyads Mean age of focal child: 5.75 years Mean age of older siblings (*n*=20): 7.1 years Design: Between-groups Country: Canada	Free play task with farm yard toys coded for: a) Enactments of pretend play b) Negotiations strategies used between the sibling dyads c) Internal state language (ISL) d) Sibling relationship quality	Pretend enactment negatively related to disputes between siblings. Low-level negotiations negatively related to ISL use during conflicts. High-level negotiations positively related to ISL use during conflicts.
Howe, Petrakos, Rinaldi & LeFebvre (2005)	*N*=40 sibling dyads Mean age of focal child: 5.75 years Mean age of older siblings (*n*=20): 7.1 years Design: Between-groups Country: Canada	Free play task with farm yard toys coded for: a) Strategies that children used to create shared meanings b) Enactments of pretend play c) Internal state language (ISL) d) Observed conflict	Shared meaning scores associated with pretend enactment. Dyads that used more strategies to construct shared meanings used more internal state language. Older siblings more likely to use more strategies to construct shared meanings.

Author(s)	Sample information	Pretend play measures	Results
Howe & Bruno (2009)	*N*=24 sibling dyads Mean age of older siblings: 8.2 years Non-clinical sample Design: Between-groups Country: Canada	Free play task with farm yard toys coded for: a) Pretend play b) Sibling collaboration c) Creativity (use of adjectives, themes, and number of object transformations).	Children engaged in less pretense with more set-up than creative themes when mothers were present during play. Sibling pretense and collaboration were only correlated when the mother was absent.
Howe, Abuhatoum, & Chang-Kredl (2014)	*N*=70 sibling dyads Mean age of older siblings: 6.75 years (range: 4.92 – 9.92 years) Non-clinical sample Design: Between-groups Country: Canada	Free play task with farm yard toys coded for: a) Themes of play b) Object use c) Descriptive language d) Internal state language	Dyads who constructed play themes in a way expected given the affordance of the toys were more likely to extend the themes of play in creative ways. References to knowledge internal states were related to creative uses of the objects.
Leach, Howe, & Dehart (2015)	*N*=65 focal children and their siblings Mean age of focal child: 4.7 years Mean age of older siblings (*n*=28): 6.32 years Design: Between-groups Country: United States	Children's semi-structured play with their siblings was coded for behaviours that create shared meanings between play partners.	Children more likely to display positive/neutral responses and prosocial strategies with friends than siblings. Older siblings engaged in more non-maintenance based behaviours for the play and employed more explanations. Older sibling's responses more negative than their younger siblings. Associations between strategies to construct shared meanings and internal state language use were found.

Author(s)	Sample information	Pretend play measures	Results
Leach, Howe, & Dehart (2016)	Sample in previous research (T1; Leach et al., 2015, above) followed up 3 years later. *N*=46 seen at time 2 (T2) Mean age of focal child: 7.88 years	Children's semi-structured play with their siblings and same-aged peer at T1 and T2 was coded for the use of internal state language in terms of the categories and referents.	Children made more references to cognitions at T2 than T1, and more often with siblings than with peers. Children referenced the emotions of the toys more at T1 than at T2.
Moore & Russ (2008)	*N*=50 Age range: 6 – 8 years Non-clinical sample Design: Cross-sectional Country: United States	Affect in Play Scale Affect, Imagination or control intervention	Imagination intervention resulted in improved play.
Roberts, Stagnitti, Brown, & Bhopti (2018)	*N*=47 Mean age: 6.25 years, (range 5 – 7) Non clinical sample Design: Cross-sectional Country: Australia	Child-Initiated Pretend Play Assessment	Sensory processing behaviours predicted children's elaborate pretend play abilities.

Author(s)	**Sample information**	**Pretend play measures**	**Results**
Tenenbaum, Snow, Roach, & Kurland (2005)	*N*=48 Mean age at time 1: 5.67 years (range 5 – 6) Mean age at time 2: 9.75 years (range 8.92 – 11.83) Non-clinical sample (eligible for Head Start). Design: Longitudinal Country: United States	Mothers and children completed a free play task at both ages with a set of toys coded for six categories, including social pretend play.	Children spoke during the task more at age 9 than at age 5. Social pretend play did not show any continuity from age 5 to age 9. Mothers of sons talked more about social pretend play than mothers of daughters.
Tessier, Normandin, Ensink, & Fonagy (2016).	*N=60* Mean age at time 1: 5.81 years Mean age at time 2: 9.23 years Children with histories of sexual abuse and a non-clinical comparison group. Design: Longitudinal Country: Canada	45 minute free play session coded using the Children's Play Therapy Instrument.	Children's ability to elaborate and conclude play narratives at time one predicted later mentalising abilities regarding others, but not the self. Children with histories of sexual abuse showed difficulties in concluding play narratives.

Author(s)	Sample information	Pretend play measures	Results
Uren & Stagnitti (2009)	*N*=41 Mean age: 6.25 years (range 5.3 – 7.92 years) *N*=8 had developmental delays Design: Cross-sectional Country: Australia	Child-Initiated Pretend Play Assessment The Penn Interactive Peer Play Scale	Cognitive pretend play skills related to social competence and level of involvement in classroom activities.
Yuill, Hinske, Williams, & Leith (2014; study 1)	*N*=48 Age range: 6 – 11 years Non-clinical sample Design: Cross-sectional Country: Germany	Free play task with either audio-augmented or non-augmented Playmobil figures coded for whether children engaged in solitary, parallel or cooperative play.	Children playing with the audio-augmented Playmobil figures played co-operatively for longer than children without the augmented toys.
Yuill, Hinske, Williams, & Leith (2014; study 2)	*N*=33 Mean age: 7.3 years Non-clinical sample Design: Cross-sectional Country: United Kingdom	Free play task with either audio-augmented or non-augmented Playmobil figures coded for: a) Sociability of the play b) Bids for attention c) Narrative roles of the speaker d) Creativity of the joint narrative	Co-operative play was more common in the augmented condition. Children in the augmented play made more narrator statements and fewer metanarrator statements than children in the non-augmented condition. Narratives were more creative in the augmented group.

Note. Exclusion criteria for the search included meta-analyses, review articles, studies in which the mean age of the sample was below six, any studies that did not report an age, and any studies which only included a clinical sample.

3.1.2.2.1. Play with toy figures

Children's pretend play is considered to occur in two formats: symbolic play that is *independent* of the physical environment, and symbolic play that is *dependent* on transforming physical objects in the child's environment (Wolf & Grollman, 1982). Various forms of toys are commonly seen in children's pretend play activities, and are "a prod to the imagination" (Cohen & MacKeith, 1991, pg. 24). Indeed, toys such as puppets and dolls are thought to encourage children's pretend play (Singer & Singer, 1990). In most research investigating pretend play, toys are provided for children to play with, and it is largely the interactions with the toys that indicate a pretend element to the play, such as transformations (e.g., a toy car as a plane) or sound effects (e.g., an engine noise for a toy car) accompanying actions with the toys (see Table 3.1).

While the research reviewed in Table 3.1 indicates that toys are used in the middle childhood period in pretend play, there is also evidence to suggest that children also use toys in their activities that may not qualify as forms of pretence but can still be considered play. Indeed, Hutt (1970) suggested that children's play is a form of *diversive exploration* in which children explore what *can* be done with objects as opposed to what the object actually *does*. Further, play can be prompted by the *affordances* of the toy in terms of what it offers the child for the purposes of play (Gibson, 1979). For example, much like a cup with a handle affords the behaviour of holding it, a toy car with wheels affords the behaviour of pushing it along a surface and so can prompt certain ways of playing with it. In one survey of children between the ages of four and twelve, over a third of children reported playing with toys as one of their favourite activities, but only when playing alone (Downey et al., 2007). However, the authors noted that a higher proportion of children reporting this were from the younger age group, and it may be that this is less frequent for children aged seven and above. Supporting this, in Case-Smith and Kuhaneck's (2008) survey of parents, for children between 6 and 7, playing with toy figures was rated as one of their least preferred play activities. Therefore, further investigation of children's use of toys within a wider variety of their playful activities in the middle childhood period would allow for a better understanding of how they may be used in terms of whether it is prompted by their affordances or they are transformed imaginatively.

3.1.2.2.2. Sociodramatic play and role play

As highlighted by Wolf and Grollman (1982), children's pretend play can also occur in a format that is *independent* of the affordances of the physical environment. One way in which children participate in this is through *sociodramatic play*: play that involves a re-enactment of an experience through their actions and narration (Galda, 1984). Examples of this form of play in middle childhood include playing dress up and playing house. There is a distinction between sociodramatic play and *thematic fantasy play* (or *role play*), where in the latter children do not necessarily re-enact their own experiences but instead imitate roles and themes they have experienced in other media, such as television or fiction (Desmond, 2001; Galda, 1984). For the purposes of the present review, sociodramatic and role play were considered together as the pretence within the play is independent of the physical environment in both formats. Sociodramatic play has similarities to storytelling and narrative, which is reviewed in the following section. Indeed, Nicolopoulou (2016) argued that play and storytelling exist on a continuum ranging from behavioural play to verbal storytelling. Within this framework, sociodramatic play would lie between these two extremes, but more anchored to behavioural enactments of pretence than to oral storytelling.

In research investigating the play of children between seven and ten years of age (see Table 3.1), sociodramatic and role play are largely categorised or coded under a broad label encompassing many forms of pretend play. For example in both Blatchford and colleague's (2003) and Boulton's (1992) large scale observations, in addition to Flannery and Watson's (1993) study, no distinction was made between the types of pretend/fantasy play and so the frequency of sociodramatic and role play themselves in these studies is currently unknown. One exception to this however is Case-Smith and Kuhaneck's (2008) surveys of parents, in which the pretend play category only consisted of sociodramatic and role play activities. In this cross-sectional study, the preference for sociodramatic/role play was low compared to the other activities at the ages of 6 and 7, and also lower in comparison to the highest ratings for sociodramatic/role play between 4 and 5 years of age. However, the age-related analyses in this study did not remove children with developmental delay who comprised half the sample. Therefore, investigating children's sociodramatic and role play in a representative community sample would be beneficial in furthering our understanding of the presence of such activities, in comparison with other imaginative and playful activities, in the middle childhood period.

3.1.2.3. Storytelling and Narrative Play

One activity argued to replace pretend play as an imaginative activity in the middle childhood period is *storytelling* (Engel, 2005). The activity of telling stories is a method by which children can construct roles and identities in order to better understand the world (Brogström, 2002), in addition to exercising their imaginative skills and language styles (Cassell & Ryokai, 2001). Storytelling typically emerges around the third birthday, and between the ages of four and six children are able to tell stories that consists of a chronological sequence of events that includes a significant event and a form of resolution (Engel, 2005; Peterson & McCabe, 1983; Scarlett & Wolf, 1979). As mentioned in Section 3.1.2.2.2, it is argued that storytelling and play exist on a continuum from oral storytelling to behaviourally enacted pretend play, with much of children's play occurring in the middle of these two extremes in the form of *narrative play*: play that is guided by a narrative theme (Engel, 2005; Nicolopoulou, 2016). Narrative play bears similarities to sociodramatic play and role play, with the distinction that in the latter, the re-enacted behaviours are the focus of the play more so than telling a story to an audience, which is the focus of narrative play (Galda, 1984; Scarlett & Wolf, 1979).

There are similarities between storytelling and pretend play, in so far as both of the activities take place within an imagined, playful context (see Figure 3.1; Scarlett & Wolf, 1979; Engel, 2005). For example, when children are engaged in telling stories, they are aware that the context of the narrative is not occurring in reality but instead should be interpreted within the context of the imagined frame. Additionally, storytelling and pretend play are found to be similar in terms of the structure underlying the activity; both contain 'episodes' of a narrative which require a degree of setting up (Eckler & Weininger, 1989).

However, there are differences between the two symbolic activities that result in storytelling emerging at a later age. Firstly, a child who is telling a story is fixed in their role as a narrator describing the events of a story, as compared to a child engaging in pretend play who is able to move in and out of the pretend scenario to transform or physically move objects (Scarlett & Wolf, 1979). Secondly, early pretend play does not require a structure, rules, and does not need an audience. Pure storytelling on the other hand is a social activity to an audience of people or, in some cases, inanimate toys, and so there is a necessity to structure the content to allow for the audience to understand what is occurring (Scarlett & Wolf, 1979). Therefore storytelling can be regarded as a more complex activity than pretend play in the ways in which imagined premises can be explored (Engel, 2005), for example, in attributing the characters with mental states (Scarlett & Wolf, 1979; further information regarding the references to the internal states of fictional characters will be reviewed in Sections 4.1.2 and 6.1.3).

However although oral storytelling is considered a social activity, this activity could be regarded as a form of solitary play when children begin to construct written stories, which emerges when children enter primary school (Drijbooms, Groen, & Verhoeven, 2017). Despite the activity of writing down a story being absent in the current literature on imaginative activities children engage in during middle childhood, insights emerge from the limited research investigating differences in oral and written narratives. For example, Drijbooms and colleagues (2017) found that written narratives produced more language that 'evaluates' the characters or plot than oral narratives in children aged 9 and 11. Critically, this form of evaluative language serves similar functions in written narratives as oral storytelling does in play, in the form of exploring imagined premises such as the internal states of the characters, the use of which increases with age (Eaton, Collis, & Lewis, 1999). Therefore, the written mode of storytelling may be a way in which some children engage in this imaginative activity, though the prevalence in the middle childhood period is currently unknown.

Due to the embedded nature of children's storytelling within their play, insights into children's storytelling in the middle childhood period largely emerge from research investigating narrative elements of pretend play (see Table 3.1). In research investigating children's play with older siblings, engagement in creative storytelling was more frequent in the absence of the mother (Howe & Bruno, 2009), and when the theme of the story matched the function of the toys (Howe et al., 2014). Further, eight-year-old children who engaged in play with audio-augmented

Playmobil characters engaged in the role of a storyteller more so than children playing with the same toys that were not augmented (Yuill et al., 2014).

Research also focuses on differences in children's pure oral storytelling, in the absence of pretend play. In one study of children between six and seven using a technology augmented toy, the *StoryMat,* story-telling was facilitated in generating more imaginative transformations as compared to when using a passive control toy (Cassell & Ryokai, 2001). Similar outcomes were found using augmented reality in children between 10 and 11, where stories were longer and more creative when using the technology compared to a control condition (Yilmaz & Goktas, 2017). Other research investigating the storytelling of bilingual children revealed that the development of narrative abilities in children between four and ten years of age were comparable in the two languages (Laurent, Nicoladis, & Marentette, 2015).

However, although the research on children at this age does suggest that children engage in imaginative storytelling as a part of their play, it does not support Engel's (2005) claim that storytelling replaces play as the medium for exploring imaginative worlds. Instead, the research highlighted in Table 3.1 suggests that storytelling often co-occurs with their pretend play in the form of narrative play. Additionally, in Eckler and Weininger's (1989) study of children aged between four and eight, some of the older children indicated a preference in 'setting up' the play as opposed to enacting stories. Therefore, whilst storytelling appears to be a prominent aspect of children's playful, imaginative activities in the middle childhood period, it does not replace other forms of play considered to be absent at this age.

3.1.2.3.1. Reading

An activity related to storytelling that is engaged in during the middle childhood period is *reading*. Although reading is not an activity traditionally considered as a form of play, both share similarities in the way in which the symbol (language) and the referent (meaning) can be arbitrarily associated (Desmond, 2001). Indeed, children who are read to aloud before bedtime, in addition to having their television viewing controlled, are more imaginative than children who do not (Singer & Singer, 1990). The content of such books can act as a 'source material' for the themes incorporated in children's pretend play and storytelling (Desmond, 2001; Galda, 1984; Singer & Singer, 1990). Therefore the more exposure children have to stories, the larger their corpus of material is to be included in their play. Given these associations between reading and imaginative activities, reading was included in the investigations contained within this chapter.

Several surveys reveal the extent to which children in the middle childhood period read for pleasure. Reading was considered a solitary activity for children between 4 and 12 in Downey and colleague's (2007) survey, and was reported as a favourite activity for 25% of the children, but only when considering activities they engage in alone. In a study of American children between the ages of 8 and 10, children spent on average 33 minutes a day reading for pleasure (Rideout, Foerh, & Roberts, 2013). Supporting this, in a survey of 1043 American children between 6 and 17, 58% of children reported enjoying reading books and 76% of children did so at least once a week, with 32% of the children doing so between 5 and 7 times a day (Scholastic, 2017). In summary, reading for pleasure appears to be an activity that is frequently engaged in during middle childhood when children are alone.

3.1.2.4. Games with Rules

Games with rules are play behaviours in which there is competition or cooperation between play partners that is regulated by explicit rules handed down from previous generations, or by a temporary agreement (Garvey, 1991; Rubin, 2001; Piaget, 1962). While Vygotsky (1967) argued that all of children's imaginary play inherently contains covert rules for behaviours, for example the conventions for enacting certain roles, the rules contained within games were considered to be overt and rigid and therefore a separate activity. The function of such games during this period, according to Piaget (1962), are to allow for children to adapt, or *accommodate*, their own behaviour in order to conform to socially accepted rules, and therefore have important implications for children's social and cognitive development.

Because games often contain formal rules that dictate a player's behaviour, have external goals and involve competition between players, including games within the category of play is contested (Rubin et al., 1983). Although rules do form a part of games, Baines and Blatchford (2010) note that such rules are often less fluid in reality and are adapted to specific contexts in which they apply, for example the number of players participating in the game or cultural contexts. Additionally, although some games contain a core feature of competitiveness wherein winning is viewed as an external goal, many do not contain a competitive element and are engaged in for reasons other than a desire to win (Baines & Blatchford, 2010). Indeed, individuals who are 'bad' at a particular game still play when winning is unlikely, as playing the game itself is enjoyable. Further, Vygotsky (1986) noted that underlying games with rules were imagined situations, for instance a game of *Chess* has overt rules regarding acceptable moves which occur within an imagined premise of the pieces on the board representing imagined roles within a conflict (Singer & Singer, 1990). Similarly, Singer (1973) argued that such games in childhood are often incorporated into imaginative premises. For example, a ball game can be framed in a pretend contest of two world-renowned teams, and in this way, the activity evolves to be a form of fantasy game. Finally, Zosh and colleagues (2018) argue that play can be considered as a spectrum ranging from unstructured free play at one end of the spectrum, with more guided games and structured play at the other. Therefore, for the investigations contained within the present chapter, games with rules were included as a form of playful, and potentially imaginative, activity.

Both Piaget (1962) and Vygotsky (1967) agreed that games with rules emerge at the school age and are most common between the ages of seven and eleven. Though research on this activity in this age range is lacking, insights emerge on the frequency of children's participation in games from observations of children's activities, largely during school break times. In one longitudinal study of 129 eight-year-olds in four schools in England, games represented a third of their break time activities (Blatchford et al., 2003). In an earlier large-scale observational study of children's break times from fourteen schools in Israel, between 38.5% - 42.3% of all children in grades 2-4 (aged between 7 and 10) took part in games with rules (Eifermann, 1971). When removing the children who did not play at all during this period, the frequencies increased to 79.1% and 85.1% respectively. Similarly, in observations of the same children out of the school context, over 50% of the children between 7 and 10 participated in games with rules. Further, in a survey of children aged between 4 and 12, games with rules in the form of ball and chasing games were reported to be children's favourite play activity, but only in a social context with friends (Downey et al., 2007). Focusing on observations of eight-year-old children in the playground, Boulton (1992) reported that children spent 22.2% of their time playing rule-based games. This frequency was half that of the 11-year-old children in the study, and so may indicate that higher frequencies found in the previously reviewed studies are driven by the older children in their samples. In summary, whilst children in middle childhood do spend some time participating in games with rules, it does not account for all of their activity. Therefore, research that investigates the occurrence of children's participation in games with rules as compared to other activities in a wider variety of contexts can provide a more complete and holistic view of play activities in the middle childhood period.

3.1.2.5. Video Games

Video games are a type of rule-based game that have become part of children's everyday worlds (Singer & Singer, 1990). The ability for children to begin to use technologies such as video games, mobile phones and computers is, in part, age dependent as it relies on their fine motor control and therefore emerges in the pre-school period (Goldstein, 2010). By the middle childhood period, video games represent the most visible aspect of the presence of technology in children's play (Downey et al., 2007).

Investigations into children's engagement with video games in the middle childhood period are largely in the form of surveys. In one national survey of American children, 26% of children aged between 8 and 11 reported playing video games at least daily, with most children of this age (75%) playing on at least a weekly basis (Gentile, 2009). Similarly, in another study of American children between the ages of 8 and 10, video games were played for up to an hour on a typical day (Rideout et al., 2013). In a national survey of Irish children aged between 4 and 12, over 95% of children played video games on a dedicated console, with this being more common in the older children than younger children (Downey et al., 2007). In relation to the use of other technologies for playing games, just under 19% of those who reported using the internet used it to play games online.

In summary, video games appear to be a prevalent feature of children's lives that is largely neglected when considering children's play activities. Possibly, this is due to the relatively recent emergence of these technologies, in addition to much of the previous research on play activities being focused to the playground. However, Case-Smith and Kuhaneck's (2008) surveys of parents reporting their children's preferred activities did compare children's preference for playing video games to other playful activities (see Table 3.1). A preference for playing video games was significantly higher in the children aged between 6 and 7 as compared to younger ages, and was amongst the top 5 activities enjoyed by the children at this age. However, the sample of children in this age group was relatively small and did not separate the children with developmental delay from their 'typically developing' comparison group for age-related analyses. Therefore, further research is necessary in order to further understand children's engagement with video game play as compared to other activities that children participate in during the middle childhood period.

3.1.2.6. Crafts and Construction Play

Crafts and construction play are common in the homes and classrooms of pre-school aged children, involving, drawing, painting and building things with materials such as Play-Doh or Lego (Lillard, 2014). There is a debate as to the extent to which craft activities can be characterised as play as these activities involve the end goal of creating something that is, in some cases, directed by externally imposed rules (Garvey, 1991; Piaget, 1962). However, given that such activities are commonly engaged in for pleasure in a context that could be regarded as playful (Rubin et al., 1983), and include a creative element to them, crafts and construction play were included in the investigations contained within the present chapter.

As crafts and construction activities are not typically considered to be a form of children's play, there is limited research investigating the extent to which children engage in such activities during the middle childhood period. In Downey and colleagues' (2013) survey of Irish children aged between four and twelve, under 20% of children reported arts and crafts as one of their favourite activities to engage in, but only when playing alone. Similarly, in Case-Smith and Kuhaneck's (2008) study, drawing, colouring and construction play were amongst the most preferred activities, particularly in the older age groups between 6 and 7. This indicates that children do enjoy engaging in such activities, supporting the argument that they should be included in considerations of children's playful activities. Therefore, there is a necessity for more research into the extent to which children in the middle childhood period engage in crafts and construction-based activities to give a more complete picture of the playful and imaginative activities that are present at this age.

3.1.3. Are there Individual Differences in Relation to Children's Participation in Play and Other Imaginative Activities?

The literature reviewed thus far indicates that, in general, children in the middle childhood period enjoy and engage in a wide variety of playful activities, despite claims that they should be absent by this age or replaced by other types of playful activities. However, there may also be individual differences, particularly related to the child's environment, that result in differences in children's engagement with these activities; these I explore in the following sections.

3.1.3.1. Gender

Research relating to gender differences in older children's playful and imaginative activities yields consistent findings for some activities. In relation to the frequency of time that children spend reading, in an average day, girls read books more often (Scholastic, 2017), and for longer than boys (Rideout et al., 2013). In Blatchford and colleagues' (2003) longitudinal study, boys showed increased engagement in game play with age whereas this decreased for girls. There were also gender differences for individual categories of games, with boys being more involved in ball games and girls being more involved in skipping and verbal games. Finally for video games, boys in middle childhood consistently appear to play games more often and for longer than girls (Gentile, 2009; Rideout et al., 2013). However it is noteworthy that even with this gender difference, some studies report that over 90% of girls do still play video games (Downey et al., 2013).

However, research investigating other activities in middle childhood yield mixed results in relation to gender differences. Whilst playground observations in one study indicated that boys engaged in pretend play more than girls (Blatchford et al., 2003), another found that girls spent more time engaging in fantasy play than boys (Boulton, 1992). Findings in relation to physical play in middle childhood are fairly consistent in indicating that boys engage in such activities more frequently than girls (Blatchford et al., 2003; Pellegrini, 1989; Pellegrini & Davis, 1993), which has been corroborated in cross cultural research indicating such gender differences may be universal (Withing & Edwards, 1973). However, other research found no gender differences for this form of play (Blatchford et al., 2003; Boulton, 1992). However, it may be that for the latter studies, this may be accounted for by the reduced observations of rough-and-tumble play of the children at this age overall. This strengthens the need for research that can isolate rough-and-tumble play from overall physical play.

One gender difference of particular note relates to children's play with toy figures. In relation to the use of toys in pretend play, some research indicates that boys are more likely to engage in pretend play that depends on transforming objects and toys than girls (Wolf & Grollman, 1982; Matthews, 1977). Additionally, other research indicates consistent gender differences in toy preferences, where children show a preference for gender-matched toys (see Ruble, Martin, & Berenbaum, 2006; Singer & Singer, 2005). However, much of the research in gender-typed toy preferences in particular used pre-school aged samples, and so the stability of these gendered preferences in the middle childhood period is unclear.

3.1.3.2. Demographic Characteristics

Children's participation in play activities may be related to demographic characteristics such as socio-economic status. Those from lower socio-economic backgrounds may engage less in play activities due to having less access to resources (Downey et al., 2013), being at an increased risk for insecure attachments, and having cognitive and language delays (Doyle et al., 1991). Indeed, children from middle-class backgrounds engage in pretend play more and for a longer period of time than those from working class backgrounds (Doyle et al., 1991). However, the sample in this research was from one school and so further research is necessary in order to further investigate such individual differences in more representative samples. Additionally, despite the notion of a 'digital divide' with individuals from lower socioeconomic backgrounds having less access to technology such as video games (Downey et al., 2013), studies indicate no association between socioeconomic status and playing video games (Downey et al., 2013; Rideout et al., 2013). However, it should be considered that in the present time period, technologies such as computers and mobile phones may no longer be luxury items, but are considered to be a household necessity. Overall, there is a necessity for research to include measures of sociodemographic adversity in investigations of differences in children's participation in play activities.

3.1.4. Research Questions

In the literature reviewed in this chapter, it has emerged that there is a need to explore the activities that children in the middle childhood period engage in within the context of a nationally representative sample. While the literature reviewed informs our understanding of the presence and enjoyment of certain individual activities in this time period, rarely has a single study considered a wide range of activities in a single sample in the middle childhood period. For example, focusing on research that has taken place in the United Kingdom, only five of the 31 studies of pretend play reviewed in Table 3.1 contained a sample from this country. Of these, two were observational studies of children's play behaviour in the school playground and so do not give any insight into other forms of play in the home or elsewhere (Blatchford et al., 2003; Boulton, 1992); one measured only co-operative pretend play with a sibling (Cutting & Dunn, 2006); and one measured children's pretend play and the creation of narratives specifically in the context of a free play task with Playmobil figures (Yuill et al., 2014). Only one study of children from the United Kingdom included a broad range of the playful and imaginative activities reviewed in which children were interviewed about their play activities in a variety of contexts (Howard et al., 2017), and only one other study in the literature reviewed in other countries in Table 3.1 included variety of play activities (Case-Smith & Kuhaneck, 2007). However, the studies did not include information on other factors in the children's environment that affect their engagement with these activities. Therefore, whist there has been evidence of individual differences in children's participation in certain individual activities, the extent to which these factors affect other activities is unknown. Therefore, the research questions for the investigation reported in the present chapter are:

What forms of play and other imaginative activities do children in the middle childhood period enjoy? In this chapter, caregivers' reports of the activities that their children enjoy were analysed in order to understand what forms of playful and imaginative activities are present at this age. This was conducted within the context of the Cardiff Child Development Study (see Chapter 2), a moderately sized representative community sample in the UK. I expected games with rules to be reported as enjoyed at a high frequency at this age. However because previous research did not take into account a variety of play activities, I was unsure as to the extent to which other playful and imaginative activities would be enjoyed.

What sources of individual differences are present that affect children's reported enjoyment of play and other imaginative activities? Once the prevalence of the activities in the middle childhood period was established, the influence of gender and demographic background characteristics on children's engagement with these activities was explored. Based on the literature reviewed, I expected gender differences to be present for reading, playing video games, physical play and playing with toy figures.

3.2. Method

3.2.1. Participants

Of the 272 families seen in the home at the childhood assessment (see Section 2.2.3), data were available for N=270 children (99%) for the following analyses. One of the families seen at the Wave 6 assessment withdrew from the study after data collection had taken place, and in one case, only the clinical portion of the interview took place and so the caregiver did not answer any questions regarding the activities the child enjoyed.

3.2.2. Procedure

See Section 2.3.6 for information regarding the procedure of the Wave 6 assessment, and Section 2.3.1 for information regarding the procedure of the Wave 1 assessment where the information in relation to sociodemographic characteristics were collected.

3.2.3. Measures

3.2.3.1. Caregivers' reports of the activities their children enjoy.

See Section 2.4.1 for information regarding this measure and Appendix 1 for the list of activities caregivers' were asked if their child enjoyed engaging in. All of the variables in the analyses were coded as dichotomous variables, where 0 indicated the caregiver reporting their child not enjoying the activity, and 1 indicated that their child did enjoy the activity.

For the present investigations, the activities were analysed separately and grouped to form seven categories of play. *Reading* and *enjoying video/computer games* were always analysed individually. *Physical play* included enjoying outside play, climbing frames, swinging and sliding. *Crafts and construction* included enjoying drawing and painting, clay/playdough, and building. *Games with rules* included enjoying ball games, hide and seek, and board games. As the remaining questions asked did not ascertain as to whether play activities contained a pretend element, they were conservatively categorised as either *play with toy figures* which included enjoying play dolls, action figures, toy vehicles, and Playmobil; or *sociodramatic play* which included playing house and dress up.

3.2.3.2. Sociodemographic characteristics

Information regarding the sociodemographic characteristics of the families were collected at the Wave 1 and Wave 2 assessments (see Sections 2.2.2 and 2.3.1). For the present investigations, social class formed a part of the sociodemographic adversity score detailed in Section 2.2.2, and so this score was used as an index of children's exposure to maternal factors known to be associated with risk for social adversity. Positive scores on this measure indicate a higher than average exposure to sociodemographic adversity.

3.3. Results

The data included in the following analyses were not normally distributed, therefore non-parametric analyses, Cochran's Q and Chi Square tests, were used for the analyses in Sections 3.3.1 and 3.3.2.1. For the analyses in section 3.3.2.2, parametric analyses (t-tests) were used as they are considered to be robust to data that is not normally distributed in samples of this size (Boneau, 1960; Lumley, Diehr, Emerson, & Chen, 2002). Further, the analyses were replicated using the non-parametric Mann-Whitney U test; the results displayed a similar pattern as the parametric analysis.

3.3.1. What Forms of Play and Other Imaginative Activities do Caregivers' Report that their Children Enjoy?

The frequency of children who were reported as enjoying the individual activities, and overall categories are presented in Table 3.2. All activities were reported as enjoyed by over 70% of the children. Cochran's *Q* tests determined that there was a significant difference in the proportion of children who were reported as enjoying the various activities, $x^2(6) = 152.651$, $p < .01$. Post-hoc tests, adjusting for multiple comparisons using the Bonferroni statistic, revealed that children enjoyed physical play, construction play and games with rules the most and at comparable frequencies. Video games were enjoyed by fewer children than physical and construction play but at a comparable level to games with rules. Play with toy figures was enjoyed by fewer children than the previous activities, but more so than sociodramatic play and reading alone, which were enjoyed by comparable numbers of children (all *p*s <.05).

Table 3.2. Percentage of children reported by parents as liking to do the activity.

Activity	Percentage of children reported as liking to do the activity (frequency)			
	Total	Girls	Boys	Gender Difference
Physical Play	**95.9% (259)**	**95.8% (113)**	**96.1% (146)**	***ns***
Outside play	94.8% (256)	94.9% (112)	94.7% (144)	*ns*
Climbing frames	86.6% (233)	87.2% (102)	86.2% (131)	*ns*
Swinging	85.5% (230)	89.7% (105)	82.2% (125)	$p = .08$
Sliding	88.1% (237)	90.6% (106)	86.2% (131)	*ns*
Games with Rules	**92.2% (249)**	**91.5% (108)**	**92.8% (141)**	***ns***
Ball games	75.2% (203)	69.5% (82)	79.6% (121)	$p = .06$
Hide and seek	79.6% (214)	82.9% (97)	77.0% (117)	*ns*
Board games	78.8% (212)	80.3% (94)	77.6% (118)	*ns*
Play with Toy Figures	**82.1% (220)**	**80.3% (94)**	**83.4% (126)**	***ns***
Dolls	37.5% (101)	69.2% (81)	13.2% (20)	$p < .01$
Action figures	46.1% (124)	27.4% (32)	60.5% (92)	$p < .01$
Trucks/cars/trains	50.4% (135)	34.2% (40)	62.9% (95)	$p < .01$
Playmobil	47.6% (128)	45.3% (53)	49.3% (75)	*ns*
Sociodramatic Play	**74.3% (200)**	**86.3% (101)**	**65.1% (99)**	**$p < .01$**
Playing house	53.9% (145)	70.9% (83)	40.8% (62)	$p < .01$
Playing dress up	68.0% (183)	82.9% (97)	56.6% (86)	$p < .01$
Construction Play	**94.1% (253)**	**95.7% (112)**	**92.8% (141)**	***ns***
Drawing and painting	90.0% (242)	95.7% (112)	85.5% (130)	$p < .01$
Clay/Playdoh!	68.4% (184)	74.4% (87)	63.8% (97)	$p = .07$
Building	80.7% (217)	76.9% (90)	83.6% (127)	*ns*
Reading Alone	**71.1% (192)**	**83.1% (98)**	**61.8% (94)**	**$p < .01$**
Video/Computer Games	**88.1% (238)**	**80.5% (95)**	**94.1% (143)**	**$p < .01$**

Note. Items highlighted and in bold reflect overall categories, individual activities comprising those categories appear below. Gender differences analysed using Chi-square.

3.3.2. Exploring Individual Differences in Children's Enjoyment of Play and Other Imaginative Activities

3.3.2.1. Differences according to gender

Table 3.2 details the percentage of children reported to enjoy engaging in various forms of play and imaginative activities according to their gender. In terms of overall categories of activities, more girls than boys were reported as enjoying sociodramatic play, $x^2(1) = 15.57$, $p < .01$, and reading alone, $x^2(1) = 14.55$, $p < .01$. Boys on the other hand were reported as enjoying playing video/computer games more than girls were, $x^2(1) = 11.71$, $p < .01$.

While there were no gender differences in the remaining overall categories, there were significant gender differences present in children reported as enjoying engaging in some of the individual activities. Within the category of playing with toy figures, girls were reported as enjoying playing with dolls more than boys, $x^2(1) = 88.65$, $p < .01$, and the boys reported as enjoying playing with action figures, $x^2(1) = 29.28$, $p < .01$, and toy vehicles, $x^2(1) = 21.76$, $p < .01$, more than the girls. Additionally, girls were reported as enjoying drawing and painting more than boys $x^2(1) = 7.61$, $p < .01$.

3.3.2.2. Differences according to sociodemographic adversity

Table 3.3 presents the sociodemographic adversity scores for the children who were reported as enjoying the play and other imaginative activities, and those who were reported to not enjoy them[1]. No differences in this risk score were found between those reported as enjoying and those reported as not enjoying the overall categories of activities.

However, there were subtle differences for two of the individual activities. Children who were reported as enjoying ball games were found to be exposed to a higher than average amount of risk for social adversity, as measured by the factor score, than those who were reported as not enjoying ball games, $t(125.90) = -2.57$, $p < .05$. Additionally, the difference in risk scores for children reported as enjoying playing house as compared to those reported as not enjoying this activity approached significance, with the children who were reported as enjoying playing house being at a higher than average risk for social adversity, $t(266.47) = -1.88$, $p = .06$.

[1] These analyses were replicated in a series of logistic regressions to test whether the socio-demographic adversity scores predicted children's enjoyment of the activities. The results displayed a similar pattern as the group comparisons, and so have not been reported.

Table 3.3. Mean sociodemographic adversity scores for children reported by parents as liking to do the activity

Activity	Mean Sociodemographic Adversity Score		
	Children reported as liking to do the activity	Children not reported as liking to do the activity	Statistical Difference
Physical Play	**-.07**	**-.13**	***ns***
Outside play	-.07	-.11	*ns*
Climbing frames	-.06	-.13	*ns*
Swinging	-.08	.01	*ns*
Sliding	-.05	-.22	*ns*
Games with Rules	**-.07**	**-.12**	***ns***
Ball games	.01	-.32	$p < .05$
Hide and seek	-.07	-.09	*ns*
Board games	-.11	.09	*ns*
Play with Toy Figures	**-.08**	**-.06**	***ns***
Dolls	-.09	-.06	*ns*
Action figures	-.05	-.09	*ns*
Trucks/cars/trains	-.01	-.15	*ns*
Playmobil	-.02	-.11	*ns*
			ns
Sociodramatic Play	**-.06**	**-.10**	***ns***
Playing house	.03	-.19	$p = .06$
Playing dress up	-.07	-.07	*ns*
Construction Play	**-.07**	**-.10**	***ns***
Drawing and painting	-.09	.07	*ns*
Clay/Playdoh!	-.05	-.12	*ns*
Building	-.09	.00	*ns*
Reading Alone	**-.13**	**.08**	***ns***
Video/Computer Games	**-.05**	**-.22**	***ns***

Note. Items highlighted and in bold reflect overall categories, individual activities compromising those categories appear below. Positive scores indicate a higher than average exposure to risk factors. Differences in adversity scores between children reported as liking to do the activity and those not reported as liking to do the activity were analysed using *t* tests.

3.4. Discussion

3.4.1. The Forms of Play and Other Imaginative Activities Reported as Being Enjoyed in the Middle Childhood Period

When caregivers from a moderately sized, nationally representative community sample in the UK reported on the types of activities that their children enjoyed, over two-thirds of the children were reported as enjoying each of the different activities. In line with some of the previous research of children at this age, more children were reported as enjoying physical and construction play than other activities (Case-Smith & Kuhaneck, 2008). An exception to this was games with rules which were reported as being enjoyed by a comparable number of children. These findings extend those of previous research that has largely looked at games with rules occurring in school and social contexts (Blatchford et al., 2003; Boulton, 1992; Downey et al., 2007; Eifermann, 1971) in demonstrating these activities as being enjoyed from a caregivers' perspective. In addition, the finding that a large number of the children at this age enjoy playing video games, a comparable number to those reported as enjoying games with rules, replicates Case-Smith and Kuhaneck's (2008) finding in a much larger sample. While playing with toy figures was found to be enjoyed by fewer children than the previous activities, it was still an activity reported as being enjoyed by over 80% of the children and more so than sociodramatic play or reading alone. This contradicts the findings of Case-Smith and Kuhaneck (2008) who found this to be one of the least preferred activities of seven-year-olds, and supports those of Downey and colleague's (2007) by demonstrating this preference for playing with toy figures in a larger sample of older children.

Although the findings from the present study in terms of games with rules being one of the more popular activities engaged in by children in the middle childhood period supports

Piaget's (1962) and Vygotsky's (1967) views that this form of play is common at this age, it does not replace other activities which were found in our sample to also be enjoyed at this age. Additionally, in contrast to Piaget's (1962) theory that pretend play declines between the ages of four of seven, the present research has demonstrated that forms of fantasy play, in the form of sociodramatic play, are still engaged in when children are seven years old. This extends the previous research summarised in Table 3.1 demonstrating that children in the middle childhood period are able to engage in pretend play activities, by also demonstrating that they choose to do so, as reported by their caregivers. Therefore, it emerges that during the middle childhood period children are reported as enjoying engaging in a wider variety of playful and imaginative activities than has been previously thought.

3.4.2. Individual Differences in Children's Enjoyment of the Activities

3.4.2.1. Gender

As expected on the basis of previous research, the girls in our sample were reported as enjoying reading alone more so than the boys (Rideout et al., 2013; Scholastic, 2017), and the boys were reported as enjoying playing video games more than the girls (Gentile, 2009; Rideout et al., 2013). Additionally, girls were found to enjoy drawing and painting more so than boys, a finding not present in the literature reviewed.

In contrast to the previous research, no gender differences were found in the present investigations for children's enjoyment of physical play activities or games with rules. However for the latter category, the one activity of *ball games* approached significance with more boys than girls being reported as enjoying this activity, a finding also present in Blatchford and colleagues' (2003) study. Additionally, much of the research that found gender differences in physical play activities did so when including rough-and-tumble play in their categorisations of the activity. In the CCDS, we had no questions related to this activity, and so it could be considered that the gender differences previously found in physical play activities were driven by gender differences in rough-and-tumble play. In support of this claim, previous research also found no gender difference in physical play activities also had lower overall observations of rough-and-tumble play (Blatchford et al., 2003; Boulton, 1992).

Although no gender differences emerged for children's overall enjoyment of playing with toy figures, in line with previous research, children demonstrated a preference for gender stereotyped toys (Ruble et al., 2006). Girls were reported as enjoying playing with dolls more than boys, and boys were reported as enjoying playing with action figures and toy vehicles more than girls. This finding adds to the literature on children's toy preferences in demonstrating that such gender stereotyped toy preferences persist into the middle childhood period (Ruble et al., 2006).

Girls were reported as enjoying sociodramatic play activities more so than the boys, a difference not reported in the existing literature of play in middle childhood. One interpretation of this finding could be that it reflects a difference in play styles, with studies of four-year-olds indicating that girls are more likely to engage in pretend play that is independent of objects in the environment (Wolf & Grollman, 1982). However, an alternate explanation could be that the activities comprising the sociodramatic play category, playing house and dress-up, have associated gender-stereotypes resulting in them being reported as more common in girls. Therefore, in order to clarify the nature of gender differences in this form of play, future research investigating a broader range of sociodramatic play activities is necessary.

However, it should be noted that non-significant differences comparing genders may not reflect a lack of a gender difference, but may instead reflect a lack of statistical power to detect an effect due to the reduced cell sizes when separating the boys and girls. However, the results of the sensitivity power analyses conducted in Section 2.5 indicate that there was sufficient power to detect small to medium effects, even when the sample is separated according to gender (see Table 2.2).

3.4.2.2. Sociodemographic adversity

With regard to sociodemographic adversity, no differences were found between those reported as enjoying or not enjoying the overall categories of activities. However, children who were reported as enjoying playing ball games were exposed to more risk factors for social adversity. This finding corroborates research in adolescent samples that has found that football was more common in families from low social class backgrounds as a result of limited access to more niche sport and outdoor activities and resources (Doyle et al., 1991; Tammelin, Näyhä, Hills, & Järvelin, 2003). Therefore, it may be that such social class differences in relation to certain activities do not begin to emerge until the middle childhood period, warranting further investigation across this age range.

3.4.3. Limitations

The investigations within this chapter have some limitations. Firstly, the question to the caregiver simply identified whether their child enjoyed each of the activities instead of the frequency of which children engaged in the activities or ratings of the extent to which they are enjoyed. However, the data still provide insight into the presence of these activities in the lives of seven-year-old children, a time at which it has been previously assumed that some of these activities, for example physical play, would be absent (Pellegrini, 2010). Therefore, the investigations contained within this chapter are an important first step in establishing a range of activities enjoyed by children in the middle childhood period. Future research can further explore the extent to which these activities are enjoyed in comparison to one another. Additionally, in the remaining chapters of this thesis, other methods including observations of children during their play will be used to better understand children's imaginative play during this time period.

Secondly, the questions were asked to caregivers, and not the children, as a preliminary interview before the diagnostic interview, the PAPA (see Section 2.3.6) was conducted. Further, as the overall aim of the CCDS was not an investigation of children's play or imagination, the items are not an exhaustive list and were presented as a checklist for the caregivers. Therefore, it is possible that some of the items may have been interpreted differently by caregivers. For example, whether the item *building* within *construction play* included branded toys such as Lego or not. Additionally, there were no direct questions asked to the caregiver's in relation to other imaginative activities reviewed in Section 3.1.2, such as whether their children enjoyed engaging in forms of storytelling or specifically symbolic play activities. It is also of note that the individual activities that were analysed in overall categories are not necessarily mutually exclusive. For example, ball games could be considered as *physical play* in addition to *games with rules*. Future research can address these criticisms by either including a more exhaustively defined list of activities to caregivers' or the children to report on what their children enjoy or by employing qualitative methods to allow for a more open-ended form of data collection in regard to these activities. In the remaining chapters of this thesis, observational methods will be used to provide an insight into the ways in which children naturally engaged in two play activities.

As has been noted in the previous sections, future research is needed in order to further clarify the extent to which a more exhaustive and clearly defined range of activities are enjoyed and engaged in by children in the middle childhood period. One option highlighted would be to employ qualitative methods with the children themselves, for example interviewing children regarding their preferred play activities and thematically coding the responses. An alternative approach would be in the use of an online survey with both a clearly defined question and activities, with responses beyond dichotomous choices. For example, using a ranking system whereby children or their caregivers' rank their preferred activities; asking children or their caregivers' to state how long they engage in these activities a week; or creating Likert-scale responses whereby children or their caregivers' could give an indication of the extent to which the activities are enjoyed. In doing one or a combination of the above, there would then be the opportunity to investigate statistically both differences according to variables such as age and gender, but also correlations amongst the activities that are enjoyed at this age.

3.4.4. Summary of the Chapter

The finding that seven-year-old children in a moderately sized, nationally representative community sample were reported as enjoying a variety of playful and imaginative activities adds to the existing literature in several ways. Firstly, activities previously studied separately were considered together in this investigation in order to give insight into children's play preferences. Further, these analyses further our understanding beyond the extant literature of gender differences and sociodemographic differences in children's enjoyment of playful and imaginative activities.

Although the present chapter addresses the question regarding the prevalence of various imaginative activities in middle childhood, the ways in which children at this age engage in such activities are currently unclear. Therefore in the subsequent chapters of this thesis, the ways in which children engage in play in two contexts will be explored using observational methods. In

Chapter 4, the ways in which children engaged in a free play activity with Playmobil figures will be identified in order to further understand children's play styles, in particular their pretend play and storytelling, two imaginative activities that were a limitation of the investigations within this chapter. In Chapter 5, the ways in which children engaged in playing a bespoke computer game will be explored in terms of their cognitive immersion with the activity. Finally in Chapter 6, these two contexts of play will be compared in terms of children's interactions with the imaginative content of the two activities.

Chapter 4.

The Child as an Actor, Narrator and Manager: Exploring Children's Imaginative Engagement during Play with Toy Figures

4.1. Introduction

In the analyses reported in Chapter 3, most six- to eight-year-old children in a moderately sized, nationally representative sample were reported as enjoying a variety of playful and imaginative activities. However, the ways in which children of this age engage in their playful activities, are currently unclear. Therefore in the present chapter, I will first review how children aged between 7 and 10 engage in pretend play, including individual differences in children's engagement with play. The review of this literature will inform the investigation that is the focus of this chapter: the ways in which children engaged in the imaginative activity of play with Playmobil toy figures.

4.1.1. Engagement with the 'Play Frame'

When children engage in pretend play, the imaginary world created during this activity is referred to as the *frame* (Kane & Furth, 1993). Although the reality of this imagined world is logically separate from the real world around a child, events occurring within the imaginary world may be processed in a similar way to the events occurring in the real world (Bretherton, 1984; Garvey, 1991; see Section 1.3). Indeed, Harris (2000) proposes that this happens when a child is absorbed in an imagined world; their point of view shifts to being within this imagined world, and events within that world are processed in the same way as real events. This experience, however, is not limited to children's engagement with the fictional worlds of their pretend play, but is also apparent when individuals read fiction (Harris, 2000), watch movies (Bateson, 1955), and play video games (Cairns et al., 2014).

Language is an important aspect of children's engagement with the play frame, emerging by the time children are four years old, and is used to accompany and structure pretend scenarios (Engel, 2005; Garvey, 1991). After observing the use of language during social pretend play of three- to five-year-olds, Giffin (1984) generated a continuum of speech categories occurring within-frame to out-of-frame (see Figure 4.1), including language reflecting both the play itself and the management of the pretend scenario. Similarly, the use of children's private speech during non-social pretend play has been noted to function as an indication of the child creating, entering and operating within the imaginary scenario (Davis et al., 2013; Krafft & Berk, 1998; Sawyer, 2017). This private speech takes the form of the enactments of roles, production of sound effects and verbal management of the pretend scenario (Davis et al., 2013; Krafft & Berk, 1998; Sawyer, 2017). In summary, children's engagement with the play frame, as reflected by their language, can be in the role of an actor, narrator or director of the play (Scarlett & Wolf, 1979).

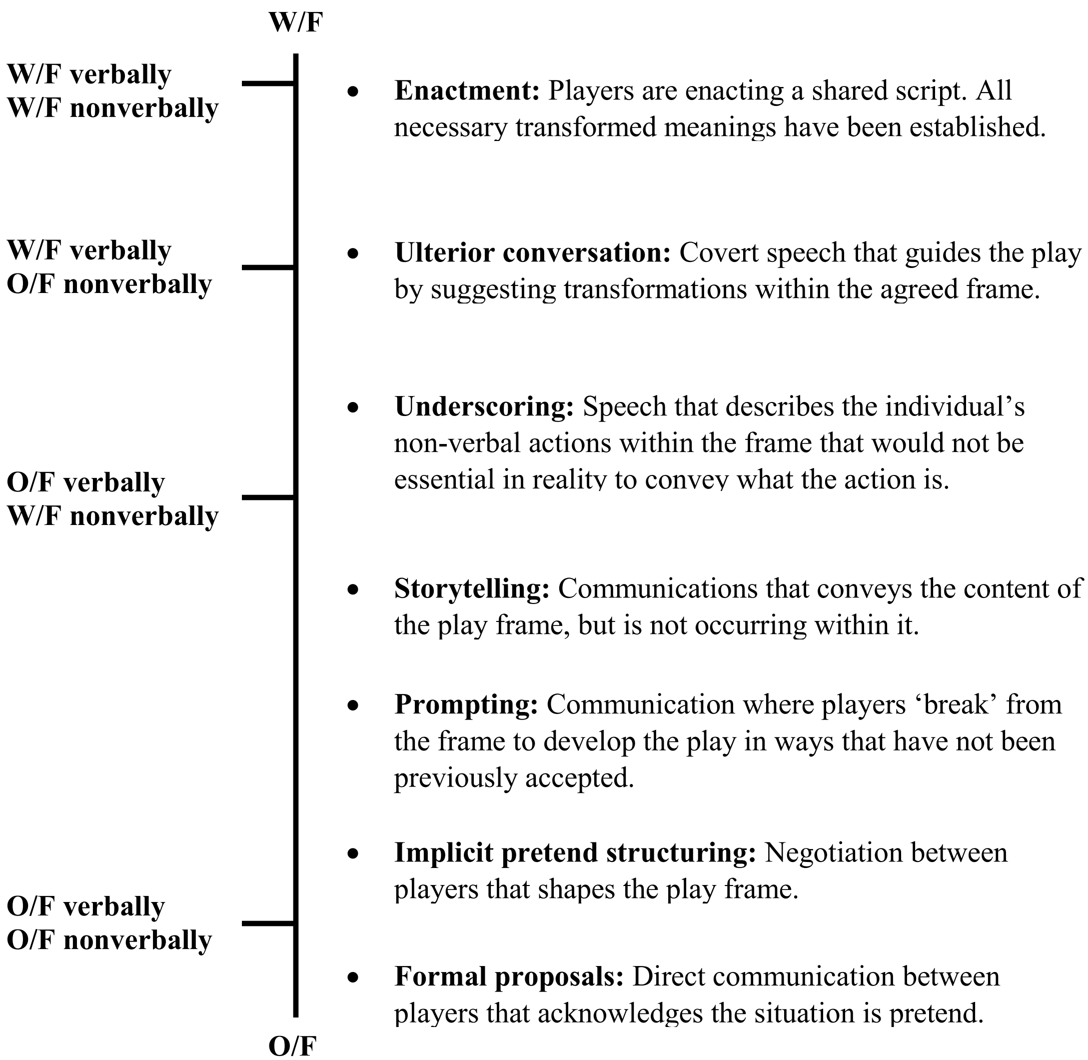

Figure 4.1. Giffin's (1984, pg. 80) continuum of metacommunicative signals in social pretend play adapted to include definitions. Within-frame (W/F), Out-of-frame (O/F).

One of the more recognisable forms of language during pretend play is the child's behaviour as an *actor*, enacting a role taking place within the play frame (Garvey, 1991; Giffin, 1984; Howe et al., 1998; Sachs, Goldman, & Charille, 1984). When verbally enacting a role, the imagined scenario is already established and players operate within the fictional reality (Giffin, 1984). Within the frame, speech relates to their identity within the imagined reality regarding the events or objects contained within it (Auwärter, 1986). For example, *"Mommy, I did something nice for you. I made you a wedding cake."* (Giffin, 1984, pg. 81). Researchers investigating the use of language during pretend play have categorised verbal enactments according to the content and tone of their speech, reflecting the context of the pretend world (Howe et al., 1998; Rydland, 2009).

A second way in which language is used during pretend play is in the form of *narrating* the events that are occurring (see Section 3.1.2.3). Although this type of speech during play is separate in form and function from enactment, by the age of four years children are able to differentiate the voices used to narrate and enact pretence, so that both voices may be used during the same pretend activity (Gardner, 1980). This use of language during play advances with age from supporting physical actions, to conveying information beyond that which is being enacted, such as the mental states of characters (Scarlett & Wolf, 1979). As highlighted in Section 3.1.2.3, storytelling allows for the use of evaluative language, providing the opportunity to explore the internal states of the fictional characters (see Section 6.1.3 for a review of the relevant literature). The complexities of the narratives advance with age and by six years of age, children are able to construct narratives with a chronological sequence of events that includes some form of resolution (Peterson & McCabe, 1983). Whilst this form of speech during play indicates a degree of engagement with the imagined world and characters within it, there is also an element of players being detached from the play frame because they are not taking on the role of a character. Instead, narrative serves the function of creating and advancing the story of the fictional reality (Giffin, 1984).

Finally, speech during pretend play can occur further 'out' of the play frame and serves the function of managing and directing the pretend scenario (Doyle & Connolly, 1989; Garvey, 1991; Giffin, 1984; Howe et al., 1998; Rydland, 2009). Much of the research on this form of language during pretend play has been investigated in the context of *metacommunication*; the signals that convey the message as to whether the verbal or non-verbal behaviour should be interpreted in terms of their nonliteral meanings within the pretend scenario (Bateson, 1955). This form of communication establishes messages regarding the organisation of play, the components within the pretend scenario and the rules governing the play (McCloyd, Thomas, & Warren, 1984). Although children's metacommunicative language in particular is investigated largely in social play scenarios, studies indicate similar language can be present in the absence of a play partner, used in order to plan one's own play (Krafft & Berk, 1998; Sawyer, 2017).

Although much of the research in children's engagement with the play frame focuses on the ways in which language is used during play, it should be noted that non-verbal actions have also been categorised in the context of play (Trawick-Smith, 1990). For example, Howe and colleagues (1998) included actions and physical gestures as part of their coding of pretend enactments regarded as taking place within the play frame (Giffin, 1984). Howe and colleagues (2014) further categorised enactments to either be *expected* given the properties, identity and affordances of the toy, or *creative* in transforming the toy to resemble something else. The authors additionally categorised object use that was to set up or organise the props, previously suggested to be a form of engaging with play independent of developmental maturity (Eckler & Weininger, 1989).

It is important to note that children may choose not to engage with pretend play in any of the previously mentioned roles. Such a lack of engagement with pretend activities and a focus on reality is included in schemes of younger children's speech during social pretend play (Auwärter, 1986; Kane & Furth, 1993). Similarly, non-verbal behaviours, such as interacting with non-play objects in the environment, are categorised as reflecting not engaging with pretend play in research with pre-school aged (Krafft & Berk, 1998), and older children (Adams et al., 2017; Howe & Bruno, 2010; Howe et al., 2014). Therefore, whilst children can engage in the role of an actor, narrator or director during pretend play (Scarlett & Wolf, 1979), children may also not engage with the play frame at all during pretend activities.

4.1.2. Engagement with Play Frame in Middle Childhood

While children may engage with the play frame in different ways, the extent to which these styles of engaging with the play frame are present in solitary play during the middle childhood period is unclear. Table 3.1 summarises the published research on pretend play in non-clinical samples in middle childhood. While research demonstrates that children in the middle childhood period do participate in pretend play activities, there are several issues with the research that warrant deeper investigations, specifically in regards to children's individual engagement with the play frame. Of the 31 studies included in the review, most either administered standardised assessments of pretend play, or measured aspects of pretend play occurring in free play scenarios in the presence of a similar aged peer, a sibling or a caregiver. Only three studies involved a free play session that took place only with an experimenter present, and coded the sessions for aspects of the play enacted (Adams et al., 2017) and narratives generated (Eckler & Weininger, 1989; Tessier et al., 2016). Therefore, insights regarding how children engage in solitary pretend play as an indication of their imagination during the middle childhood period in free play scenarios are currently limited.

In addition, many of the studies of pretend play in middle childhood used samples that are not representative of the general population, or were small. In the three studies that looked at children engaging in free play in the absence of a play partner, one study pre-selected their sample as those being predisposed to playing imaginatively according to an interview schedule (Eckler & Weininger, 1989). The remaining two studies conducted group comparisons of either children who had or had not been sexually abused (Tessier et al., 2016; *n*=21 children were in the non-clinical comparison group), or different age groups (Adams et al., 2017; *n*=12 children were in the 6-8-year-old age group) which resulted in a limited sample size of children from a non-clinical sample aged seven to ten. Indeed, sample sizes were also small in studies investigating pretend play in the presence of an older sibling (Howe et al., 1998; Howe et al., 2002; Howe et al., 2005; Howe & Bruno, 2009; Howe et al., 2014; Leach et al., 2015), and studies comparing clinical groups with non-clinical controls (Case-Smith & Kuhaneck, 2008; Henning et al., 2016). Therefore conclusions drawn from these studies are limited, highlighting the necessity for more research in larger representative samples.

A further issue regarding the research on older children's pretend play is that the different ways in which children might engage with play has been neglected. For example, Wolf and Grollman (1982) differentiated play that was *object-independent fantasy play* and *object-dependent transformational play*, the latter of which was found to be more common in four-year-old males than females (Matthews, 1977). Additionally storytelling, or narrative play, has been regarded as a different style of engaging with play that develops later and has been argued to replace symbolic play as a format for engaging in imaginative activities when children reach the age of four (Engel, 2005; Scarlett & Wolf, 1979; see Sections 3.1.2.2.2, 3.1.2.3 and 4.1.1). Further, Eckler and Weininger (1989) identified that amongst older children, a preference for play in the form of 'setting-up' was an active choice by some children as opposed to being dependent on their developmental level. Because such differences in the ways in which children engage with play are largely neglected in the literature of children beyond the age of six, more research is necessary in order to investigate a broader range of aspects of older children's play behaviours.

4.1.3. Individual Differences in Children's Engagement with the Play Frame

It is also important to investigate possible sources of individual variation in these styles of engagement. In the following sections, I will explore the child's gender, sociodemographic characteristics, executive function and verbal ability as possible correlates of engaging with play in different ways.

4.1.3.1. Gender

As highlighted in Section 3.1.3.1, the research investigating play in middle childhood yielded mixed results in relation to gender differences in children's participation in pretend play activities (Blatchford et al., 2003; Boulton, 1992). Additionally, the investigations in Chapter 3 indicated that gender-typed toy preferences observed in younger children persist into the middle childhood period (Ruble et al., 2006; Singer & Singer, 2005). While there are limited investigations of the ways in which older children engage with the play frame, one study of younger children did note that when narrating a story as a part of play, girls adopted a more conversational strategy *towards* the toys, employing a first-person perspective, whereas boys took a third-person viewpoint as an observer (Wolf, Rugh, & Altshuler, 1984). Further, one noteworthy result of the analyses in Chapter 3 suggested that girls enjoy forms of sociodramatic play more so than boys. Possibly, this reflects gender differences in play styles identified in younger children; for example, Matthews (1977) demonstrated that pretend play that is dependent on transforming objects is more common in four-year-old boys than girls (Wolf & Grollman, 1982). Finally, there have been contradictory findings for gender differences in relation to the creation of fictional worlds in research on children's paracosms (Cohen & MacKeith, 1991; Root-Bernstein & Root-Bernstein, 2006; Taylor, et al., 2018). Therefore, there is a rationale for investigating the extent to which there are gender differences in relation to children's engagement with the play frame in middle childhood.

4.1.3.2. Sociodemographic Characteristics

Children's socio-economic backgrounds could affect the ways in which children engage with play (identified in Section 3.1.3.1). Children from middle-class backgrounds engage in pretend play more often and for longer than those from working-class backgrounds (Doyle et al., 1991). It could be that those from lower socioeconomic backgrounds have an increased risk for insecure attachments, cognitive and language delays (see Sections 4.1.3.3 and 4.1.3.4 below; Doyle et al., 1991), in addition to having less access to resources (Downey et al., 2013). This latter suggestion in particular may affect the ways in which children engage with the play frame, as the content of stories in television, movies and books act as a source material for themes included in children's play (Desmond, 2001; Galda, 1984; Singer & Singer, 1990). In sum, further investigation of the relationship between sociodemographic characteristics and the ways in which older children engage with the play frame during a free play task are necessary.

4.1.3.3. Executive Function

Executive function is an umbrella term for a set of related skills including inhibitory control, working memory, and attention, and have been found to be associated with children's pretend play (see Carlson & White, 2013; Sachet & Mottweiler, 2013). Indeed, *inhibitory control* is theorised to be associated with children's pretend play as children must inhibit reality in order to maintain the imagined components of the play (Carlson, White, & Davis-Unger, 2014; Pierucci et al., 2014). Similarly, *cognitive flexibility* may be associated with pretend play as such activities involve an appreciation of the perspectives of imagined others and the ability to move in and out of the play frame in order to manage the play (Carlson & White, 2013; Giffin, 1984). Finally, *working memory* may play a role in children's pretend play in enabling children to retain information regarding the imagined world and recall appropriate scripts for the play (Pierucci et al., 2014).

Support for the association between executive function and pretend play is demonstrated in a limited number of studies of preschool-aged children. In general, four-year-olds who perform better on a battery of executive function tasks also demonstrate a better ability to distinguish between real and pretend scenarios and demonstrated more pretend actions (Carlson et al., 2014). Similarly, in a study of three and four-year-old children, executive function was positively associated with the recollection of pretend scenarios (Albertson & Shore, 2009). More specifically, children between the ages of four and seven who showed greater inhibitory control also demonstrated more instances of symbolic play (Kelly & Hammond, 2011). While these studies demonstrate associations between executive function and pretence related abilities, the direction of effects in these correlational studies is currently unclear. However, one intervention study of children aged between three and five demonstrated that an intervention in which children engaged in high levels of fantastical pretend play facilitated the development of executive function skills, as compared to non-imaginative play interventions and a control group (Thibodeau, Gilpin, Brown, & Meyer, 2016).

The extent to which associations between executive function and pretend play persist into middle childhood is currently unclear. One study of pretend play in seven-year-old children found no association between executive function and pretend play (Hoffman & Russ, 2012). However, this study used a standardised assessment of pretend play, the Affect in Play Scale (APS; Russ, 2004), and a measure of executive function typically used in clinical samples (Hoffman & Russ, 2012). Therefore, additional research is needed to investigate associations between executive function and pretend play further, using a battery of tasks appropriate for a community sample. Additionally, at present it is unclear whether the different ways in which children engage with the play frame, either as an actor, narrator or manager (Scarlett & Wolf, 1979), are associated with executive function. Although, in research on paracosms in middle childhood, inhibitory control, but not working memory, was found to be poorer in children who created such fictional worlds than those who did not (Taylor et al., 2018). Therefore, it could be expected that children who engage with the play frame would have poorer performance on tasks of executive function.

4.1.3.4. Verbal Ability

As noted in Section 4.1.2, language is an important component of pretend play, in terms of structuring and accompanying the play (Davis et al., 2013; Engel, 2005; Garvey, 1991; Krafft & Berk, 1998; Sawyer, 2017) and in reflecting children's mode of engagement with the play frame (Scarlett & Wolf, 1979). Indeed, it is fairly well established in younger children that pretend play and language development are associated; however whether this association is causal or due to an underlying symbolic component is currently debated (for a review, see Lillard et al., 2013).

Only one of the studies of pretend play in middle childhood reviewed in Table 3.1 included a measure of verbal IQ in the analyses, and found no association between the verbal IQ of four-year-old children and cooperative pretence with their older siblings (mean age 7.05

years). However, verbal IQ was associated with cooperative pretence with a similarly aged peer (Cutting & Dunn, 2006). However, it is of note that the verbal IQ of the older siblings in this study was not assessed. Further, children who created paracosms did not differ on verbal comprehension as compared to children who did not (Taylor et al., 2018). It is not yet known whether verbal ability and pretend play, particularly children's mode of engagement with the pretend play scenario, are associated in middle childhood. In any case, as children's language is one of the ways in which children's engagement with the play frame can be established, their verbal ability should be controlled in analyses.

4.1.4. Combining Variable-Centred and Person-Centred Analyses to Investigate Children's Engagement with the Play Frame

In the investigations reported in the present chapter, both the styles of engagement and the children who engage in these styles were identified in order to fully investigate children's engagement with the play frame and sources of individual variation. In order to accomplish this, both variable-centred and person-centred analyses were used.

Variable-centred analyses are used to understand an individual or behaviour by focusing on individual variables or measurements for use in the statistical analysis (Mandara, 2003). One relevant issue with this method is that conclusions are made regarding *groups of people* when the analysis was conducted on variables reflecting the frequency of their *behaviours* (Bergman & Magnusson, 1997; Mandara, 2003). This focus on variables can be problematic for making conclusions that characterise individuals as the information provided by the analysis is variable oriented, not individual oriented (Bergman & Magnusson, 1997). Therefore, when investigating whether there are sources of individual variation in children's engagement with the play frame, for example whether storytelling is associated with a better working memory, a variable-centred approach would only provide information on whether storytelling behaviours are associated with better working memory for the sample as a whole, and not whether the subsample of children who tell stories in their play have better working memory than other children.

Person-centred analyses, on the other hand, allow for the construction of profiles or *clusters* of individuals based on a set of variables (Bergman & Magnusson, 1997). These clusters can then be used to draw conclusions in relation to individual members of the sample (Burt, Hay, Pawlby, Harold, & Sharp, 2004; Bergman & Magnusson, 1997). With respect to the previous example, a person-centred analysis would allow for the identification of a group of children in the sample who tell stories in their play and therefore would allow for a test of whether those children have better working memory on average than children in the sample.

4.1.5. Research Questions

From the literature reviewed in Chapter 3 and in this chapter, it has emerged that there is a paucity of research examining solitary pretend play in large representative samples of older children and more specifically, the ways in which they engage with the play frame. Therefore, the research questions for the investigations reported in the present chapter are:

In what ways do children engage with play during a solitary free play activity? In order to address this research question, coding schemes of children’s language and behaviour during the free play task were adapted in order to measure and describe the different ways in which children engaged with the play frame.

Does children’s verbal and non-verbal engagement during play cluster in theoretically meaningful ways? In order to address the previous research question, the variables that comprise the adapted coding schemes were analysed in both variable-centred and person-centred analyses in order to establish whether the variables and the participants can be grouped in ways that reflect styles of engaging with play. Based upon the literature reviewed, it was expected that these styles would reflect engagement in the role of an actor, narrator, manager or less engaged player (Scarlett & Wolf, 1979).

How do any individual differences that are present affect the ways in which children engage in play? Finally, I investigated the associations between engagement with the free play activity and child gender, sociodemographic characteristics, executive function, and language. I hypothesised based on the literature reviewed that there would be associations with child gender and executive function, but not verbal ability (Taylor et al., 2018).

4.2. Method

4.2.1. Participants

Of the 272 families seen in the home at the childhood assessment (see Section 2.2.3), data were available for *N*=256 children (94%) for the following analyses. One child had a developmental delay and did not complete any testing; one session took place in a language other than English or Welsh and no translation was available; four sessions experienced technical issues and so data were not available; seven children refused to complete the Playmobil free play task; in two sessions the task was not completed due to time restrictions; and one family withdrew the data after data collection took place.

4.2.2. Procedure

See Section 2.3.6 for information regarding the procedure of the Wave 6 assessment and Section 2.4 for information relating to the procedure of the Plamobil free play task, executive function tasks and the BPVS (Dunn & Dunn, 2009).

4.2.3. Measures

4.2.3.1. Talkativeness score

The children's speech during the Playmobil free play task was transcribed in temporal units of 5 seconds (see Appendix 4 for an example of a transcript from this task). A proportional measure of the child's talkativeness was generated by dividing the number of 5 second segments in which the child spoke by the total number of 5 second segments in the task. This resulted in a score ranging between 0 and 1. This measure of talkativeness was validated in previous research using measurements of the mean length of utterances as recorded by *Audacity* software (Roberts et al., 2013). Any instances of non-word noises that were not sound effects were excluded from this calculation.

4.2.3.2. Verbal engagement with play

The coding scheme used to assess the children's verbal imaginative engagement during the free play task was adapted from the schemes developed to assess metacommunication by Auwärter (1986), Giffin (1984), and Howe and colleagues (1998). The coding scheme is displayed in Table 4.1 with verbatim examples from the transcripts.

Instances of e*nactment* were noted to categorise speech that gave a voice to the toy figures. This form of speech was characterised by either including an exaggerated tone of voice (Howe et al., 1998), or an increase in the pitch, timbre or volume of speech (Auwärter, 1986; Doyle & Connolly, 1989), in addition to the content of speech reflecting enacting a role.

Sound effects were coded separately from enactments, as Giffin (1984) argued that such vocalisations are less within-frame than verbal enactments. This form of communication serves to support and explain the physical enactments of play but would not be necessary if that action occurred in reality. For example, the sound effect from a child of *"ring ring"* to accompany the physical action of picking up a pretend phone explains that the pretend phone is ringing, but would not need to be made in reality. Therefore these vocalisations, while enhancing the experience, indicate that such actions are pretend.

Although it is argued that the creation of *narratives* falls within the same category of pretend talk that includes enactments (Katz, 2001), the use of narrative was coded separately in the present analyses. Narrative was defined as speech reflecting the child's own point of view as opposed to the point of view of a character (Auwärter, 1986). Narrative creation also included utterances that questioned the experimenter on what might happen next in the narrative, or the current internal states of the characters (Garvey, 1991).

Speech coded as *management* did not occur in the form of 'play speech', but was produced in the child's natural voice (Doyle & Connolly, 1989). Utterances coded as management speech included speech reflecting role assignment, transformations, rules of play and arrangements of props. Finally, the category *speech about reality* was included to capture the extent to which children's speech did not reflect any reference to the pretend activity they were asked to engage in (Auwärter, 1986; Kane & Furth, 1993).

For any cases in which the task ended before three minutes (14.6%), the coding of children's engagement with the play was pro-rated up to 36 segments (3 minutes). Two independent observers coded 25% (n=67) of the transcripts to assess the reliability of the coding scheme. Table 4.1 presents the results of the reliability analysis (Median Intra-Class Correlation [ICC] = .92), indicating good coder agreement on the measure.

4.2.3.3. Use of objects

A continuous narrative transcript of the children's physical behaviour and use of objects was recorded in 5 second segments and corresponded with their speech. The use of objects was coded using a scheme developed by Howe and colleagues (2014), which categorised the use of toys during play. *Set up/organisation* refers to the child physically setting up and organising the toys but does not entail using the toy in a playful manner. *Expected use of objects* is defined as the child using the objects and animating props in a conventional way, given the form and function of the object. *Creative use of objects* is defined as the child changing the identity or function of an object in a way that is not a typical use of that object in reality. *N*o *use of objects* was included in order to categorise any behaviours from the child that did not involve the Playmobil figures. Following initial piloting of the coding scheme, an additional category of *handling objects* was included to capture the child simply holding or looking at an object, but not using them in ways that could be categorised according to Howe and colleagues' (2014) scheme.

For any cases in which the task ended before three minutes (14.6%), the coding of the child's use of objects was pro-rated up to 36 segments (3 minutes). Two independent observers coded 25% (*n*=67) of the transcripts to assess the reliability of the coding scheme. Table 4.2 presents the results of the reliability analysis (Median ICC = .97), indicating good coder agreement on the measure.

4.2.3.4. Sociodemographic adversity

See Section 2.2.2 for full details regarding this measure. The sociodemographic adversity score is an index of children's exposure to maternal factors known to be associated with risk for social adversity. Positive scores on this measure indicate a higher than average exposure to sociodemographic adversity. Scores were available for all 256 children whose data were available from the Playmobil free play task.

4.2.3.5. Executive function

All of the executive measures were a part of the Amsterdam Neuropsychological Tasks (ANT; de Sonneville, 1999), a computerised set of well-validated tasks. See Section 2.4.2 for specific information regarding each task.

Response inhibition. Response inhibition was measured using the Response Organisation Objects (ROO) task, and was operationalised as the difference in mean reaction times (ms) between the incompatible and compatible parts of this task, where a lower difference indicates better response inhibition.

Of the 256 children whose data were available from the Playmobil free play task, *n*=253 (98.8%) completed the ROO and have response inhibition data available. In one case the child was not testable, and in two cases the child refused to complete the task fully.

Cognitive flexibility. Cognitive flexibility was measured using the ROO task, and was operationalised as the difference in mean reactions times between the compatibles trials of the mixed part of the task (part 3) and all trials of the compatible part of the task (part 1). A lower difference in these reaction times indicates better cognitive flexibility.

Of the 256 children whose data were available from the Playmobil free play task, *n*=253 (98.8%) completed the ROO and have cognitive flexibility data available. In one case the child was not testable, and in two cases the child refused to complete the task fully.

Working memory. Working memory was assessed using the Visuospatial Sequencing task (VSS) in which the child was asked to replicate a sequence of circles presented on the computer that gradually increased in difficulty in the number of targets and sequence complexity. The total number of correctly identified targets in the correct order indicated *working memory*.

Of the 256 children whose data were available from the Playmobil free play task, n=242 (94.5%) completed the VSS and have working memory data available. In three cases there was a technical error; in four cases only one child-testing session was completed and so the task was not administered; two children were not testable; two children refused to complete the task; and in three cases the task was not administered due to time constraints.

4.2.3.6. Verbal ability

See Section 2.4.5 for full information regarding this measure. Children's knowledge of vocabulary was assessed using the BPVS (Dunn & Dunn, 2009). Children's receptive vocabulary was calculated by normalising the data based on their age to produce a standardised score. Of the 256 children whose data were available from the Playmobil free play task, receptive vocabulary data were available for n=252 (98.4%) cases. In three cases, only one child-testing session was completed and so the task was not administered; and in one case the child refused to complete the task.

Table 4.1. Coding scheme for measuring children's verbal engagement with play.

Category	Sub-category	Definition	Examples
Enactment (E)		The content of the speech reflects the child identifying with the role assumed while engaged in play.	*"'Hey, how about we down and play tic-tac*
Sound effects (SE)		The symbolic meaning of an action is reinforced by a sound **that is not necessary if the action occurred in reality**.	
Narration (N)	1. Storytelling.	Narrative style of talking about the events and characters occurring in the play, but the speech is not in the role of a character inside the fictional reality.	*"She's sailing away, away from home"*
	2. Commentary.	Speech that is commenting on the fictional scenario **but does not advance the story**.	*"Then she needs a lit table"*
Management (M)	1. Discussion of roles.	Speech that reflects the assignment of roles to the child or to the experimenter as well as discussion regarding what the role entails.	*"Are you gonna use t grownups?"*
	2. Initiation/termination of pretence.	Speech that reflects a proposal or intention to pretend; transform a character or object into something novel*; or is an intention to transform a character, area or object into something (this does not include just labelling the characters or scenes but must have an intention, e.g., this is going to be the bedroom). Statements that approve or reject a pretend proposal, transformation or idea.	*"This is the doctor"* *"Let's just pretend it closed"* *"Can I explode the classroom up?"* *"It's not really an orphanage"*
	3. Rules of play and properties of objects.	Speech that establishes the rules of play in terms of what is allowed, and what is not allowed. Speech that describes the properties of objects (e.g., who they belong to).	*"I'm gonna start the off, erm off, and then have to finish it"* *"No, this is their pain*
	4. Arrangement of props.	Speech that reflects the physical placement of the objects in the scene. This does not include questions about where things **could or should** be placed, but the actual placement of the figures.	*"Hide him in there"* *"Hmm washing mach over there"*
Speech about reality (R)		Any speech that is not in reference to the Playmobil free play activity.	*"(Can I) go on X-Box*

Note. Categories are not mutually exclusive. One segment of speech can contain more than one category. * In the Cardiff Child Devel
transformations were considered as those that were not a part of the battery of social understanding stories that the children were prev

Table 4.2. Coding scheme for measuring children's use of objects during play.

Category	Definition	Intra-class Correlation (reliability)
No use of object (N)	The child is not handling or using any of the Playmobil toys.	.99
Handling of object (H)	The child is holding, interacting with or handling a Playmobil toy but does not meet criteria for coding the action as (S). The child is examining the pieces to identify them, but not using them in play.	.83
Set up/organisation (S)	The child physically setting up or organising the toys but is not using the toy in play.	.97
Expected use of object (E)	The child uses the objects and animates props in a conventional way given the form and function of the object. This can be coded based upon the speech occurring.	.99
Creative use of object (C)	The children changed the identity or function of an object in a way that is not typical of that object in reality. The child changes the identity or use of a piece to stand for something else.	.96

4.3. Results

Children's age at the time of assessment (mean 83.37 months, range 67 - 104 months) was not significantly associated with any of the measures related to the Playmobil free play task and so is not mentioned further.

4.3.1. Children's Verbal Engagement with the Free Play Task

Table 4.3 displays the descriptive statistics for children's engagement with the free play task. Engagement in the form of narrative was the most common way in which children engaged with the free play task, followed by enactments and managements. A repeated measures ANOVA confirmed that there were significant differences in the ways in which children engaged with the free play task, $F(2.50, 637.68) = 68.14$, $p < .01$. Pairwise comparisons, adjusted for multiple comparisons using the Bonferroni statistic, showed that children engaged in the form of narratives more than any other form of engagement; enactments were engaged in more than sound effects or speech regarding reality; and engagement in the form of management was more frequent than sound effects or speech regarding reality (all *p*s $< .05$).

Table 4.4 displays the inter-correlations of all variables in the coding scheme. Children's engagement through the enactment of a role was positively associated with making sound effects, $r(256) = .49$, $p < .01$, and negatively associated with engagement in the form of managing the pretend scenario, $r(256) = -.23$, $p < .01$. Children's use of sound effects was similarly negatively associated with managing the pretend scenario, $r(256) = -.17$, $p < .01$. Finally, children's engagement in the form of the creation of a narrative was negatively associated with speech regarding reality, $r(256) = -.15$, $p < .05$.

4.3.2. Children's Use of the Objects during the Free Play Activity

Descriptive statistics for the use of objects during the free play task are presented in Table 4.3. The most common use of objects during the free play task was to set up or construct the Playmobil figures. A repeated measures ANOVA confirmed there were significant differences in the ways in which children used the objects during the free play task, $F(2.23, 563.05) = 547.76$, $p < .01$. Pairwise comparisons, adjusted for multiple comparisons using the Bonferroni statistic, revealed that using the objects to set up was the most common use of objects; handling the objects was statistically more common than using them in expected ways, creatively and not at all; using the objects in expected ways was more frequent than using the objects in creative ways; and not using the objects was more common that using them in creative ways (all *p*s $< .05$).

Children who used the figures more often in the form of setting them up were less likely to simply handle the objects $r(254) = -.44$, $p < .01$, or use them in expected ways, $r(254) = -.56$, $p < .01$ (see Table 4.4).

Table 4.3. Descriptive statistics for items from the verbal engagement with play and use of objects coding schemes.

Variable	Mean	Standard deviation	Range
Talkativeness score	0.63	0.26	0.00 – 1.00
Play engagement enactment	3.15	5.78	0.00 – 30
Play engagement sound effects	0.64	1.93	0.00 – 18
Play engagement narrative	6.31	6.53	0.00 – 32
Play engagement management	2.72	2.87	0.00 – 12
Play engagement reality speech	1.10	2.21	0.00 – 12
Object use handling	7.66	4.44	0.00 – 30.38
Object use set up/organisation	21.35	7.84	0.00 – 35
Object use expected use	3.68	5.39	0.00 – 29
Object use creative use	0.14	0.81	0.00 - 7
No use of objects	2.89	4.53	0.00 – 36

Note. Talkativeness scores represent the proportion of segments in which speech occurred during the task. Play engagement and object use scores represent the mean number of segments in which codeable behaviour or speech occurred.

Table 4.4. Inter-correlation of items from the verbal engagement with play and use of objects coding schemes.

	1	2	3	4	5	6	7	8	9
1. Talkativeness score	-								
2. Play engagement enactment	.34**	-							
3. Play engagement sound effects	.22**	.49**	-						
4. Play engagement narrative	.54**	.02	.05	-					
5. Play engagement management	.36**	-.23**	-.17**	-.02	-				
6. Play engagement reality speech	.18**	-.09	-.05	-.15*	-.04	-			
7. Object use handling	.22**	.15*	.02	.15*	-.05	.02	-		
8. Object use set up	-.27**	-.33**	-.34**	-.16*	.25**	-.19**	-.49**	-	
9. Object use expected use	.10	.50**	.52**	.13*	-.31**	-.14*	-.04	-.56**	-
10. Object use creative use	.14*	.11	.37**	.12	-.05	.06	-.03	-.07	.07
11. No use of objects	.08	-.16**	-.06	-.06	-.01	.45**	-.10	-.44**	-.14*

Note.* $p < 0.05$, ** $p < 0.01$. Talkativeness scores represent the proportion of segments in which speech occurre
Play engagement and object use scores represent the mean number of segments in which codeable behaviour or s

4.3.3. Factor Structure Underlying Children's Verbal Engagement with Play and their Use of Objects

To identify whether children's verbal and non-verbal behaviours during play reflect styles of engaging with the play frame, a principal components analysis (PCA) was conducted on the items that comprised the verbal engagement with play and use of objects coding schemes, with orthogonal rotation (varimax). As the overall frequency for the use of objects in creative ways was low, it was combined with using objects in expected ways to give an overall *use of objects in expected or creative way* variable. Barlett's test of sphericity, $X^2(36) = 921.76$, $p < .001$, indicated that correlations between items were sufficiently large for PCA (see Table 4.4 for inter-item correlations). An initial PCA analysis was used to obtain eigenvalues for each component in the data. Three components had eigenvalues over Kaiser's criterion of 1 which in combination explained 62.43% of the variance, and so were retained in the final analysis. Table 4.5 shows the factor loadings after rotation, and the percentage of variance explained by each of the factors. The items that load on each factor suggests that factor 1 represents engaging in the role of an *actor*, factor 3 represents engaging in the role of a *narrator,* and factor 2 represents *not engaging* with the play task. Factor scores were generated from the PCA using the regression method and were used for all further analyses in relation to the research questions.

Table 4.5. Summary of principal components analysis results for the engagement with play and use of objects coding schemes.

	Rotated factor loadings		
Item from coding schemes	**Engagement as an actor**	**No engagement with play**	**Engagement as a narrator**
Use of objects in expected or creative way	**.86**	-.09	.07
Play engagement sound effects	**.78**	-.05	-.03
Play engagement enactment	**.75**	-.15	.09
Object use set up	**-.56**	**-.52**	**-.56**
Play engagement management	**-.49**	-.11	.01
No use of objects	-0.5	**.87**	-.02
Play engagement reality speech	-0.6	**.78**	-.1
Object use handling	.01	.07	**.85**
Play engagement narrative	.01	-.21	**.60**
Eigenvalues	2.63	1.74	1.25
% of variance	29.24	19.33	13.86

Note. Factor loadings over .40 appear in bold.

4.3.4. Identifying Clusters of Children Who Engage in Play in Different Ways

In order to identify whether children's verbal and non-verbal behaviours during play could be used to group children according to how they engage with the play frame, a hierarchical cluster analysis was conducted on the ten items that comprised the verbal engagement with play and use of objects coding schemes. A hierarchical analysis was chosen for the present study as it is the preferred option when the sample is of a moderate size (under 300; Hair, Black, Babin, Anderson & Tatham, 2013). When conducting cluster analysis, a *linkage* method and a *distance metric* must be selected. The linkage method, or clustering algorithm, defines the point within a cluster from which the similarity to other clusters is calculated (Hair et al., 2013). For the present analysis, Ward's (1963) method was chosen as in this method, the distance between the clusters is measured based upon the degree of similarity within all cases in the same cluster, as opposed to pre-selected ones or a centroid. The distance metric refers to the distance that exists between two cases in multivariate space that are to be clustered (Hair et al., 2013). For the present study, the Euclidian distance measure was used in which a smaller distance indicates greater similarity between two cases. This distance measure is the one most commonly used in research and has been recommended as a preferred choice for use in psychological research (Hair et al., 2013; Henry, Tolan, & Gorman-Smith, 2005). One issue with the Euclidian measure is that it is sensitive to variables with larger dispersion (Hair et al., 2013). As the ranges and standard deviations of the variables entered into the cluster analysis varied (see Table 4.3), the data were standardized as z-scores prior to conducting the cluster analysis.

A four cluster solution was selected based on visual inspection of the dendrogram, in addition to theory suggesting that children may engage in pretend play in the role of an actor, narrator, or manager, in addition to behaviour that is not categorised as play. A criticism of cluster analysis is that clustering methods can produce multiple solutions from the same data. In order to address this, the cluster analysis was replicated using a different method, a non-hierarchical *K-Means* analysis specifying a four cluster solution, as suggested by Henry and colleagues (2005). This resulted in four clusters that resembled those identified in the initial hierarchical analysis in relation to the engagement in play and object use measures, though the sizes of the clusters differed. Analysis of the degree to which the hierarchical and non-hierarchical methods classified the children into the same clusters indicated moderate agreement ($k = .56$; Landis & Koch, 1977). Therefore, the clusters extracted from the initial hierarchical analysis as described were used in all subsequent analyses.

The means and standard deviations of the items that comprise the verbal engagement with play and the use of objects coding scheme according to cluster membership are presented in Table 4.6, with subjective labels for the clusters. The labelling of the clusters was aided by the interpretation of the radar plots presented in Figure 4.2, in addition to the factor scores from the factor analysis in Section 4.3.3 for each cluster which is presented in Figure 4.3. Cluster 1 was labelled as the *managers*, due to the children in that cluster having the highest mean frequencies of using the objects to set up in comparison to the other clusters, and verbally engaging less in narrating and acting as compared to other clusters. Furthermore, as Figure 4.3 displays, their average factor score for the engagement as an actor factor was negative. Because the items reflecting verbally managing the play loaded onto this factor in a negative direction, the negative factor score was considered further evidence as the cluster representing children engaging as managers of the play. Cluster 2 were considered to be the *actors*, being the children who showed the highest frequency of enactments and sound effects, with more uses of the objects in expected and creative ways than the other clusters. Cluster 3 was regarded to be children who engaged in play as *narrators*; both Table 4.6 and Figure 4.2 show that they engaged the most in the construction of narratives in their play. Finally, the children in Cluster 4 were regarded to be the *less engaged players* as they as a group did not use the objects in play and talked about reality most often.

In relation to the proportion of time children were speaking during the free play activity, Table 4.7 presents the means and standard deviations of children's talkativeness scores according to cluster group membership. A one-way ANOVA revealed a significant difference in the clusters in relation to children's talkativeness score during the free play activity, $F(3, 250) = 42.90$, $p < .01$. Post-hoc tests, adjusted for multiple comparisons using the Bonferroni statistic, revealed that the managers talked significantly less than the narrators, actors, and non-players (all ps $< .05$).

Table 4.6. Means and standard deviations for the variables entered into the cluster analysis with the final cluster

Cluster (*N*)	Play engagement coding Mean (SD)							Object use coding Mean (SD)	
	Enactment	**Sound effects**	**Narrative**	**Management**	**Speech about reality**	**Handling**	**Set up**	**Expected use**	**Creat use**
1 (100)	.79 (1.84)	.11 (.40)	3.07 (3.52)	2.38 (2.27)	.36 (.73)	6.09 (3.18)	27.01 (3.68)	1.27 (2.08)	.00 (0
2 (51)	10.67 (8.72)	2.39 (3.62)	6.19 (6.20)	1.37 (1.89)	.58 (1.15)	7.97 (4.16)	15.26 (6.41)	11.58 (6.51)	.44 (1.
3 (81)	1.81 (2.39)	.28 (.88)	11.40 (7.12)	4.00 (3.65)	.65 (1.09)	9.26 (5.26)	19.23 (7.62)	2.35 (2.92)	.18 (.5
4 (22)	1.50 (3.54)	.39 (.94)	2.72 (3.38)	2.64 (2.31)	7.12 (2.60)	8.22 (4.62)	17.43 (9.07)	1.20 (1.76)	0 (0)

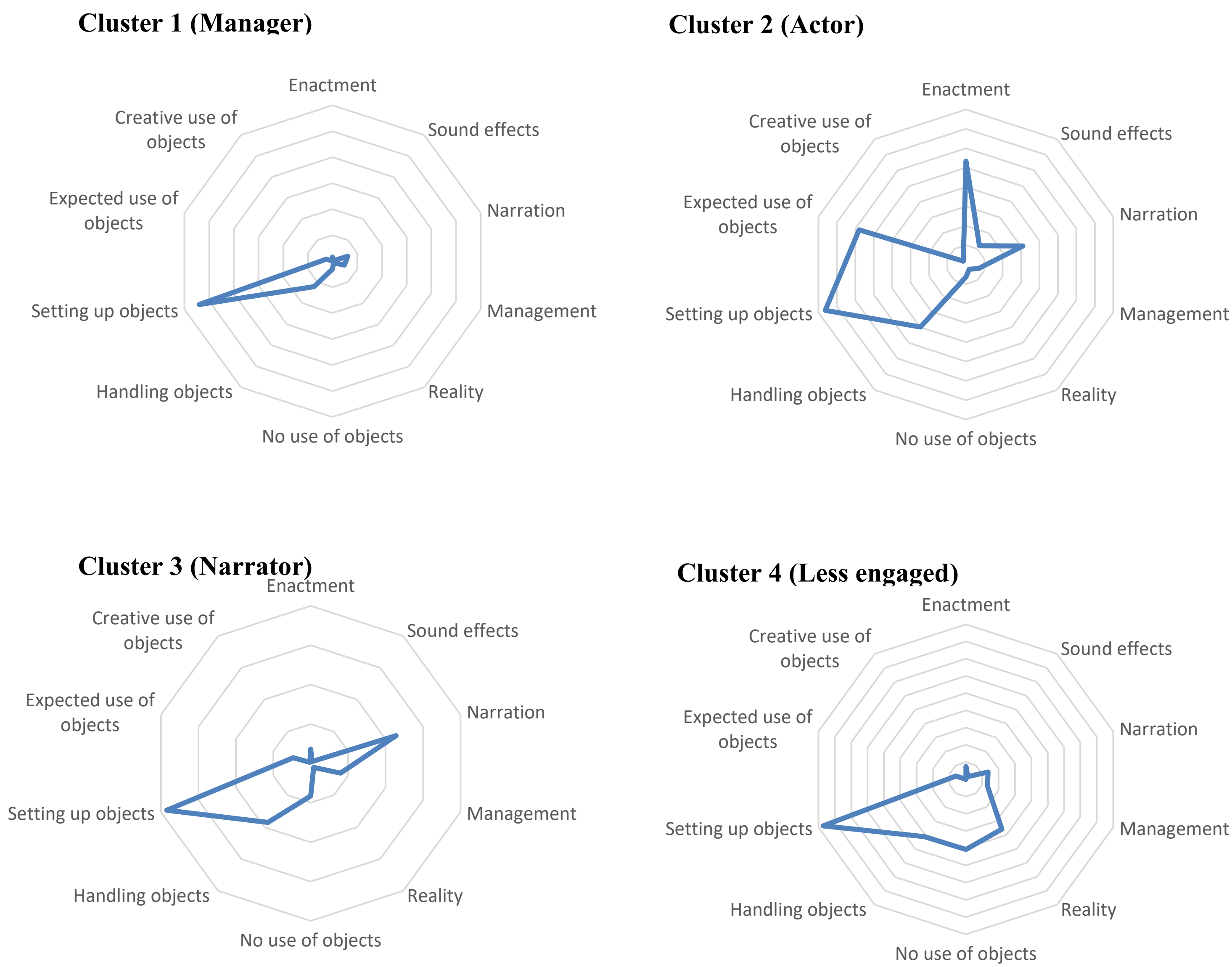

Figure 4.2. Mean frequencies of items from the coding schemes entered into the cluster analysis. Numbers represent the clusters from the final solution.

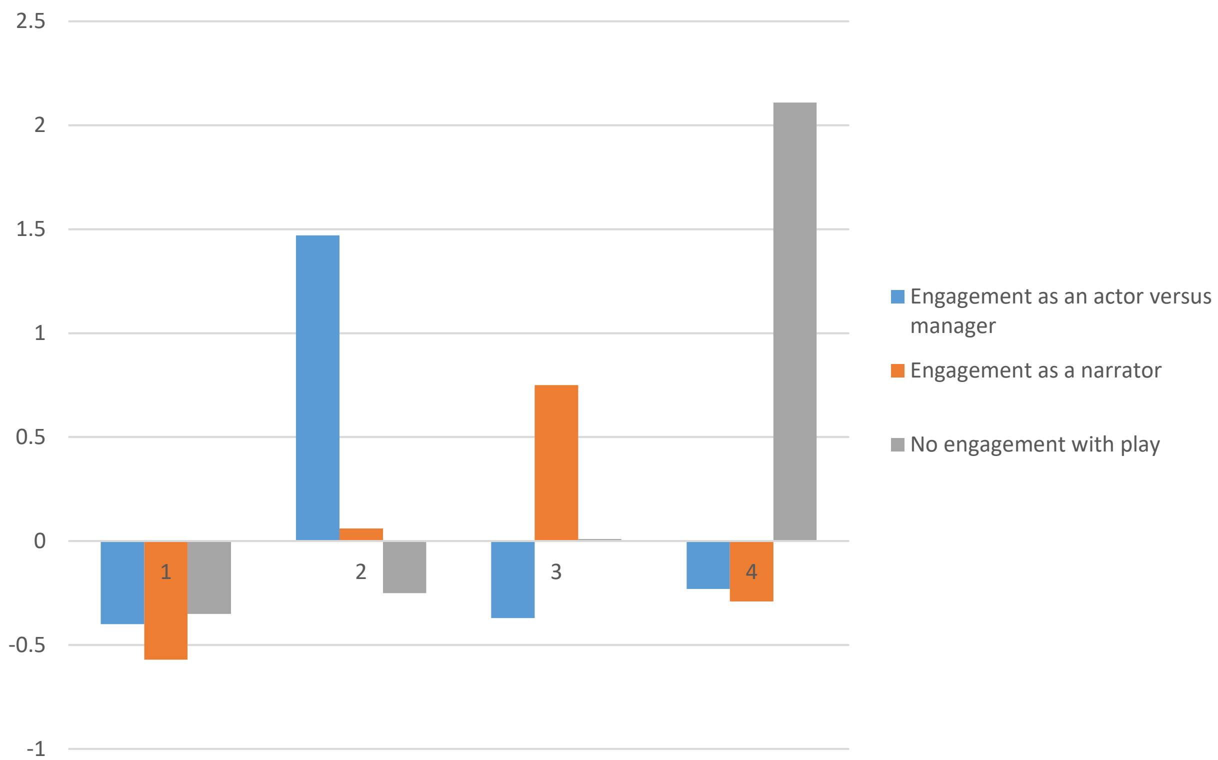

Figure 4.3. Factor scores from the factor analysis investigating children's engagement with the play for the clusters extracted from the cluster analysis.

Note. Numbers on the X axis represent the clusters from the final solution.

Table 4.7. Means and standard deviations of children's talkativeness scores according to cluster group membership.

Cluster Group	Talkativeness score Mean (SD)
Manager	.44 (.24)
Actor	.70 (.23)
Narrator	.77 (.17)
Less Engaged	.73 (.19)

4.3.5. Sources of Individual Differences in how Children Engage in the Free Play Task[2]

4.3.5.1. Gender

Table 4.8 displays the descriptive statistics according to gender for the verbal engagement and use of objects coding schemes, as well as the factor scores derived from the analysis in Section 4.3.3.

Gender differences were present for two items from the verbal engagement coding scheme, with boys being more likely than girls to use sound effects in their play, $t(189.26) = -3.09$, $p < .01$, and girls being more likely to engage with the play in the form of verbally managing the play, $t(209.20) = 2.09$, $p < .05$.

In relation to the use of objects coding scheme, gender differences were present with girls being more likely to use the objects for setting up, $t(251.80) = 2.62$, $p < .01$, whereas boys were more likely to use the figures in expected, $t(241.21) = -3.52$, $p < .01$, and creative ways, $t(142.70) = -2.70$, $p < .01$.

Only one of the factors derived from the analysis in Section 4.3.3 displayed an effect of gender, with boys engaging in play in the role of an actor more so than girls, $t(240.01) = -3.79$, $p < .01$. However, Pearson Chi-Square analysis revealed no significant differences in the gender composition of the four groups that emerged from the cluster analysis in Section 4.3.4 (see Figure 4.4).

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[2] Caregivers' reports of children enjoying playing with Playmobil and toy figures (Chapter 3) was analysed as a covariate for any significant findings in linear regression analyses. However, the inclusion of these items did not represent a significant step in the models, and so were not reported.

Table 4.8. Descriptive statistics (Mean [SD]) according to gender for the items from the verbal engagement coding scheme, use of objects coding scheme, and factor scores generated.

Variable	**Boys (*n*=143)**	**Girls (*n*=113)**	**Gender Difference**
Talkativeness score	0.64 (0.25)	0.61 (0.27)	*ns*
Play engagement enactment	3.61 (6.13)	2.58 (5.28)	*ns*
Play engagement sound effects	0.94 (2.41)	0.27 (0.90)	$p < .01$
Play engagement narrative	6.50 (6.43)	6.08 (6.68)	*ns*
Play engagement management	2.37 (2.53)	3.15 (3.21)	$p < .05$
Play engagement reality speech	0.97 (1.84)	1.26 (2.60)	*ns*
Object use handling	7.65 (4.34)	7.68 (4.59)	*ns*
Object use set up/organisation	20.23 (8.38)	22.74 (6.90)	$p < .01$
Object use expected use	4.68 (6.14)	2.44 (3.94)	$p < .01$
Object use creative use	0.25 (1.07)	0.01 (0.09)	$p < .01$
No use of objects	2.84 (4.74)	2.95 (4.28)	*ns*
Factor 1: Actor	0.20 (1.14)	-0.25 (0.72)	$p < .01$
Factor 2: Not engaged	-0.01 (0.97)	0.02 (1.04)	*ns*
Factor 3: Narrator	0.02 (0.98)	-0.03 (1.03)	*ns*

Note. Talkativeness scores represent the proportion of segments in which speech occurred during the task. Play engagement and object use scores represent the mean number of segments in which codeable behaviour or speech occurred.

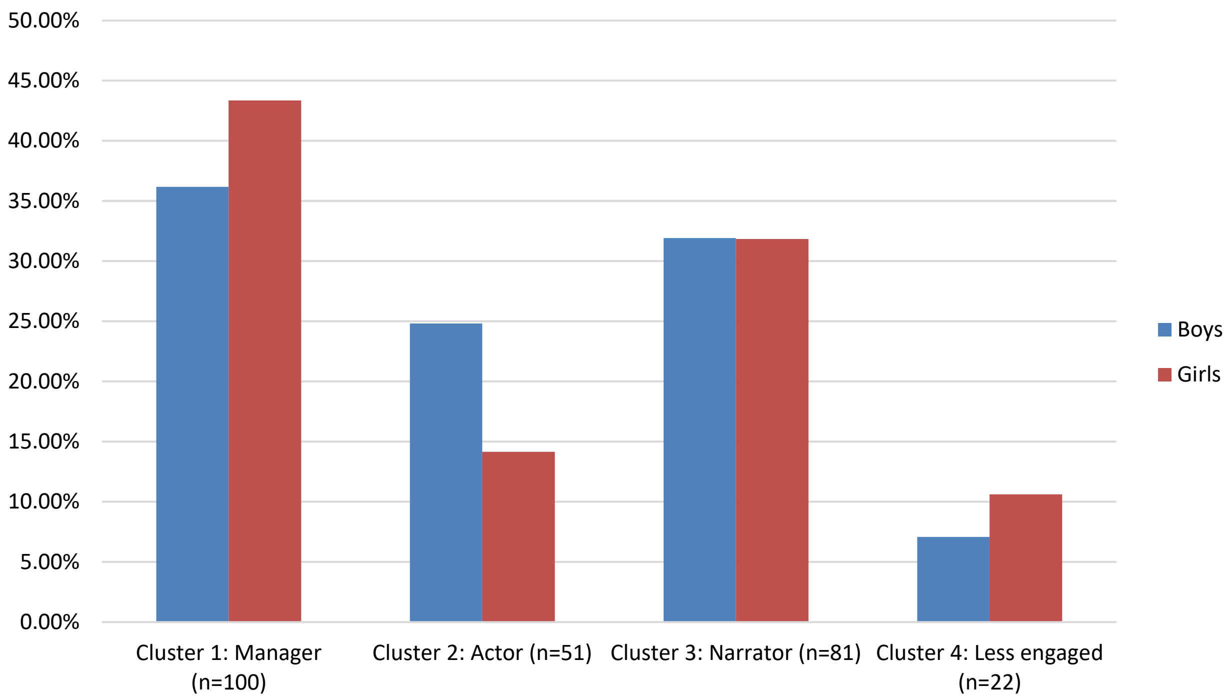

Figure 4.4. Gender composition of the clusters. Percentages represent the proportions of each gender from the sample analysed in this chapter.

4.3.5.2. Sociodemographic adversity

The mean sociodemographic adversity score for the children who completed the Playmobil free play task was -0.09 (*SD* = 0.96). Table 4.10 displays the correlations between the sociodemographic adversity score and all other variables of interest. The score was not significantly correlated with any of individual items from the verbal engagement or use of objects coding schemes, or with the factor scores generated in Section 4.3.3.

Table 4.9 displays the mean sociodemographic adversity scores according to cluster group membership. A one-way ANOVA revealed no significant differences in the adversity score according to cluster group membership.

4.3.5.3. Executive function

Response inhibition. Children's mean response time for the response inhibition task was 305.36ms (SD = 181.68). Table 4.10 displays the correlations between children's response inhibition and other variables of interest. No significant correlations emerged with respect to response inhibition and any items from the coding schemes or the factor scores. Table 4.9 displays the mean response inhibition response times for the children according to cluster group membership. Although the narrators appeared to have a better response inhibition overall, a one-way ANOVA revealed no significant differences between cluster groups.

Cognitive flexibility. Children's mean cognitive flexibility score was 693.54ms (SD = 319.88). Table 4.10 displays the correlations between children's cognitive flexibility and other variables of interest. The score was not significantly correlated with any of individual items from the verbal engagement or use of objects coding schemes, or with the factor scores generated in Section 4.3.3. Although the managers had the poorest cognitive flexibility scores (see Table 4.9), a one-way ANOVA revealed no significant differences between cluster groups.

Working memory. The mean working memory score for the children who completed the free play task was 66.10 (SD = 18.24). There were no significant correlations with this score and any items from the coding schemes or factor scores (see Table 4.10). A one-way ANOVA revealed no significant differences between cluster groups in relation to working memory (see Table 4.9).

4.3.5.4. Receptive vocabulary

The mean receptive vocabulary of the children who completed the Playmobil free play task was 99.29 (SD = 11.77). Receptive vocabulary was not correlated with any of the items from the coding schemes or factors scores (see Table 4.10) and a one-way ANOVA revealed no significant differences between the cluster groups in relation to children's receptive vocabulary (see Table 4.9).

Table 4.9. Mean scores (SD) for children's exposure to sociodemographic adversity, executive function and receptive voabulary according to cluster group membership.

Variable	**Cluster Group**			
	1: Manager	**2: Actor**	**3: Narrator**	**4. Less engaged**
Sociodemographic adversity factor	-0.13 (0.95)	0.01 (0.97)	-0.08 (0.98)	-0.11 (0.99)
Response inhibition	307.55 (170.44)	322.42 (218.83)	291.40 (176.80)	305.52 (175.69)
Cognitive flexibility	721.48 (324.79)	699.31 (312.90)	661.72 (299.74)	656.38 (391.98)
Working memory	67.29 (17.21)	66.98 (15.31)	65.68 (20.42)	61.37 (21.40)
Receptive vocabulary	99.47 (10.88)	98.41 (13.07)	100.56 (12.25)	95.76 (11.17)

Table 4.10. Inter-correlations of all continuous variables of interest.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Talkativeness score	-														
2. PE: Enactment	.34**	-													
3. PE: Sound effects	.22**	.49**	-												
4. PE: Narrative	.54**	.02	.05	-											
5. PE: Management	.36**	-.23**	-.17**	-.02	-										
6. PE: Reality	.18**	-.09	-.05	-.15*	-.04	-									
7. OU: Handling	.22**	.15*	.02	.15*	-.05	.02	-								
8. OU: Set up	-.27**	-.33**	-.34**	-.16*	.25**	-.19**	-.49**	-							
9. OU: Expected use	.10	.50**	.52**	.13*	-.31**	-.14*	-.04	-.56**	-						
10. OU: Creative use	.14*	.11	.37**	.12	-.05	.06	-.03	-.07	.07	-					
11. OU: No use	.08	-.16**	-.06	-.06	-.01	.45**	-.10	-.44**	-.14*	-.04	-				
12. Factor 1: Actor	.12*	.75**	.78**	.01	-.49**	-.06	.01	-.56**	.84**	.25**	-.05	-			
13. Factor 2: Not engaged	.05	-.15*	-.05	-.21**	-.11	.78**	.07	-.52**	-.09	-.02	.87**	0	-		
14. Factor 3: Narrator	.44**	.09	-.03	.60**	.01	-.10	.85**	-.56**	.08	-.01	-.02	0	0	-	
15. Adversity	-.05	-.01	.06	-.09	-.09	-.02	-.01	-.11	.07	.03	.10	.09	.09	-.03	-
16. Response Inhibition	-.00	.04	.01	.06	-.06	-.04	-.04	.01	.07	-.05	-.07	.05	-.07	-.00	-.06
17. Cognitive Flexibility	.04	.01	-.02	-.03	.07	-.02	.02	.06	-.00	-.09	-.09	-.03	-.07	-.01	.01
18. Working Memory	-.06	-.01	-.11	-.03	.11	-.05	-.04	.10	-.04	-.06	-.01	-.09	-.05	-.04	-.26*
19. BPVS	.08	.01	-.07	.08	.11	-.00	-.08	.14	-.06	-.00	-.02	-.09	-.07	-.04	-.48*

Note. PE=Play Engagement, OU=Object Use. * $p < 0.05$, ** $p < 0.01$.

4.4. Discussion

4.4.1. In what ways do children engage with play during a free play activity?

One of the aims of this chapter was to measure children's engagement with the play frame during a free play activity. As hypothesised based on Eckler and Weininger's (1989) research, seven-year-old children verbally engaged with play most frequently in the role of a narrator of events. However, it is of interest that some children at this age were still engaging with play in the form of enacting roles, which was not associated with their age, cognitive abilities or sociodemographic background, contradicting earlier assertions that narrative play replaces play centred on symbolic transformations (Engel, 2005; Scarlett & Wolf, 1979). Furthermore, the most common use of the objects in the present study was to set up and organise the play scenario. This finding supports those of Weininger (1989), who found that this form of engaging in play was a preference of children that was independent of their developmental level. Therefore, the present study adds to the limited body of work demonstrating that children above six years of age in a representative sample do engage in pretend play, and that children demonstrate individual differences in the way in which they engage with the play frame.

A subsidiary aim was to investigate the extent to which the categorisations of children's speech and behaviour clustered in theoretically meaningful ways, and whether they grouped the children into meaningful clusters. In the variable-centred analysis, the item loadings in the principal components analysis supported previous studies in the ways in which children might engage with the play frame (Auwärter, 1986; Giffin, 1984; Howe et al., 1998; Scarlett & Wolf, 1979). The first factor, considered as children engaging in the role of an actor, included children's enactment of roles, sound effects, and use of objects in expected and creative ways. Of particular note for this factor was that items reflecting the child verbally managing the play scenario displayed negative factor loadings. Therefore, this factor can be considered as reflecting the child's engagement with the play on a continuum from a manager to an actor. However, all factors contained negative item loadings for children using the toys to set up the play. Therefore, to an extent, a negative factor score on all items indicates behaviour in the form of managing the play. An additional factor, reflecting the child engaging with play in the role of a narrator, consisted of the items categorising children's speech as narrating the events and handling the objects. Finally, a factor emerged that reflected the children not engaging with the play.

In a person-centred analysis, the items from the coding scheme also grouped the children into a style of engaging with the play as an actor, narrator, manager, or a less engaged player (Scarlett & Wolf, 1979). The numbers of children within the cluster groups supported the results from the variable-centred analyses, with most children engaging with the play as *managers* and *narrators.* However, it is of note that in each of the cluster groups, children were not solely engaging in play in that particular style. For example, those who formed a part of the cluster group of *actors* still demonstrated the production of verbal narratives in their play. Therefore, these groupings can be regarded as explorations that indicate a preference of the children to engage in play in a particular style more so than others to allow for group comparisons, as opposed to a distinct separation of children who only engage in the play in a particular way.

As noted above, children's use of objects to *set up* the play was a non-verbal form of engagement which showed the highest frequency overall (Table 4.3), loaded onto all of the factors in the factor analysis (Table 4.5), and was a prominent form of engaging with the play in each of the cluster groups (Table 4.6). Therefore with regard to the cluster of *managers* that emerged from the cluster analysis, it noteworthy that they are only doing the most common behaviour, whereas the children in the other clusters are engaging with the play in other ways, in addition to setting up the toys. Further, when considering the nature of the Playmobil toys available for use (see Figure 2.4), other than the six 'characters' and animals, all of the figures were either furniture, toys, or items that would be present in the home or school. It could be considered that the *affordance* of such items (see Section 3.1.2.2.1) are to be arranged, organised or set up in a space (Gibson, 1979). Therefore the children who form the cluster of managers may be engaging in behaviours that are a response to the affordances of the toys, in terms of physically setting them up, and not going beyond this. Indeed, this cluster of children talked less than children in the other clusters, yet there was no association with verbal ability, suggesting the physical engagement with the objects was their own preference. Therefore when considering this group of children as *managers* of the play, this label reflects more their management of the physical placement of the toys, as opposed to imagined world of the play frame.

4.4.2. What sources of individual differences affect the ways in which children engage in play?

4.4.2.1. Gender

Several gender differences were found in children's engagement with the play frame. In line with Matthews' (1977) finding that play dependent on the affordances of the physical properties of toys was more common in boys, boys in our sample were found to be more likely to use the objects in expected ways and transform them creatively than girls. However, this latter finding was somewhat inconsistent with Matthews' (1977) who found transformation play was more common in girls. In our study, girls were more likely to verbally manage the play and use the objects to set up. In relation to overall styles of engaging with the play frame, boys were more likely than girls to engage with the play as an actor, as indicated by the factor scores. Both these findings stand in contrast with Wolf and colleagues' (1984) results in a much smaller sample of younger children. However, although there was a trend in a similar direction for the gender composition of the groups from the cluster analysis, this did not reach significance, possibly due to reduced cell sizes when children were split unevenly into cluster groups. Therefore, gender is a factor that influences children's engagement with play in different ways.

4.4.2.2. Sociodemographic adversity, executive function and verbal ability

One interesting result of the analyses in this chapter was that children's engagement with the play activity was not associated with their age, risk for sociodemographic adversity, executive function or verbal ability. These null results in relation to executive function support those of Hoffman and Russ (2012) who similarly found no relationship between pretend play and executive function, and extends this finding using a battery of well validated executive function tasks (Brunnekreef et al., 2007). These findings also support those of Taylor and colleagues (2018) research on children's creation of paracosms in finding no associations with verbal ability or working memory, however in this study, there were no associations with inhibitory control. Therefore, the lack of an association between these factors and children's engagement with the play frame supports a view that these styles of engagement reflect a preference of the child to engage with the play in a particular style that is independent of their verbal ability, executive function, sociodemographic background and age (Scarlett & Wolf, 1979; Weininger, 1989).

4.4.3. Limitations

One issue that arises from the present work is the extent to which the experimenter's presence could have affected the way in which children engaged with the play. Although this task was regarded as a solitary play activity, Piaget (1962) argued that all pretence-related activities could be social if considered as a performance to imagined, or real, others. In three- to-five-year-old children, the presence of a teacher led to the use of less private speech, both in general and in the form of fantasy play speech, but this occurred only when the adult was directly involved in the play as opposed to simply watching or supporting the activity (Krafft & Berk, 1998). Other research, however, showed that the absence of an adult was associated with children exhibiting more creative behaviours during play with their siblings (Howe & Bruno, 2009). Future research could address this by investigating children's naturally occurring play in the absence of other individuals. For example, advances in techniques for unobtrusive data recording, such as the LENA system for recording children's language in the home during a specified time period in the absence of experimenters (Gilkerson & Richards, 2009), allows for the possibility to investigate the speech that occurs in their natural play in the absence of a play partner or observer.

A second potential issue that pertains to the investigations in the present chapter is related to the disproportionately high number of segments in which children used the objects to set up the play or organise the toys (M=21.35 segments out of 36, see Table 4.3), which has been noted above. While the inclusion of children's non-verbal behaviour provides richer detail regarding children's engagement with play, as well as capturing engagement from children who are less talkative, the variable loaded negatively onto all factors that emerged from the principal components analysis with an orthogonal rotation (see Table 4.5). This poses an issue as the factors resulting from a principal components analysis with an orthogonal rotation should not be correlated and it could be argued that this item should be removed. However, the principal components analysis was also conducted omitting this item, and resulted in identical factor loadings for the other items. Therefore, the item was retained in order to reflect children's actual behaviour in this early investigation. This item was similarly high in all groups that emerged from the cluster analysis (see Table 4.6 and Figure 4.2). This poses an issue for cluster analysis due to this method being influenced by variables with large dispersion that are entered into the analysis (Hair et al., 2013). However, steps were taken to address this issue in standardising all scores for the cluster analysis. Additionally, the item loadings and high levels of children's use of objects to set up in all cluster groups could be regarded as an accurate reflection of this form of engagement being present in all children's play, though for some this is all they do.

Further, the high level of children's use of the objects to set up the play could be related to the short length of the task. It could well be the case that children used the objects in this way to *initially* set up the play, and if given longer would move onto other ways of engaging with the play activity. An extended free play activity lasting longer than three minutes would potentially capture more varied ways of children engaging with the toys beyond setting them up, and would address the issues associated with the disproportionately high number of segments in which children used the objects to set up the toys. However, it should be acknowledged that the relatively brief nature of the current activity allowed for a large sample of children to be assessed, both in this activity and in the potential covariates included in the analyses in this thesis. Further, it should also be noted that although there was a disproportionately high number of segments in which children set up the play in this three-minute free play activity, this was not the case for all children, and some were engaged primarily in enacting roles and telling stories for the majority of the time. Additionally, the results of the cluster analysis indicate that there is a distinction between the children who engaged primarily in setting up the toys and managing the play, and those children who did this *in addition* to enacting roles and narrating stories.

A further issue regarding the investigations in relation to the free play task is that this activity followed a battery of social-cognitive tasks (see Section 2.4.3). The format of those tasks involved the experimenter narrating a story, followed by a series of questions for the child to answer. Therefore, it should be acknowledged that there is the potential that these preceding tasks influenced children's behaviour in the free play activity. Indeed, in piloting the coding schemes it was noted that some children were using the names and locations from the stories in their own play, and some had chosen to engage in the activity by reversing roles and telling the experimenter a story followed by asking them questions. However, as this was noted in the piloting phase, the coding of children's play was adjusted to account for this: verbal and physical transformations were not considered to be novel or creative if they were in any way a part of the preceding stories (see Tables 4.1 & 4.2). For example, the names and roles of characters were not considered to be novel if they were the same as those given by the experimenter during the battery of social-understanding tasks. Although, the possibility remains that the ordering of these tasks may have prompted some children to tell stories more than they would have done otherwise.

A final limitation of the analyses within the present chapter concerns the conclusions that can be drawn from the cluster analysis conducted in Section 4.3.4. While the use of this technique enabled an exploration of the ways in which children can be grouped together according to the ways in which they played, such methods should be viewed as an exploratory method to describe the structure of the data (Henry et al., 2005). Therefore, the conclusions that were drawn in relation to the comparisons of the cluster groups in this chapter should be regarded as tentative.

4.4.4. Summary of the Chapter

In summary, the present investigations contribute to the limited research evidence regarding pretend play in middle childhood by demonstrating that when children from a nationally representative sample engaged with a play task, they did so in the role of an actor, narrator, director or a less engaged player (Scarlett & Wolf, 1979). This style of engagement was not associated with children's cognitive abilities, age or sociodemographic background and so appears to reflect a personal preference for engaging with play in a particular style.

In subsequent chapters of this thesis, I will explore the ways in which children engage in another play-related activity, a video game (Chapter 5). Following this, I will explore children's interactions with the imaginative content of these two contexts in terms of the internal state attributions made to the fictional characters within the play frame and within the virtual environment of the video game (Chapter 6). Further, Chapter 6 will also include an exploration of whether there are any differences in such mental state attributions according to children's styles of engaging with the play frame.

Chapter 5.

Exploring Children's Immersion in a Bespoke Video Game

5.1. Introduction

In Chapter 4, I investigated children's play with toy figures in the context of their styles of engagement with the *play frame*, which was found to be in the form of an *actor*, *narrator* or *manager* of the play (Scarlett & Wolf, 1979). In the present chapter, I will use a similar approach to investigate children's styles of engagement with playing a video game: a process labelled 'immersion'. I will first review the processes by which individuals become immersed in video game environments and the existing methods of measuring immersion. This review will inform the development of a coding scheme of immersion for six- to eight-year-old children playing a bespoke video game designed for the CCDS to establish if individual differences in children's engagement with this activity are present.

5.1.1. Immersion in a Video Game

As highlighted in Section 4.1.1, when children engage with an imaginary frame in their pretend play, events occurring in this frame are processed in a similar way to real events (Bretherton, 1984; Harris, 2000; Garvey, 1991). This is also present in adults when playing video games, and is referred to as *immersion* (Cairns et al., 2014). Immersion is an experience that is frequently reported by video game players, and refers to the degree of cognitive and emotional involvement that players have with a video game (Cairns, Cox, Day, Martin, & Perryman, 2013; Cairns et al., 2014; Jennet, 2010; Przybylski, Rigby, & Ryan, 2010). Although recent research showed that American children between the ages of 8 and 10 are playing video games for up to an hour on a typical day (Rideout et al., 2013), there have been few empirical studies investigating children's experience of immersion. This is an important issue for current research as being immersed in a video game is associated with increased learning outcomes when playing an educational game (Cheng et al., 2015; Hamari et al., 2016), higher levels of anger after playing a violent game (Lull & Bushman, 2016), and physical aggression (Kim & Sundar, 2013).

One theoretical perspective on people's experiences when playing video games describes immersion as being a graded process (Brown & Cairns, 2004). In this view, players progress through the stages of immersion by removing certain barriers, a process that involves a mixture of both human activity and certain characteristics of the game. The first stage of immersion, *engagement,* requires a time investment, effort and a degree of attention in order to overcome the barrier of controlling the game. The gamer then moves to the second stage of *engrossment* whereby the features of the game such as the plot, narrative and graphics combine in a way to affect their emotions and make them less aware of their own surroundings. When empathy and an emotional attachment to the game is felt, the player reaches the final stage of *total immersion* where individuals describe themselves as being detached from reality and experiencing the feeling of *presence*. Presence describes the subjective experience of being in a different environment to the one they are physically in (van den Hoogen, Ijsselsteijn, & de Kort, 2009;

Witmer & Singer, 1998). This theory incorporates the technical aspects of the system with subjective experience of the gamer, the latter being predominant as they become more immersed.

Alternative models portray immersion as a result of the combination of certain factors. Ermi and Mäyrä (2007) suggest that three components come together to result in the player feeling immersed in the game. *Sensory immersion* refers to the physical properties of the game's graphics, acoustics and general method of presentation to the player. This aspect of immersion is regarded as a separate construct focusing on the objective properties of the virtual environment (Barclay & Bowers, 2018; Zhang, Perkis, & Arndt, 2017) as compared to the more subjective view of immersion proposed by Brown and Cairns (2004). *Challenge-based immersion* relates to the motoric and mental skills that are required in order to progress through a game environment. Finally, *imaginative immersion* describes the component where a player engages with the narrative of the game and identifies with the game character. *Imaginative immersion is* similar to last stage of *total immersion* described by Brown and Cairns (2004); it contains an element of empathy with the game characters and is driven by the individual's subjective experience as opposed to the objective characteristics of the game.

A similar model, the Player Involvement Model (Calleja, 2011; Calleja, Herrewijn, & Poels, 2016) identifies six interrelated dimensions of game play that players attend to that result in immersion in a game. The model suggests that as a player becomes more involved with each dimension, attentional resources are freed. This allows the player to attend to multiple dimensions of the game, resulting in immersion. *Kinaesthetic involvement* is the component of learning the motoric actions of controlling the avatar. *Spatial involvement* relates to the individual navigating and exploring the virtual environment. *Shared involvement* refers to the interaction with or awareness of other game characters, both human and computer controlled.

Narrative involvement describes the engagement with the scripted narrative of the game. *Affective involvement* encompasses the positive and negative emotions felt by players when playing a game. Finally, *ludic involvement* refers to the choices made in a game environment and the repercussions of the choices made. According to the Player Involvement model, both the technical properties of the game and the subjective experience of the game result in immersion. Indeed, experimentally manipulating the game controller, social setting and complexity of the narrative in a game affects a person's involvement in these dimensions (Calleja et al., 2016). The dimensions in this model are similar to those found in Brown and Cairns (2004) latter stages of *engrossment* and *total immersion*, as well as Ermi and Mäyrä's (2007) factors of *challenge-based* and *imaginative immersion*. Figure 5.1 summarises the similarities present in the dimensions of the different models.

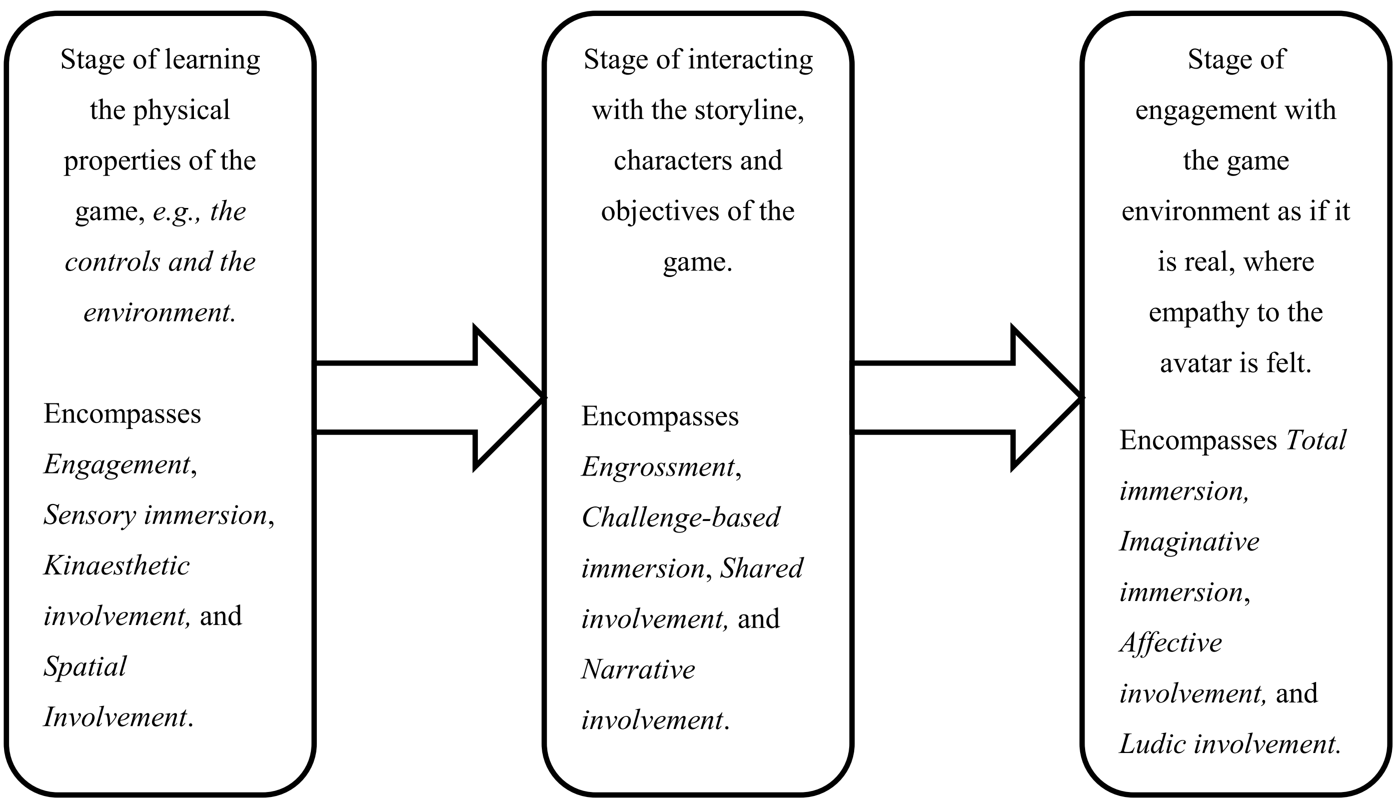

Figure 5.1. Summary of the process of immersion based on the models proposed by Brown and Cairns (2004), Ermi and Mäyrä (2007), and Calleja (2011).

5.1.2. How is Immersion Measured?

One of the aims of the present chapter is to develop a measure of children's immersion in a video game. Before developing this measure, it is important to understand the aspects of a player's experience whilst playing a game that indicate immersion. In the following sections, I describe the currently available measures of immersion and review how they assess immersion.

5.1.2.1. Questionnaires and interviews

One method used to study immersion is retrospective self-report questionnaires, mostly completed after playing the game. Critically, these questionnaires are used to assess the person's tendency to become immersed with the video game, as opposed to focusing solely on the properties of the game. Table 5.1 summarises questionnaires developed to measure immersion specifically in a video game as opposed to other virtual environments, the factors generated from the questionnaire items, and the samples they have successfully been used in.

Brown and Cairns' (2004) argue that the experience of immersion is a graded process, and as such informed the development of the Immersive Experience Questionnaire (IEQ; Jennet et al., 2008), the Game Immersion Questionnaire (GIQ; Cheng et al., 2015), and the Questionnaire of Player Immersion in Computer Game Narrative (Qin, Rau, & Salvendy, 2009). The latter questionnaire is of particular note, as the factor analysis resulted in seven factors that were considered post-hoc by Qin and colleagues (2009) to form the three dimensions proposed by Brown and Cairns (2004) when grouped together. Engagement consisted of *attraction, time investment* and *usability*. Engrossment contained *emotional attachment* and *decreased perceptions*. Finally, total immersion consisted of *presence* and *empathy*. An additional questionnaire, The Game Engagement Questionnaire (GEQ; Brockmyer et al., 2009), is a 19-

item measure based on a review of literature and focus groups with children and adults. In all cases, the responses to the questions are summed to give a total immersion score.

The factor structure of the questionnaires and models of immersion described previously share similarities and suggest several themes that are important to the experience of being immersed in a video game environment (Denisova, Nordin, & Cairns, 2016). All questionnaires have items that address the functional aspects of playing the game, including how to use the controller, the usability of the interface and the goals to be accomplished in the game. Further, research using the questionnaires showed that immersion was related to the appeal (Ustinova, Leonard, Cassavaugh, & Ingersoll, 2011; Christou, 2014), difficulty (Burns & Fairclough, 2015, Qin et al., 2009), point of view (Denisova & Cairns, 2015), and player's performance in the game (Cheng et al., 2015). This is similarly reflected in the Player Involvement Model (Calleja, 2011) in the dimensions of *kinaesthetic and spatial involvement*, the factor of *challenge-based immersion* in Ermi and Mäyrä's (2007) model, and the barriers present in the early stage of *engagement* according to Brown and Cairns (2004). Critically, the latter model suggests that learning the functional aspects of playing a game is necessary for becoming immersed.

Furthermore, these questionnaires contain items regarding emotional reactions to the game, including empathy towards the game player's avatar. This experience was present for the IEQ (Jennet et al., 2008) and the questionnaire developed by Qin and colleagues (2009) supporting the stages of *imaginative immersion*, *affective and shared involvement* for Ermi and Mäyrä's (2007) and Calleja (2011), respectively. In the GIQ (Cheng et al., 2015), empathy with the avatar was related to a higher level of immersion, supporting Brown and Cairns' (2004) view that an affective and emotional component is important to reach the stage of *total immersion*.

The notion of being unaware of the real world environment was present in most of the questionnaires but loaded onto the higher stage of total immersion for Qin and colleagues (2009), thus supporting Brown and Cairns' (2004) model. This experience is not a part of the models described by Ermi and Mäyrä's (2007) or Calleja (2011) as it was argued to reflect *presence* (McMahan, 2003). However, support for an association between presence and immersion is provided insofar that higher scores on a measure of immersion related to a reduced ability to re-engage with a puzzle task that involved cognitive and physical engagement (Jennet et al., 2008).

One problem with the use of questionnaire measures of immersion is they are typically administered after the player has finished the game. If, as Brown and Cairns (2004) suggest, immersion is a graded process that increases dynamically during play, then it would be expected that scores on a measure of immersion would vary through the experience of playing the game. It could be hypothesised that items related to the functional aspects of playing the game would be present early, with the more "immersive" items referencing the individual's emotional attachments, empathy and dissociation from the real world occurring later. The questionnaires, however, only provide information on these dimensions at the end of play, therefore losing information as to whether the experiences varied during the process of playing the game. Cheng, Lin, She and Kuo (2016) attempted to address this by administering the GIQ (Cheng et al., 2015) over successive sessions with the same game, and found immersion appeared to increase with progressive experience of the game. This latter finding supports Brown and Cairn's (2004) view that as competence with a game increases, so does an individual's immersion in the game. However, this method still failed to capture the variation in the experience of immersion as the individual is playing the game and only reflected the end state of each session. This could result in inflated scores as it is a reflection of the point at which the individual has mastered the controls and has experienced the greatest degree of immersion. Conversely, scores could be lower as the person is “out” of the immersive experience and more aware of the real world.

Secondly, most were administered to adults (see Table 5.1). Only two questionnaires were used in research involving children and adolescents aged 11 - 14, the GIQ (Cheng et al., 2015; Cheng et al., 2016) and the GEQ (Brockmyer et al., 2009; Norris, Weger, Bullinger, & Bowers, 2014; Piotrowski & Meester, 2018). The most apparent concerns for using the questionnaires in children of younger ages would be an inability to understand the questions and to engage in introspection. For example, questions regarding time perception, as a measure of dissociation from the real world, could be unreliable as time perception is maturing between the ages of 3 and 10 years (Droit-Volet, 2013). Therefore, there is a need for the development of measures of immersion that are appropriate for younger children that do not rely on self-report.

Other successful techniques used to investigate the experience of immersion in younger participants include interviews with players. Hannaford (2012) interviewed nine-year-old children regarding their immersion with the narratives of video games. However, though the study demonstrated the feasibility of using interview methods with younger children, analysis of the data was limited to reporting individual case studies, relied on the children’s introspection and data was collected after the game was played. Søndergaard (2013) combined interviews with observational techniques of children between 8 and 14 years of age, in order to better understand the complex interactions between the real and video game environment. In Sondergarrd’s (2013) study, speech and behaviour from the real environment and that which occurred in the virtual one was included to indicate their immersion. Though this work did not report an observational coding scheme that could be used, observational tools for analysing speech and behaviour of children while playing a game can be viewed as a valid method to assess their immersion.

Table 5.1. Questionnaire measures of immersion and sample information of the studies that have used them in video game research.

Questionnaire	Factors in questionnaire	Sample information of studies that have used the questionnaires to investigate immersion in video games.
Immersive Experience Questionnaire (IEQ; Jennet et al., 2008)	Control Challenge Cognitive involvement Emotional involvement Real world dissociation	Burns & Fairclough (2015): mean age 23.67 years. Cairns et al., (2013): mean age 20.4 years, range 18 -25. Christou (2014): mean age 23.1 years. Denisova & Cairns (2015): mean age 23.5 years. Denisova, Nordin & Cairns (2016): mean age 26.42 years, range 18 – 63. Engström, Brusk, & Östblad (2015): mean age 22.5 years, range 15 – 39. Jennet et al., (2008, study 1): mean age 21 years, range 18 -36. Jennet et al., (2008, study 2): mean age 25.4 years, range18 – 39. Kothgassner et al., (2018): mean age 67.65 years, range 54 - 90 Nordin, Hudson, Cairns, Rasid & Baharin (2018): mean age 20.95 years, range 17 – 35.
Questionnaire of Player Immersion in Computer Game Narrative (Qin, Rau, & Salvendy, 2009)	Control Curiosity Familiarity Challenge and skills Comprehension Concentration Empathy	Qin, Rau & Salvendy (2010): mean age 34.5 years, range 20 – 31. Ustinova, Leonard, Cassavaugh, & Ingersoll (2011): mean age 32 years.

Questionnaire	Factors in questionnaire	Sample information of studies that have used the questionnaires to investigate immersion in video games.
Game Engagement Questionnaire (GEQ; Brockmyer et al., 2009)	No factor analysis conducted.	Brockmyer et al. (2009): mean age 19.4 years, range 18 – 26 years. Bronner, Pinsker, Naik, & Noah (2016): mean age 16.6 years. Byun & Loh (2015): mean age 21 years, range 18 – 25 years. Denisova, Nordin & Cairns (2016): mean age 26.42 years, range 18 – 63. Laffan, Greaney, Barton, & Kaye (2016): mean age 25.47 years, range 18 – 64 years. Li, Jiang, Tan, & Wei (2014): range 12 – 30 years. Norris, Weger, Bullinger, & Bowers (2014): mean age 11.97 years, range 11-14 years. Poore et al. (2017): mean age 26.57 years. Piorowski & Meester (2018): mean age 9.52 years, range 8 – 10 years. Smith, King, Richardson, Roane, & Gradisar (2017): mean age 15.9 years, range 15 – 17. Wu & Rank (2015): median age 22 years, range 19 – 34 years.
Game Immersion Questionnaire (GIQ; Cheng, She, & Annetta, 2015)	Attraction Time investment Usability Decreased perception Emotional attachment Empathy Presence	Cheng, Shet, & Anneta (2015): 12 -13 years. Cheng, Lin, She, & Kuo (2016): 12 – 14 years.

5.1.2.2. Observational methods

Observational coding schemes are a method of measuring immersion that is not dependent on age or an understanding of the questions. Critically, the opportunity is then present to assess the individual's experience of immersion throughout their game play as opposed to following completion of the game or at specified time points. Von der Pütten and colleagues (2012) coded behavioural measures of immersion, though the authors use the alternative term 'presence', from video records of individuals in virtual reality environments. Variables coded in this study included verbal and nonverbal emotional reactions to the content, commenting or pointing to the content, and engaging in a dialogue with the virtual content itself. However, the age of the participants in the study was not reported and so it is unclear as to whether children would demonstrate similar behaviours. Martinovic, Burgess, Pomerleau, and Marin (2016) developed an observational scheme for children who were between 7 and 12 years of age, based upon the literature as well as direct observations of the children. This scheme contained items similar to those used in questionnaires measuring immersion and those observed by von der Pütten and colleagues (2012), such as emotional reactions to the game and questions related to an understanding of what to do in the game. The frequencies of such behaviours correlated with subjective measures of immersion (von der Pütten et al., 2012), and corroborated previous research using questionnaires showing that the time spent playing the game and performance were related to a greater experience of immersion (Cheng et al., 2015; Martinovic et al., 2016).

However, problems with these observational schemes include the absence of objective definitions for the behaviours that would allow the tools to be used in other work. Von der Pütten and colleagues (2012) do not define many of the terms; although some are intuitive, others are more unclear, such as *"comment (on) the virtual environment"*. Although Martinovic and colleagues (2016) do provide examples of each code, it is unclear why this coding scheme, unlike the existing questionnaires, separated the valence of emotions experienced, such that negative emotions indicated less immersion with the content. All questionnaire measures of immersion and the models of immersion indicate that emotional reactions are a factor present in the experience of immersion, regardless of whether they are positive or negative. Indeed, when playing a violent video game, those who were more immersed demonstrated increased anger than those who were less immersed (Lull & Bushman, 2016). However, the observational studies do provide evidence of the feasibility of developing coding schemes of immersion based on observations of individuals while playing a game.

5.1.3. Individual Differences in Immersion

If immersion is, to an extent, a process driven by an individual's subjective experience (see Section 5.1.1), then it is plausible that there are sources of individual variation that affect the likelihood or extent to which a person becomes immersed within a video game. While the nature of individual differences in children's immersion in video games has not been investigated, in the following sections I will explore possible sources of individual differences in immersion.

5.1.3.1. Previous Experience with Video Games

As highlighted in Section 5.1.1 and summarised in Figure 5.1, one of the initial processes that must occur before a player becomes immersed within a video game is to learn the controls of the game and how to proceed through the objectives. Therefore those who are unfamiliar with game controllers and have less experience with video games in general may be less likely to become immersed, as it takes them longer to overcome this initial barrier. Indeed, when comparing individuals playing a game using a traditional controller (PlayStation 3 controller) compared to a non-traditional motion-based controller (PlayStation Move racing wheel controller), those using a traditional controller experienced a greater degree of competence, positive affect and the dimensions of the Player Involvement Model analogous to immersion (Calleja et al., 2016). Although other research has not found an association with video game experience and immersion (Denisova & Cairns, 2015; Christou, 2014), previous experience in these studies was measured in relation to the commercially available games and controllers used in the respective studies, as opposed to experience with video games in general.

5.1.3.2. Sociodemographic Characteristics

Further, previous experience with video games may be related to socioeconomic background. As highlighted in Section 3.1.3.2, those from a lower socioeconomic background may have less video game experience due to having less access to technology (Downey et al., 2013). While the analyses reported in Chapter 3 showed that children's exposure to socioeconomic risk was not associated with caregiver reports of children's enjoyment of playing video games, there is the possibility that sociodemographic factors are associated with having less experience with playing video games, which could, in turn, affect the children's immersion.

5.1.3.3. Gender

In the adult literature on immersion, there have been no reported significant gender differences in immersion (Brockmyer et al., 2009; Byun & Loh, 2015; Kothgassner et al., 2018; von der Pütten et al., 2012). In the limited childhood literature, one study showed gender differences but only for two of 15 games used in the research (Martinovic et al., 2016). Therefore, there is a necessity to further investigate gender differences in children's immersion.

It may be that gender differences are associated with immersion, due to gender differences in children's previous experience with video games. In line with previous research where boys played video games more often and for longer than girls (Gentile, 2009; Rideout et al., 2013), in the CCDS, caregivers reported that boys enjoyed playing video games more than girls (see Chapter 3). Therefore, it may be that boys are more likely to become immersed within video games as they are more motivated to play games and have more experience with them.

5.1.3.4. Motor control

If those with more experience playing video games and in using controllers are more easily immersed within a game (see Section 5.1.3.1), it is plausible that those who are less *able* to use the controller are less likely to become immersed as the initial barrier to control the game is more difficult (Calleja, 2011; Brown & Cairns, 2004). Indeed, there are individual differences in children's motor control that are related to experience, with *novices* performing movements that are variable and unreliable (for a review, see Adolph & Berger, 2006). Therefore, one potential source of individual difference in children's immersion in a video game could be fine motor control.

5.1.3.5. Executive Function

The experience of immersion is characterised as a process in which an individual inhibits reality and processes the content of the game as if it is real (see Section 5.1.1 and Figure 5.1). Therefore, those who have better *inhibitory control, cognitive flexibility*, and *working memory* may be more likely to become immersed as they are better able to inhibit reality and retain information regarding the virtual world (Carlson & White, 2013; Carlson et al., 2014; Pierucci et al., 2014).

5.1.4. Selecting an Appropriate Video Game for Investigating Children's Immersion

One relevant issue to studying immersion within a video game that underpins research using video games relates to the game selected for the research. Most research uses commercially available games that differ in genre, point of view of the avatar, and visual and auditory properties. This leads to inconsistency in the literature and restricts the comparisons that can be made between the results of different studies, because the game used is itself a confounding variable (Elson & Quandt, 2014). This is particularly important for immersion research, as certain properties of a game, such as the presence of auditory features (Byun & Loh, 2015; Chandrasekera, Yoon, & D'Souza, 2015; Wu & Rank, 2015), the inclusion of a narrative (Bormann & Greitemeyer, 2015; Calleja, 2011; Calleja et al., 2016), the point of view of the avatar (Denisova & Cairns, 2015), and the display system (Lull & Bushman, 2016), are all associated with immersion. Further, although experience with the game used in the study is not associated with immersion in adults (Denisova & Cairns, 2015; Christou, 2014), prior experience with the game may be a confound for investigations of immersion in children, some of whom may have no experience with video games at all.

One way to overcome this issue is through the use of modifications of existing games to manipulate the variables of interest while controlling other relevant characteristics of the game environment (Elson & Quandt, 2014). Though the use of modified (or "modded") games for research purposes is rare, previous research shows this technique is feasible and, following training on the game, can produce valid data (Hay et al., 2017; Frey, Hartig, Ketzel, Zinkernagel, & Moosbrugger, 2007). Indeed, Calleja and colleagues (2016) successfully used game-editors to create experimental levels in which specific elements of the game could be varied to investigate the effects on the players' immersion. This method results in data that are comparable between subjects, as participants experience the same game features, narratives and will not have experienced the game previously.

5.1.5. Research Questions

It is evident that there is a paucity of research examining immersion in children, particularly in relation to whether there are individual differences in relation to this subjective experience. An issue present is that there is currently a lack of an appropriate measure for the study of immersion in childhood. Therefore, the research questions for the investigations contained in the present chapter are:

Can children's immersion within a bespoke video game be measured from children's speech while playing the game? Attempts at developing observational schemes (Martinovic et al., 2016; von der Pütten et al., 2012) show this is a feasible method; however, these schemes lack definitions and applicability to other samples, and are inconsistent with the other literature on immersion. Therefore, a coding scheme of children's immersion was developed based on the aspects of immersion identified in the existing literature. This coding scheme was applied to children's speech as they played a bespoke video game.

What items from the coding scheme developed reflect children's immersion in the video game? The variables that comprise the coding scheme developed were analysed in variable-centred analyses in order to explore whether the items loaded onto factors that reflect the process of becoming immersed, as summarised in Figure 5.1. It was hypothesised that factors would emerge that reflect children engaging with the functional components of playing the game, in addition to the more imaginative and immersive aspects of responding to the narrative and characters in the game.

What sources of individual difference are present and how do they influence children's immersion within a video game? Finally, the analyses tested whether children's immersion in the video game was associated with their previous video game experience, sociodemographic characteristics, gender, motor control, executive function and verbal abilities.

5.2. Method

5.2.1. Participants

Of the 272 families seen in the home at the childhood assessment (see Section 2.2.3), data were available for *N*=259 children (95%) for the following analyses. One child had a developmental delay and did not complete any testing; one session took place in a language other than English or Welsh and no translation was available; five sessions experienced technical issues resulting in no data for this task; three children refused to complete the task; in one case the task was not completed due to time restrictions; and one of the families withdrew the data after data collection took place. The remaining two children completed less than a third of the game and so were removed from analyses.

5.2.2. Procedure

See Section 2.3.6 for information in relation to the procedure of the Wave 6 Childhood Assessment and Section 2.4 for information regarding the procedures of the caregiver interview, executive function tasks, and the BPVS (Dunn & Dunn, 2009).

The procedure for the Castell Arth Mawr Adventure Game (CAMGame) is detailed in Section 2.4. Briefly, in the CAMGame the child was told that they were on a school trip to a castle with their teacher and classmates from their own school, the red school. Later in the game, rival children from the blue school were introduced who were competing to find treasure that had been buried somewhere in the castle. The children's speech and facial expressions were video-recorded using the webcam on the laptop, and the child's progression through the video game was recorded using *Fraps* (Beepa, 2013) software. Children played the game on an Alienware™ laptop using a traditional Xbox™ controller. Instructions of how to use the controller were given by the researcher before the child began playing and repeated as a part of the in-game narrative.

5.2.3. Materials

5.2.3.1. Castell Arth Mawr Adventure Game (CAMGame; Hay et al., 2017)

See Section 2.4.4 and Appendix 2 for information relating to the CAMGame (for a video demonstration of the CAMGame, visit https://youtu.be/SpixvsHypg8). According to previous research, several aspects of the game could facilitate immersion. First, instructions regarding how to proceed to the next goal were embedded in the narrative, elicited from characters in the game (Wu & Rank, 2015). Further, the game was played in a first-person point of view, which is associated with higher levels of immersion compared to a third-person perspective (Denisova & Cairns, 2015). Finally, the narrative of the game was designed to be emotionally engaging, featuring 'taunts' from rival characters, competition with another school, and a climatic ending (Calleja et al., 2016).

5.2.4. Measures

5.2.4.1. Talkativeness score

The children's speech as they played the CAMGame was transcribed into temporal units of 5 seconds (see Appendix 5 for an example of a transcript from this task). When children were not playing the game due to a technical error with the game, or the segment was a repetition of a part of the game that had been previously completed, or was a segment in which the child was away from the laptop, segments were excluded from all analyses and calculations of talkativeness scores and task length. A proportional measure of the child's talkativeness was generated by dividing the number of 5 second segments in which the child spoke by the total number of 5 second segments of the length of the task, yielding a score between 0 and 1. Any instances of non-word noises that were not sound effects were excluded from this calculation.

5.2.4.2. Immersion coding scheme

The transcripts of the children's speech were analysed by extraction of themes that resembled those identified from the existing questionnaire measures of immersion. This method resulted in 11 items that are presented in Table 5.2 alongside definitions and verbatim examples used for the coding of the transcripts. In Table 5.3, the 11 items are presented alongside the questions or codes from existing measures of immersion that they most resemble. Two independent observers coded 25% (*n*=65) of the transcripts to assess reliability of the coding scheme. Table 5.2 presents the results of the reliability analysis (Median *ICC* = .95), indicating good coder agreement on the measure.

Because the length of time it took each child to complete the game differed (mean 19:01 minutes, range 08:30 – 41:45 minutes), proportion scores were created for the purposes of the analyses in this chapter to allow meaningful comparisons to be made between the children. For each child, the total frequency of each code was divided by the total number of 5 second segments for the task resulting in a score ranging between 0 and 1.

The existing literature suggests that the experience of immersion is captured by a person experiencing the virtual environment as if he or she really is the avatar; becoming emotionally involved with the game and experiencing empathy with the game characters and the avatar (Cheng et al., 2015; Jennet at al., 2008; Qin et al., 2009). Four codes in the scheme presented in

Table 5.2 related to the notion of the child being engaged in the game environment as if it were real; these codes were analogous to the most representative items from the previously reviewed questionnaires: *Speech to game characters, Characteristics of game characters, Creation of narrative,* and *Emotion* (see Table 5.3 for the analogous items from existing measures).

Table 5.2. Coding scheme for measuring children's immersion in a video game.

Item	Definition & Verbatim Examples	Reliability Statistic
Speech to game characters (SGC)	Any speech that is directed towards the characters in the game. Attention may need to be drawn to the characters speech noted on the transcripts to establish if X is responding to a character who has just spoken. *"Where are you going?" "I have a hammer, so get back!" "Look I can jump like you okay!"*	.99
References to game characters (RGC)	Any speech that makes specific reference to the characters in the game **but is not directed to the characters.** *"Where are the blue kids going?" "He said hit the armour." "Why is he the bear king?"*	.99
Characteristics of game characters (CGC)	Any speech made that is in reference to or directed to a game character that is a comment on their personal characteristics. This additionally includes references to the internal states of the characters. This will most likely be an adjective. *"You are naughty" "Wait for me you, rude people" "Those idiots are way behind me" "There's my friend" "He's a bully" "He doesn't know I have a mallet" "She can't see me over here"* Do not include any comments that are about the characters' physical appearance.	.97
Creation of narrative (CN)	Any speech made by the child that is the child bringing their own thoughts, ideas or narrative **that expands beyond what is explicitly present in the game**. The child bringing a novel idea, or something that is not present, into the narrative of the game. *"I'm possible in disguise aren't I?" "The princess has gone." "I'm going to call you Teeny"*	.78
Use of controller (UC)	Any reference to the controller or questions to the experimenter about how to use the controller. *"What do all these do? The X, A, B, Y?" "Which one's the purple one?"*	.98
Rules of game (RG)	Any questions to the experimenter about how to do an action or achieve a goal regardless of whether it is possible given the rules of the game. Or any questions directly asking if the rules of the game allow for an action to occur. *"Can't I just climb over the rocks?" "How do you push them?" "How do you say "Are you alright?" "How do I attack?"*	.92

Item	Definition & Verbatim Examples	Reliability Statistic
Future thinking (F)	Any statements or questions about what may happen next within the context of the game world. Questions about things happening/characters doing things that are not currently occurring. Any questions to the experimenter about the consequences of the child's actions in the game. *"Is he going to hit me?" "If you go in the water, would you die?" "What happens if you fall off?"*	.90
Help-seeking (HS)	Any questions to the experimenter (or in some cases a game character) about what the child has to do or where to go next in order to progress through the game (goal orientated). This includes asking the experimenter to take over play. This does not include general questions about the game. *"Where's the door?" "So basically you have to find the statue before the blues?" "Can you do the jumps?"*	.95
Uncertainty/Helplessness (UH)	Speech by the child which is an expression of them not knowing how to do something or not being able to do something in the game. *"I don't know which way to go" "I can't do it"*	.93
Emotion (E)	Speech by the child which is an expression of an emotional or affective reaction in relation to the events/characters/narrative of the game. This includes using emotive language to **describe** the game content and language reflecting the child's enjoyment of the game. *"I'm a bit scared" "This is scary" "I'm a bit freaked out" "I really like this game, this is cool"*	.96
Speech about reality (R)	Speech by the child which is unrelated to the game world. Do not include if the child is speaking about other video game. *"What's for dinner?"*	.89

Note. Categories are not mutually exclusive. One segment of speech can contain more than one category. Coding is in reference to the speech relating to the game.

Table 5.3. The coding scheme measuring children's immersion alongside the analogous items from existing measures of immersion.

Item	Analogous item from existing coding scheme
Speech to game characters	"Verbal answer in dialogue with virtual content" (von der Pütten et al., 2012). "At any point did you become so involved that you wanted to speak to the game directly" (Jennet et al., 2008).
References to game characters	"Commenting the virtual content" (von der Pütten et al., 2012).
Characteristics of game characters	"Commenting the virtual content" (von der Pütten et al., 2012). "Belittled game characters (showing frustration)" (Martinovic et al., 2016).
Creation of narrative	"Parts of the story are formed by me in the course of playing the game", "I can control the progress of the game story" (Qin et al., 2009).
Use of controller	"I can control the character to move according to my arrangement", "I can control the game interface" (Qin et al., 2009).
Rules of game	"Having trouble understanding the game" (Martinovic et al., 2016).
Future thinking	"Were you able to anticipate what would happen next in response to actions that you performed?" (Witmer & Singer, 1998).
Help seeking	"Having trouble understanding the game (Asking questions during play)" (Martinovic et al., 2016). "I know my next goal while finishing an event every time" (Jennet et al., 2008).
Uncertainty/Helpless ness	"Having trouble understanding the game, asked rater for instructions/to clarify; did not seem to understand" (Martinovic et al., 2016). "Were there any times during the game in which you just wanted to give up?" (Jennet et al., 2008).
Emotion	"Showing enjoyment", "Showing frustration", "Seeming anxious/nervous" (Martinovic et al., 2016). "My emotion often varies with the stories progress", "I like the type of game", "I often feel nervous or excited because of the game", "When I am playing the game, I feel as if I have experienced the context of the game in person, just like I am who the avatar is in the game", "I used to be so integrated into the avatar in the game that I could feel his/her feelings" (Qin et al., 2009). "I feel different", "I feel scared", "I get wound up", "Playing makes me feel calm" (Brockmyer et al., 2009). "To what extent did you feel emotionally attached to the game?" (Jennet et al., 2008).
Speech about reality	"Getting distracted while playing" (Martinovic et al., 2016) "To what extent did you feel consciously aware of being in the real world whilst playing?" (Jennet et al., 2008)

5.2.4.3. Children's previous experience with video games

See Section 2.4.1 for information regarding the relevant section of the caregiver interview. Caregivers were asked to report the frequency of time their child spent playing video games. Responses were recorded as an ordinal variable ranging from never to three or more hours a day. This variable was dichotomised for the statistical analyses in this chapter to contrast children who played computer games daily compared to the other children in the sample (see Hay et al., 2017). For three of the 259 children who completed the CAMGame, the question in relation to children's previous experience with video games was not answered by the caregiver.

5.2.4.4. Sociodemographic adversity

See Section 2.2.2 for full details regarding this measure. The sociodemographic adversity score is an index of children's exposure to maternal factors known to be associated with adverse social circumstances. Positive scores on this measure indicate a higher than average exposure to sociodemographic adversity. Scores were available for all 259 children in the analysis.

5.2.4.5. Executive function

All executive function measures were a part of the Amsterdam Neuropsychological Tasks (ANT; de Sonneville, 1999), a computerised set of well-validated tasks. See Section 2.4.2 for specific information regarding each task.

Response inhibition. Response inhibition was measured using the Response Organisation Objects (ROO) task, and was operationalised as the difference in mean reaction times (ms) between the incompatible and compatible parts of this task, where a lower difference indicates better response inhibition.

Of the 259 children whose data were available from the CAMGame task, *n*=247 (95.4%) completed the ROO and had response inhibition data available. In one case there was a technical error; in one case the child refused to complete the tasks; in five cases the data were excluded by ANT algorithms as not reflecting valid performance; in four cases the task was not fully completed; and in one case the child was not testable on this task.

Cognitive flexibility. Cognitive flexibility was measured using the ROO task, and was operationalised as the difference in mean reactions times between the compatibles trials of the mixed part of the task (part 3) and all trials of the compatible part of the task (part 1). A lower difference in these reaction times indicate a better cognitive flexibility.

Of the 259 children whose data were available from the CAMGame task, *n*=244 (94.2%) completed the ROO and had cognitive flexibility data available. In one case there was a technical error; in one case the child refused to complete the tasks, in five cases the data were excluded by ANT algorithms as not reflecting valid performance; in seven cases the task was not fully completed; and in one case the child was not testable on this task.

Working memory. Working memory was assessed using the Visuospatial Sequencing task (VSS) in which the child was asked to replicate a sequence of circles presented on the computer that gradually increased in difficulty in the number of targets and sequence complexity. The total number of correctly identified targets in the correct order indicated their *working memory*.

Of the 259 children whose data were available from the CAMGame task, *n*=244 (94.2%) completed the VSS and had working memory data available. In three cases there was a technical error; in two cases the child refused to complete the tasks; in two cases the children were not testable on this task, in three cases the task was not completed due to time constraints; and in five cases only one child-testing session was completed and so the task was not administered.

Fine motor control. Motor control was assessed using the Pursuit task (PU) in which the child was asked to move the mouse to 'catch' a moving star with the cursor for five minutes. The mean deviation (mm) from the star over the course of the task indicated their *visuomotor coordination* or *fine motor control*.

Of the 259 children whose data were available from the CAMGame task, *n*=225 (86.9%) completed the PU and had fine motor control data available. In two cases there was a technical error; in four cases the child refused to complete the tasks; in seven cases the task was not fully completed; in ten cases the child the child was not testable; in six cases the task was not completed due to time constraints, and in five cases only one child-testing session was completed and so the task was not administered.

5.2.4.6. Verbal ability

As children's speech was the source of information regarding their immersion in the game, receptive vocabulary was included as a control to ensure that children's immersion was not related to an increased verbal ability. Children's knowledge of vocabulary was assessed using the BPVS (Dunn & Dunn, 2009; see Section 2.4.5 for full information regarding this measure). The receptive vocabulary of the children was calculated by normalising the data based on their age to produce a standardised score. Of the 259 children whose data were available from the CAMGame task, receptive vocabulary data were available for *n*=254 (98.1%) cases. In four cases, only one child-testing session was completed and so the task was not administered and in one case the child was not testable on the task.

5.3. Results

5.3.1. Children's Immersion within the CAMGame

Table 5.4 displays the descriptive statistics for children's immersion as indicated by their speech as they played the CAMGame. A repeated measures ANOVA revealed significant differences in proportions of scores of items in the immersion coding scheme, $F(3.44, 888.52) = 208.01$, $p < .01$. Pairwise comparisons, adjusted for multiple comparisons using the Bonferroni statistic, indicated that children most commonly referred to the game characters in their speech. Children spoke to the game characters and sought help to progress through the game at comparable levels, and more often than engaging in the remaining categories from the coding scheme. Children referred to the characteristics of the game characters and inquired as to the rules of the game at comparable levels, and more often than the remaining categories from the coding scheme, which all occurred at comparable levels, other than speech regarding reality, which was the least common way in which children spoke while playing the CAMGame (all ps < .05).

Table 5.5 displays the inter-correlations of the variables from the immersion coding scheme. Children's overall talkativeness whilst playing the CAMGame was positively associated with all items from the coding scheme. While there were considerable positive associations between the items from the coding scheme (see Table 5.5), speech related to the reality outside of the game context was not associated with any of the other items from the coding scheme.

Table 5.4. Descriptive statistics for items from the immersion coding scheme.

Variable	Mean	Standard deviation	Range
Talkativeness score	.45	.19	.00 - .85
Speech to game characters	.02	.03	.00 - .18
References to game characters	.06	.04	.00 - .24
Characteristics of game characters	.02	.02	.00 - .10
Creation of narrative	.01	.01	.00 - .05
Use of controller	.01	.01	.00 - .04
Rules of game	.02	.01	.00 - .10
Future thinking	.01	.01	.00 - .05
Help seeking	.03	.02	.00 - .14
Uncertainty/Helplessness	.01	.01	.00 - .07
Emotion	.01	.01	.00 - .05
Speech about reality	.00	.00	.00 - .03

Note. All scores presented in this table are as a proportion of the duration of the task for each child.

Table 5.5. Inter-correlation of items from the immersion coding scheme.

	1	2	3	4	5	6	7	8	9
1. Talkativeness score	-								
2. Speech to game characters	.59**	-							
3. References to game characters	.64**	.39**	-						
4. Characteristics of game characters	.51**	.53**	.63**	-					
5. Creation of narrative	.51**	.47**	.39**	.42**	-				
6. Use of controller	.42**	.19**	.27**	.16*	.21**	-			
7. Rules of game	.38**	.22**	.25**	.12	.19**	.19**	-		
8. Future thinking	.38**	.23**	.56**	.41**	.38**	.13*	.25**	-	
9. Help seeking	.42**	.08	.30**	.15*	.13*	.25**	.29**	.13*	-
10. Uncertainty/Helplessness	.25**	-.03	.09	-.02	.03	.15*	.15*	.09	.21**
11. Emotion	.47**	.31**	.32**	.30**	.25**	.21**	.21**	.28**	.20**
12. Speech about reality	.14*	.04	.09	.01	-.02	.10	.10	.07	.01

Note. * $p < 0.05$, ** $p < 0.01$. All scores presented in this table are as a proportion of the duration the task for e

5.3.2. Factor Structure Underlying the Immersion Coding Scheme

To identify whether the items from the immersion coding scheme reflect levels of becoming immersed within a computer game, a principal components analysis (PCA) was conducted on the items from the coding scheme, with orthogonal rotation (varimax). Bartlett's test of sphericity, $X^2(55) = 597.29$, $p < .001$, indicated correlations between the items were sufficiently large for PCA (see Table 5.5 for inter-item correlations). An initial PCA analysis was used to obtain eigenvalues for each component in the data. Three components had eigenvalues over Kaiser's criterion of 1 which in combination explained 52.32% of the variance, and so were retained in the final analysis. Table 5.6 displays the factor loadings after rotation, and the percentage of variance explained by each factor. The items that loaded on each factor suggested factor 1 represents children's *immersive engagement* within the context of the game, factor 2 reflects children's *functional engagement* with the rules and goals of the game in addition to using the controller to navigate through the game, and factor 3 represents *not engaging* with the game. Factor scores were generated from the PCA using the regression method and were used in subsequent analyses in relation to the research questions.

Table 5.6. Summary of the principal components analysis for the immersion coding scheme.

Item from coding schemes	Rotated factor loadings Immersive engagement with the game	Functional engagement with the game	No engagement with the game
Characteristics of game characters	**.82**	.01	-.03
References to game characters	**.75**	.30	.05
Speech to game characters	**.73**	-.01	.04
Creation of narrative	**.70**	.08	-.10
Future thinking	**.63**	.19	.09
Emotion	**.42**	.37	.17
Help seeking	.10	**.75**	-.21
Uncertainty/Helplessness	-.12	**.64**	.07
Use of controller	.21	**.53**	.11
Rules of game	.24	**.47**	.13
Speech about reality	.01	.08	**.96**
Eigenvalues	3.36	1.39	1.00
% of variance	30.54	12.67	9.11

Note. Factor loadings over .40 appear in bold.

5.3.3. Sources of Individual Differences in Children's Immersion with the CAMGame

In the following sections, the sources of potential individual variation in children's immersion was explored in preliminary univariate analyses in order to provide an informed basis for the multivariate analyses in Section 5.3.4. Each variable was explored in relation to the factor scores generated in Section 5.3.2 as well as the individual items from the coding scheme.

5.3.3.1. Age

The mean age of the children who completed the CAMGame was 83.44 months (*SD*=4.51 months). Table 5.7 displays the inter-correlations of the factor scores derived from the analysis in Section 5.3.2 and the continuous variables of interest in relation to sources of individual differences in children's immersion.

The child's age in months at the time of playing the game was positively associated with the factor scores on the immersive engagement factor, $r(259) = .14$, $p < .05$. In relation to the individual items from the coding scheme, older children were more likely to create narratives, $r(259) = .13$, $p < .05$, and less likely to express uncertainty and helplessness, $r(259) = -.14$, $p < .05$.

5.3.3.2. Gender

Table 5.8 displays the descriptive statistics according to gender for the items from the immersion coding scheme, the factors scores derived from the analysis in Section 5.3.2, and the variables of interest in relation to individual differences.

In relation to the factor scores, boys had higher scores on the immersive engagement factor than girls, $t(256.99) = -4.66$, $p < .01$, and while there was a trend for girls to have higher scores on the functional engagement factor as compared to boys, $t(257) = 1.85$, $p = .07$, this did not reach significance.

With regards to individual items from the coding scheme, boys spoke to the characters in the game, $t(248.89) = -3.84$, $p < .01$, referred to the characters, $t(256.90) = -2.23$, $p < .05$, attributed characteristics to the characters, $t(255.40) = -3.14$, $p < .01$, and created narratives, $t(240.48) = -4.17$, $p < .01$, more often than the girls did. Girls on the other hand expressed uncertainty and helplessness more often than the boys did, $t(177.59) = 3.20$, $p < .01$.

5.3.3.3. Previous experience with video games

Table 5.9 displays the descriptive statistics for the items from the immersion coding scheme, the factors scores derived from the analysis in Section 5.3.2, and the variables of interest in relation to individual differences, according to whether children play video games less than daily, or at least once a day.

Children who played games daily had higher scores on the immersive engagement factor than children who played games less than daily, $t(254) = -2.19$, $p < .05$. In relation to individual items from the coding scheme, children who played games daily spoke to the characters, $t(230.54) = -2.74$, $p < .01$, and created narratives, $t(254) = -2.24$, $p < .05$, more than children who played games less than daily.

5.3.3.4. Sociodemographic adversity

The mean sociodemographic adversity score for the children who completed the CAMGame was -.06 (*SD* = .98). Table 5.7 displays the inter-correlations of the factor scores derived from the analysis in Section 5.3.2 and children’s sociodemographic adversity score.

Sociodemographic adversity was positively associated with higher scores on the immersive engagement factor, $r(259) = .12$, $p < .05$. In relation to the individual items from the coding scheme, only creating narratives was associated with a higher than average exposure to sociodemographic adversity, $r(259) = .16$, $p < .05$.

5.3.3.5. Executive function

Response inhibition. The mean response time for the response inhibition task for the children who completed the CAMGame was 303.26ms (*SD* = 179.97). No significant associations were found between children's response inhibition and their factor scores derived from the analysis in Section 5.3.2 or individual scores from the items from the immersion coding scheme (see Table 5.7).

Cognitive flexibility. The mean response time for the cognitive flexibility task for the children who completed the CAMGame was 692.12ms (*SD* = 319.86). No significant associations were found between children's cognitive flexibility and their factor scores derived from the analysis in Section 5.3.2 or individual scores from the items from the immersion coding scheme (see Table 5.7).

Working memory. The mean working memory score for the children who completed the CAMGame was 65.88 (*SD* = 18.51). Whilst there were no significant associations between this score and the factor scores derived from the analysis in Section 5.3.2 (see Table 5.7), a negative correlation was found in relation to one of the items from the coding scheme, with a higher working memory score being associated with less frequent attributing characteristics to the game characters, $r(259) = -.14$, $p < .05$.

Fine motor control. The mean score for fine motor control for the children who completed the CAMGame was 20.55 (SD = 21.46). Whilst there were no significant associations between this score and the factor scores derived from the analysis in Section 5.3.2 (see Table 5.7), a negative correlation was found in relation to one of the items from the coding scheme, with a higher fine motor control score being associated with less frequent attributing characteristics to the game characters, $r(259) = -.15$, $p < .05$.

5.3.3.6. Verbal ability

The mean receptive vocabulary of the children who completed the CAMGame was 98.88 (SD = 12.09). Table 5.7 displays the inter-correlations of the factor scores derived from the analysis in Section 5.3.2 and children's receptive vocabulary.

A positive correlation was found between children's receptive vocabulary and their scores on the factor that reflects children's functional engagement with the game, $r(259) = .15$, $p < .05$. In relation to individual items from the coding scheme, children's receptive vocabulary was positively associated with children expressing uncertainty and helplessness whilst playing the CAMGame, $r(259) = .15$, $p < .05$.

Table 5.7. Inter-correlation of factor scores and continuous variables of interest in relation to individual differen

	1	2	3	4	5	6	7	8	9
1. Talkativeness score	-								
2. Factor 1: Immersive engagement	.65**	-							
3. Factor 2: Functional engagement	.48**	.00	-						
4. Factor 3: No engagement	.09	.00	.00	-					
5. Child age (months)	-.04	.14*	-.11	.04	-				
6. Adversity	.12*	.12*	-.03	.06	.24**	-			
7. Response inhibition	.10	.03	.05	.04	-.13	-.04	-		
8. Cognitive flexibility	.18	.06	.11	.07	-.09	.02	.56**	-	
9. Working memory	-.11	-.08	-.00	.00	-.20	-.26**	-.19**	-.18**	-
10. Fine motor control	.07	.10	-.07	-.01	-.22**	.12	.03	.06	-.41
11. Receptive vocabulary	.001	-.10	.15*	.03	-.22**	-.49**	.00	.01	.32*

Note. * $p < 0.05$, ** $p < 0.01$.

Table 5.8. Descriptive statistics (Mean [SD]) according to gender for the variables of interest.

Variable	**Boys (*n*=146)**	**Girls (*n*=113)**	**Gender difference**
Talkativeness score	.46 (.19)	.43 (.20)	*ns*
Speech to game characters	.03 (.04)	.02 (.02)	$p < .01$
References to game characters	.06 (.04)	.05 (.04)	$p < .05$
Characteristics of game characters	.02 (.01)	.01 (.02)	$p < .01$
Creation of narrative	.01 (.01)	.00 (.01)	$p < .01$
Use of controller	.01 (.01)	.01 (.01)	*ns*
Rules of game	.02 (.01)	.01 (.01)	*ns*
Future thinking	.01 (.01)	.01 (.01)	$p = .08$
Help seeking	.03 (.02)	.03 (.02)	*ns*
Uncertainty/Helplessness	.01 (.01)	.01 (.01)	$p < .01$
Emotion	.01 (.01)	.01 (.01)	*ns*
Speech about reality	.00 (.00)	.00 (.00)	*ns*
Factor 1: Immersive engagement	.24 (1.06)	-.31 (.82)	$p < .01$
Factor 2: Functional engagement	-.10 (.93)	.13 (1.08)	$p = .07$
Factor 3: No engagement	-.07 (.99)	.09 (1.01)	*ns*
Child age (months)	83.48 (4.31)	83.40 (4.79)	*ns*
Previous experience with video games (% daily)	54.79%	41.59%	$p < .05$
Adversity	.05 (1.02)	-.20 (.90)	$p < .05$
Response inhibition	283.88 (172.68)	327.39 (186.63)	$p = .06$
Cognitive flexibility	663.47 (304.13)	727.61 (336.37)	*ns*
Working memory	63.48 (19.02)	69.11 (17.36)	$p < .05$
Fine motor control	24.03 (25.02)	16.04 (14.62)	$p < .01$
Receptive vocabulary	97.88 (12.66)	100.18 (11.21)	*ns*

Note. Talkativeness scores and items from the immersion coding scheme represent proportions based on the duration of the task for each child.

Table 5.9. Descriptive statistics (Mean [SD]) according to whether children play video games daily, or less than daily for the variables of interest.

Variable	**Less than daily video game play (*n*=129)**	**Daily video game play (*n*=127)**	**Statistically significant difference**
Talkativeness score	.43 (.19)	.47 (.20)	$p = .07$
Speech to game characters	.02 (.03)	.03 (.04)	$p < .01$
References to game characters	.05 (.04)	.06 (.04)	*ns*
Characteristics of game characters	.01 (.02)	.02 (.02)	*ns*
Creation of narrative	.01 (.01)	.01 (.01)	$p < .05$
Use of controller	.01 (.01)	.01 (.01)	*ns*
Rules of game	.02 (.01)	.01 (.01)	*ns*
Future thinking	.01 (.01)	.01 (.01)	*ns*
Help seeking	.03 (.02)	.03 (.02)	*ns*
Uncertainty/Helplessness	.01 (.01)	.01 (.01)	*ns*
Emotion	.00 (.01)	.01 (.01)	*ns*
Speech about reality	.00 (.00)	.00 (.00)	*ns*
Factor 1: Immersive engagement	-.13 (1.02)	.14 (.97)	$p < .05$
Factor 2: Functional engagement	.01 (.93)	-.02 (1.08)	*ns*
Factor 3: No engagement	.04 (.91)	-.04 (1.09)	*ns*
Child age (months)	83.32 (4.50)	83.59 (4.57)	*ns*
Adversity	-.17 (.90)	.03 (1.03)	*ns*
Response inhibition	325.99 (190.99)	280.08 (167.55)	$p < .05$
Cognitive flexibility	690.65 (285.10)	705.94 (345.35)	*ns*
Working memory	68.66 (17.74)	63.31 (19.02)	$p < .01$
Fine motor control	18.46 (18.16)	22.55 (24.29)	*ns*
Receptive vocabulary	100.17 (11.73)	97.81 (12.40)	*ns*

Note. Talkativeness scores and items from the immersion coding scheme represent proportions based on the duration of the task for each child.

5.3.4. Establishing the Contribution of the Sources of Individual Differences to Children's Immersion with the CAMGame[3]

The preliminary analyses in Section 5.3.3 revealed that children's age, gender, exposure to risk factors for sociodemographic adversity, and previous experience of video games were associated with their factor score on the *immersive engagement factor* derived from the analysis in Section 5.3.2. Additionally, it was found that children's gender and receptive vocabulary were associated with their factor score on the *functional engagement factor*. Therefore, before these variables were entered into linear regression analyses, the existing relationships between the sources of individual variation were explored.

With regards to the variables associated with the immersive engagement factor scores, children's previous experience with video games, $X^2(1) = 4.14$, $p < .05$, and adversity, $t(252.62) = -2.07$, $p < .05$, also significantly differed according to their gender (see Table 5.8). Therefore, in order to establish the relative contribution of these variables to children's immersive engagement factor scores, these variables were entered into a linear regression analysis. When entered into the same model, only gender significantly predicted children's factor scores for immersive engagement ($\beta = .25$, $p < .01$), although children's age approached significance ($\beta = .11$, $p = .07$, see Table 5.10).

With regards to the variables that were found to be associated with the functional engagement factor scores, children's age was associated with their receptive vocabulary, $r(254)$

[3] Caregivers' reports of children enjoying playing video games (Chapter 3) were analysed as a covariate for any significant findings in linear regression analyses. However, the inclusion of this item did not represent a significant step in the models, and so were not reported.

= -.22, $p < .01$, and with one of the items from the coding scheme that loaded onto the functional engagement factor (see Table 5.7). Therefore, in order to establish the relative contribution of these variables to children's functional engagement factor scores, these variables were entered into a linear regression analysis. When entered into the same model, only children's receptive vocabulary predicted their factor scores for functional engagement ($\beta = .14$, $p < .05$), although gender approached significance ($\beta = -.11$, $p = .08$, see Table 5.11).

Table 5.10. Prediction of children's immersive engagement factor scores from sources of individual variation.

Predictor	ΔR^2	***B***	***SE B***	β
	.10**			
Gender		.50	.12	.25**
Age (months)		.03	.01	.11
Sociodemographic adversity		.07	.07	.06
Previous experience with video games		.19	.12	.10

Note. * $p < 0.05$, ** $p < 0.01$. The coefficients presented are those obtained in the final model: $F(4, 251) = 7.19$, $p < .01$, $R^2 = .09$.

Table 5.11. Prediction of children's functional engagement factor scores from sources of individual variation.

Predictor	ΔR^2	***B***	***SE B***	β
	.04*			
Gender		-.22	.13	-.11
Receptive vocabulary		.01	.01	.14*

Note. * $p < 0.05$, ** $p < 0.01$. The coefficients presented are those obtained in the final model: $F(2, 251) = 4.66$, $p < .05$, $R^2 = .03$.

5.4. Discussion

5.4.1. Can children's immersion in a video game be measured from their speech during game play?

One of the aims of this chapter was to develop a measure of children's immersion in a bespoke video game based on their speech during game play. This coding scheme was developed based upon a review of existing measures of immersion, relevant theory and themes that emerged from the transcripts of children's speech. When entered into a principal components analysis, the loadings of the items from the coding scheme supported conclusions from the existing literature that the experience of immersion consisted of engaging with the game environment as if it is real (Brown & Cairns, 2004; Calleja, 2011; Ermi & Mäyrä, 2007). In line with the literature reviewed, the items related to engaging with the characters and events within the narrative of the virtual environment loaded onto the first factor which was regarded as immersive engagement with the game play. The second factor, considered as children's functional engagement with the game, consisted of the items that reflected children questioning the controls, rules and goals of the game environment. Finally, a factor emerged that reflected children not verbally engaging with the video game.

5.4.2. What sources of individual differences affect children's immersion in a video game?

Children's age, gender, previous experience with video games, exposure to sociodemographic adversity, executive function and receptive vocabulary were explored as sources of individual variation in children's factor scores on the immersive and functional engagement factors that emerged from the factor analysis. When taking into account the correlates that were independently significantly associated with children's immersive engagement with the video game, only gender remained a significant predictor of children's immersion. This finding is in line with the findings of Martinovic and colleagues (2016) who found gender differences in children's immersion for some of the games used in their study, but stands in contrast to the adult literature of immersion where no significant gender differences were reported (Brockmyer et al., 2009; Byun & Loh, 2015; Kothgassner et al., 2018; von der Pütten et al., 2012). Additionally, gender explained the associations between age, adversity and children's previous experience with video games in the analyses in Section 5.3.3. This latter finding supports the adult literature which found no associations between immersion and individuals experience with video games (Denisova & Cairns, 2015; Christou, 2014).

However, it must also be considered that additional factors beyond the scope of this investigation are associated with these sources of individual differences and can potentially explain these links. Further, it is possible that any effects of previous experience on immersion are subtle and not found due to a lack of power. However, as noted in Section 2.5, the childhood sample of the CCDS is sufficiently powered to detect small to medium effect sizes. In summary, the present study extends the existing literature in highlighting the importance of gender in independently being associated with children's immersion, but in also explaining the associations with other correlates that were initially found.

The present study also extends the current literature on immersion in being, to my knowledge, the first to find no significant association between immersive engagement in a game and executive function or verbal ability. One interpretation of this non-significant finding, as noted above, is that this is due to a lack of statistical power, though the CCDS sample is sufficiently powered to detect small to medium effects. Therefore another interpretation of this null result is similar to that posed for the lack of associations found between these variables and children's engagement with the play frame, in terms of this reflecting a preference or style of the child that is independent of verbal ability and executive function (see Section 4.4.2.2).

Alternatively, although immersion is a subjective experience, it is also influenced by the technical and physical aspects of the video game (Brown & Cairns, 2004; Calleja, 2011; Ermi & Mäyrä, 2007). It may be that in games which have physical properties that are less immersive, individual differences would play a larger role as the immersion is not facilitated by the game. Indeed, as noted in Section 5.2.3.1, certain features of the CAMGame are associated with immersion, including the first-person point of view (Denisova & Cairns, 2015) and the engaging narrative (Calleja et al., 2016; Wu & Rank, 2015). Therefore, it may be that for video games which have 'less immersive' properties themselves, individual differences in children's cognitive abilities would have an effect on their immersion.

One interesting source of individual variation in children's factor scores for functional engagement with the game was their receptive vocabulary, an association not explained by gender. Possibly, those with a higher verbal ability were more comfortable in conversing with the adult experimenter, who in turn may have encouraged them to express their concerns and worries. However, as receptive vocabulary was not associated with their talkativeness score, it is likely that this association is unrelated to a propensity to speak more. Secondly, children with a higher verbal ability could be more concerned with the functional aspects, or rules in relation to, many of the activities they engage in. Or possibly, as this association was only present for children's expression of uncertainty and helplessness, this association could be a reflection of children having the vocabulary to express their helplessness, as opposed to children with a higher vocabulary necessarily engaging more in the functional aspects of playing the game.

5.4.3. Limitations

One of the issues from the present work is that children who were more immersed in the game may have spoken less, and therefore, the measure may not be an appropriate source for measuring immersion. Indeed, the existing questionnaire measures of immersion contain items that refer to a dissociation from the real world and being less aware of their surroundings (Brockmyer et al., 2009; Brown & Cairns, 2004; Cheng et al., 2015; Jennet et al., 2008; Qin et al., 2009). However, it may be that the presence of speech in this context is not related to how immersed the children are in the video game, but is related to their age and use private speech. Private speech describes speech by children that is addressed to themselves or to no one (Berk, 1986), and decreases with age, with one cross-sectional study showing that self-talk was most common in 5 to 8-year-olds (Winsler & Naglieri, 2003). Additionally, private speech is related to task difficulty in studies of children (Fernyhough & Fradley, 2005) and young adults (Duncan & Cheyne, 2002). Therefore, it may be that private speech during challenging game play, such as the CAMGame, is a common behaviour amongst younger children but declines as age increases. Further, in order to support the conclusion that the immersion factor from the CAMGame is a valid measure of immersive engagement, the analyses to be reported in Chapter 6 will test whether this factor is associated with engagement in a play context in which dissociation from the real world is not expected to be a part of the experience.

Finally, the measure of previous experience with video games used in the present analyses has some limitations. Firstly, the variable contrasts children who play video games daily with those who play less than daily. This latter group captures children who may play weekly in addition to those who play games on a much less frequent basis. Additionally, the question was answered by the caregiver which may introduce error in terms of children playing games without the caregiver's awareness, but also in terms of what constitutes a 'video game'. The question posed could have reasonably been interpreted differently by individual caregivers. For example some may have included casual tablet games, such as *Angry Birds*, as a video game whilst others may have only games played on video game consoles. Future research can address this criticism by more clearly defining what is meant by a video game, or by collecting data on the frequencies of the all different types of games being played by children on various technology mediums.

5.4.4. Summary of the chapter

In summary, the present investigations add to the limited research regarding children's immersion in video games in the development of a coding scheme that can be used to measure immersion from recordings of children playing a game. The scheme has expanded beyond the criteria of immersion as stated in questionnaire measures by including themes that emerged naturally from the children as they played the game. Gender differences were present in this nationally representative sample; boys were more immersed in the video game than girls.

In the next chapter of the thesis (Chapter 6), I will compare children's immersion in the video game and their engagement with the play frame (Chapter 4) as an index of their imaginative engagement with play in the two contexts. Further, I will explore children's interactions with the imaginative content of these two contexts in terms of the attributions of internal states made to the fictional characters within the play frame and within the virtual environment of the video game as an indication of their engagement in both types of fictional worlds.

Chapter 6.

Comparing Children's Imaginative Engagement in Virtual and Non-Virtual Contexts of Play

6.1. Introduction

In Chapter 4, children's play with Playmobil figures was investigated in the context of their styles of engagement with the *play frame*, in the form of an *actor*, *narrator* or *manager* of the play (Scarlett & Wolf, 1979). In Chapter 5, children's engagement as they played a bespoke video game was investigated in the context of their *immersion* with the narrative and characters of the game (Brown & Cairns, 2004; Calleja, 2011; Ermi & Mäyrä, 2007). In the present chapter, I will compare styles of engagement in these two contexts to establish whether such styles are similar in the non-virtual and virtual activities. Further, I will explore children's imaginative engagement in the two activities in the context of their use of internal state language as they engage in the non-virtual and virtual play activities. In particular, I will examine their references to the internal states of the *fictional and virtual characters* in their play as an indication of their engagement with the fictional and virtual worlds.

6.1.1. Children's Use of Internal State Language as an Indicator of Imaginative Engagement

Internal state language refers to terms used to describe an individual's thoughts, feelings and desires (Bretherton & Beeghly, 1982). Identifying the use of internal state language in children's naturally occurring speech is a rich context for understanding children's appreciation of the internal worlds of themselves and others (Bartsch & Wellman, 1995). Children's use of internal state language is relatively stable from the preschool period into later childhood, even when controlling for the stability in general language ability (Carr, Slade, Yuill, Sullivan, & Ruffman, 2018). As reviewed in Section 1.1.3, the awareness of one's own internal states and use of internal state language in describing others is associated with imagination, in terms of having an imaginary companion (Davis, Meins, & Fernyhough, 2011; Davis et al., 2014; Gleason et al., 2003). Associations between children's pretend play and use of mental state terms have been investigated, largely in the context of children's social play (see Section 6.1.3 below). However, the primary interest in the present investigations is the extent to which children's references to internal states represent their engagement in the play frame and immersion in a virtual world.

As highlighted in Section 4.1.1, when children engage in pretend play they imagine themselves within the fictional scenario, or frame, and adopt a perspective within this imagined world (Bretherton, 1984; Harris, 2000; Garvey, 1991). In role playing, Harris (2000) notes that "children also give expression to the *emotions*...that are appropriate to the adopted role...and comment on the content of the *perceptual* experience that is available" (pg. 31, italics added for emphasis). Similarly, Bruner (1986) highlighted that stories, created during the course of children's play (see Section 4.1.1), "involve characters in actions with *intentions* or *goals*" (pg.

20, italics added for emphasis). Further, as highlighted in Sections 3.1.2.3 and 4.1.1, storytelling and creating narratives provide an opportunity to 'evaluate' characters in terms of their internal states. Taken together, there is a justification for the exploration of children's use of internal state language as they engage in play activities, as an indicator of their engagement with the imagined or virtual word.

Not only has children's use of internal state language been investigated in the context of the category of internal state being referred to (e.g., cognitions, emotions, desires, etc.), but also in terms of the referent of the internal state. Research in two- to three-year-olds found that children refer to their *own* internal states more so than the internal states of *others* (Brown & Dunn, 1991). However, children's references to the internal states of others are associated with perspective-taking skills (Howe, 1991; Tessier et al., 2016). Further, references to *shared* internal states (the child's own and a play partner's) is more common in older children (Leach et al., 2016). It is also of note that within the context of children's play, there may be spontaneous interaction with imaginary entities created (Weisberg, 2013), and so internal states may also be attributed to inanimate objects and *virtual or fictional characters* (Leach et al., 2016; see Sections 6.1.2 and 6.1.3 below). According to simulation theorists, children's references to the internal states of others represent the child adopting the perspective of the other and imagining their own mental states in their position (see Sections 1.2 and 1.3; Bartsch & Wellman, 1995; Harris, 2000). Therefore, when categorising children's references to internal states as an indicator of their engagement in an imagined or virtual context, it is important to note the referent of such internal state attributions as being an individual outside of, or within, the play frame or virtual world.

6.1.2. The Use of Internal State Language in Children's Interactions with Technology and Video Games

Although children's use of internal state language in their natural speech as they play video games has received little empirical study, during children's interactions with other technologies, especially computers, children refer to the technology as possessing cognitive states (e.g., "think" and "know", Turkle, 1997). In a series of studies of children aged six to eight, Turkle (1997) reported that children's language in relation to technology depicted an interest in the mental state of the computer, such as "how much it (a computer) can *remember*" (pg. 80, italics added for emphasis). Children are not confused regarding the distinction between living people and inanimate machines; however, they are willing to attribute a mental state, particularly cognitions, to such technologies.

Video games and electronic toys are considered to be children's first and most popular introduction into the world of technology (Goldstein, 2010). Within such contexts, it is noted that children refer to virtual characters in video games and electronic toys, such as *Tamagotchi* or *Furby,* as possessing internal states as if they are living entities, more so than they do regarding non-technological stuffed or mechanical toys (Francis & Mishra 2009; Subrahmanyam et al., 2001). For example, in a sample of five- to six-year-old children, a 'smart toy' characterised as an animate aardvark was attributed feelings and human skills (Plowman & Luckin, 2004). Indeed, in the literature reviewed in Chapter 5, identifying with the characters in a video game as if they were animate was considered to reflect the child's immersion in the content of the game (Ermi & Mäyrä, 2007; see Section 5.1.1). Therefore, attributions of internal states to the characters, as an indication of their identification with the characters, formed a part of the coding of children's immersion in the bespoke video game designed for the CCDS. However, for the analyses in the current chapter, it is necessary to elaborate upon this coding so that all references to internal states are categorised according to the internal state category, in addition to the referent of the internal state attribution, as a reflection of the children's engagement in the virtual world.

6.1.3. The Use of Internal State Language during Children's Pretend Play

In Chapter 4 of this thesis, I highlighted that children's speech as they engage in pretend play, particularly when narrating a story but also in role play, can be used to convey the internal states of the fictional characters within the play frame (Scarlett & Wolf, 1979; Wolf et al., 1984; see Sections 4.1.1 & 3.1.2.3). The use of internal state language has been investigated in older children's pretend play and is associated with more complex play scenarios (see Table 3.1). For example, in studies of children's play with older and younger siblings, children's references to cognitive states, specifically what they *know*, were related to using objects in creative ways (Howe et al., 2014). Additionally, references to *cognitive* and *goal-related* internal states were associated with the use of strategies to create shared meanings in children's play with their siblings (Howe et al., 2005; Leach et al., 2015). Further, complex forms of play may indeed foster children's understanding of mental states. For example, children's ability to create and conclude elaborate narratives during play predicted their use and understanding of mental state terms relating to others, but not the self, at a later time point (Tessier et al., 2016).

Although past research demonstrates associations between older children's engagement in pretend play and their use of internal state language in general, only one study considered the referent of the internal state language to identify internal states attributed to fictional characters (Leach et al., 2016). In a longitudinal study of the same sample at four and seven years of age, Leach and colleagues (2016) found that children referenced the internal states of toys at both ages in play with their siblings and close friends, yet references to the emotions of the toys were more common at the younger age. The authors suggested that referring to the emotions of the toys was a means by which children initiated play with their partners, which reflected flexible social-cognitive skills. Therefore, further research is warranted to investigate the internal state language attributed to fictional characters in children's solitary play, in relation to the different ways in which children engage with play.

As highlighted in Section 3.1.2.3, beyond children's pretend play, the use of internal state language has been investigated in the context of their oral or written narratives. Critically, in these formats, the mental language used is in reference to the fictional characters in the narratives (Fox, 1991). In the individual narratives of 6 to 10 year old children, the frequency of mental state terms was unrelated to their competence in creating narratives and was facilitated by peers only when their references to mental states was low in their individual narrative (Pinto, Tarchi, & Bigozzi, 2016). Additionally, the use of mental state terms in general was stable across the contexts of personal and fictional narratives in children aged between nine and ten, though the use of *emotion* terms was greater in personal narratives and *volitional* (intentional and desire) terms was greater in fictional narratives (Longobardi, Spararo, Renna, & Rossi-Arnaud, 2014). Therefore, this research suggests that children in middle childhood do attribute internal states to fictional characters, and this is stable across contexts of narrative production.

6.1.4. Research Questions

From the literature reviewed in this chapter, an additional measure of children's imaginative engagement with play activities, in addition to their engagement with the play frame or immersion in a video game, could be the attribution of internal states to the fictional characters in both contexts. References to the internal states of others could reflect a shift in perspective from the self to the other (Bartsch & Wellman, 1995; Harris, 2000; Howe, 1991), and so a reference to the internal state of a fictional character would indicate the child's perspective being within the play frame or virtual world (Bretherton, 1984; Harris, 2000; Garvey, 1991). Therefore, the research questions for the investigations within the present chapter are:

Are there similarities in children's imaginative engagement with play in non-virtual and virtual contexts? Children's engagement with the play frame, as indexed by the factor scores and cluster groups generated in Chapter 4, was compared with their immersion in the Castell Arth Mawr Game in order to establish the extent to which children engaged in these activities in similar ways.

Are there similarities in children's use of internal state language (ISL) in non-virtual and virtual contexts? The use of ISL, in particular the referent of the internal state, was explored within and between the two contexts. Although attributions of internal states to the virtual characters was a part of the coding in Chapter 5, ISL was re-coded for this activity in a manner to capture all referents and individual internal state categories, in order to allow for direct comparisons with the Playmobil free play activity.

Is children's use of internal state language (ISL), particularly referring to the internal states of fictional or virtual characters, associated with their imaginative engagement with the activities? It was hypothesised, based on the literature reviewed thus far, that children would attribute internal states to fictional characters more when they were engaged with the play frame or immersed in the video game, in comparison with the other styles of engaging with the play in each context.

6.2. Method

6.2.1. Participants

Of the 272 families seen in the home at the childhood assessment (see Section 2.2.3), *N*=251 children completed both the Playmobil free play activity and the Castell Arth Mawr Adventure Game (CAMGame) and have data available for the following analyses (see Sections 4.2.1 and 5.2.1 for the derivation of the sample for the two tasks).

6.2.2. Procedure

See Section 2.3.6 for information regarding the procedure of the Wave 6 assessment and Sections 2.4, information relating to the procedure of the Playmobil free play task, the CAMGame, caregiver interview, executive function tasks and the BPVS (Dunn & Dunn, 2009).

6.2.3. Measures

6.2.3.1. Talkativeness scores

Children's talkativeness during the Playmobil free play activity and CAMGame was computed by dividing the number of 5 second segments in which the child spoke by the total number of 5 second segments for the each task (see Sections 4.2.3.1 and 5.2.4.1 respectively). This resulted in a score ranging between 0 and 1, and has been validated as a measure of talkativeness in previous research using measurements of the mean length of utterances as recorded by *Audacity* software (for details, see Roberts et al., 2013).

6.2.3.2. Children's imaginative engagement in play with toy figures

Children's imaginative engagement and use of objects during the free play activity were measured using coding schemes described in Sections 4.2.3.2 and 4.2.3.3 respectively. Children's imaginative engagement was categorised, based on children's speech, as reflecting their *enactment* of a role, creation of s*ound effects*, *narration* of events or stories, *management* of the play, or engaging with the play less. Inter-rater reliability for this scheme was excellent (Median Intra-Class Correlation [ICC] = .92). Children's use of objects during the play was categorised as *handling* the toys, *setting up* the toys, or using the objects in *expected* or *creative* ways. Inter-rater reliability for this scheme was excellent (Median ICC = .97). For any cases in which the task ended before three minutes (14.6%), the coding of children's engagement with the play was prorated up to 36 segments (3 minutes).

The items from these coding scheme were entered into a principal components analysis (PCA) and resulted in three factors that explained 62.43% of the variance (see Section 4.3.3). These factors were considered to reflect engaging with the play as an *actor*, a *narrator* or *not engaging* with the free play activity.

The items from the coding schemes were additionally entered into a cluster analysis which resulted in 4 groups of children, who were considered to be either *managers, actors*, *narrators,* or *less engaged players* (see Section 4.3.4).

6.2.3.3. Children's immersion in a video game

Children's immersion in the CAMGame was measured using a coding scheme that was developed based on a review on the existing literature (see Chapter 5). The coding scheme categorised children's speech as reflecting s*peech to game characters,* making *references to game characters*, attributing *characteristics to game characters, creation of narratives,* asking questions regarding the *use of the controller,* referring to the *rules of the game, future thinking* in relation to the game world, *help seeking,* expressions of *uncertainty and helplessness, emotion*, and *speech about reality* (see Section 5.2.4.2). Inter-rater reliability for this scheme was excellent

(Median ICC = .95). Because the length of time it took each child to complete the game differed, proportion scores were created for the purposes of the analyses to allow meaningful comparisons to be made between the children. For each child, the total frequency of each code was divided by the total number of 5 second segments for the task resulting in a score ranging between 0 and 1.

The items from these coding scheme were entered into a PCA and resulted in three factors that explained 52.32% of the variance (see Section 5.3.2). These factors were considered to reflect children's *immersive engagement* with the context of the game, their *functional engagement* with the rules, goals and control of the game, and additionally children *not engaging* with the game.

6.2.3.4. Children's references to internal states during the Playmobil free play activity

The transcripts of children's speech as they engaged in the Playmobil free play activity were further coded for the use of internal state language (ISL) using a coding scheme developed specifically for the CCDS (Paine, 2017; Paine, Hashmi, Roberts, Fyfield, & Hay, 2018) and was adapted from Roberts and colleagues' (2013) coding scheme based on Barsch and Wellman's (1995) categorisation of belief-desire reasoning. This coding scheme categorises speech that reflects references to the following internal state categories: *perception, physiology, preference, intention, desire, emotion* and *cognition* (see Table 6.1 for definitions and examples). In addition to separating the categories of internal state terms use, the referent of the term was coded as either being towards the *self*, the *character*, or *other* individuals. In any cases where the referent of the term was unclear, it was coded as being to another individual.

Two independent observers coded 26% (*n*=67) of the transcripts to assess the reliability of the coding scheme. Table 6.2 presents the results of the reliability analysis (Median ICC =

.95) indicating good coder agreement on the measure. In order to allow for direct comparisons of children's use of ISL in the contexts of the Playmobil free play activity and the CAMGame, proportion scores were created. For each child, the total frequency of each code was divided by the total number of 5 second segments for the task resulting in a score ranging between 0 and 1.

6.2.3.5. Children's references to internal states during the CAMGame

The children's speech as they played through the CAMGame were further coded for children's use of ISL in an identical manner to the coding of ISL during the Playmobil free play activity (see Table 6.1). However, an additional referent category was included in order to capture references that attributed internal states to the *avatar* that the child was in control of (see Table 6.3 for the clarified definitions for coding the referent of ISL).

Two independent observers coded 20% (*n*=52) of the transcripts to assess the reliability of the coding scheme. Table 6.4 presents the results of the reliability analysis (Median ICC = .94) indicating good coder agreement on the measure. Because the length of time it took each child to complete the game differed, proportion scores were created for the purposes of the analyses to allow meaningful comparisons to be made between the children. For each child, the total frequency of each code was divided by the total number of 5 second segments for the task resulting in a score ranging between 0 and 1.

Table 6.1. Coding scheme for children's use of internal state language (ISL) during the Playmobil free play activity with verbatim examples.

ISL category	ISL category description	Examples		
		ISL to self	ISL to character	ISL to other
Perception	Comments made about perception of an object using one of five senses, such as "see," "hear," "feel," "taste," "smell."	*"That one looks like…"* *"I didn't see it"*	*"She heard it stop again"* *"And the teacher sees"*	*"Can you see it in the camera?"*
Physiology	Comments made about physical states and sensations, including "sleepy," "pain," "hot/cold (as in temperature)," "sick," "comfy."	*"It really hurts"*	*"They're feeling tired"*	No instances of physiology to other occurred
Preference	Comments made about positive or negative judgements of an object, action or experience. Coding preference includes terms include "like," "hate," "love," "favourite," "enjoy," "interest."	*"My favourite colour is pink and blue"* *"I like this one"*	In play voice: *"Kate's the best "*	*"Do you like that thing that's there?"*
Intention	Comments made about present intentional actions that are goal-directed and future intentions. Includes "try," "attempt," "on purpose," "mean to," "going to."	*"I'm just gonna mix them all"* *"I'm going to do this"*	In play voice: *"I'm gonna find a bed"* *"They're gonna sit down"*	*"Can you try and put them in?"* *"Are you gonna play?"*
Desire	Comments made about longing for an object, action or experience. Desire terms include "want," "wish," "hope," "fancy," "rather," "need (as in want)."	*"I wish you can buy everything for free"* *"I want that one"*	In play voice: *"Actually I don't want to…"* *"And he wants to sit there"*	*"Do you wanna play with me?"*
Emotion	Comments made about feeling states, including basic emotions "happy," "sad," "surprised," "disgusted" and variations like "fed up," "bored," "glad," "excited."	*"That was disgusting"*	*"Mum and teacher are happy"* *"They are kind of sad"*	No instances of emotion to other occurred
Cognition	Comments made about beliefs and knowledge. Also include general terms indicating other cognitive activity, such as "remember," "imagine," "pretend," "understand."	*"I'm gonna pretend these chairs are here"* *"I think that goes here"*	*"Kate does not know where it is"* *"Then they thought"*	*"And imagine, she buyed another"*

Table 6.2. Reliability statistics (ICC) for the coding of children's use of internal stage language during the Playmobil free play activity.

Internal state language category	ISL to self	ISL to character	ISL to other	**ISL category total**
Perception	.94	.95	.98	**.96**
Physiology	1	.94	0 variance	**.95**
Preference	.88	.94	0 variance	**.91**
Intention	.99	.95	.85	**.99**
Desire	.91	.98	1	**.96**
Emotion	.85	.97	0 variance	**.94**
Cognition	.97	.90	.96	**.97**
ISL referent total	**.98**	**.97**	**.97**	

Note. 0 variance indicates an instance where both coders agreed the item from the coding scheme did not occur for the reliability sample. Therefore, the reliability is equal to 1.

Table 6.3. Descriptions and examples of the referents of internal state language (ISL) used for coding children's speech as they played the CAMGame.

ISL referent	Description	Examples
ISL attributed to the self	An ISL term that is used in the first person (plural or singular) where the internal state *could* reasonably be attributed to the child.	*"I'm going to go through the door"* – The intention is the child's intention. *"I'm looking at the floor"* – The perception *could be* the child's perception of seeing the floor on the screen. *"I don't like this game"* – The preference is the child's preference.
ISL attributed to the avatar	An ISL term that is used in the first person (plural or singular) where the attribution of the internal state *could not* be attributed to the child in reality.	*"Oh no, I'm dying!"* – The physiology could not be the child's physiology. *"I'm surviving...I was drowning"* - The physiology could not be the child's physiology.
ISL attributed to the character	An ISL term that is used in the third or second person (plural or singular) where the attribution of the internal state is made towards a character (or inanimate object) within the game context.	*"Why are you looking at me for?"* – The perception is the virtual character's perception. *"You know you're in here magic statue"* – The cognition is the virtual character's perception.
ISL attributed to others	An ISL term that is used in the third or second person (plural or singular) where the attribution of the internal state is made towards any real person outside of the game context. Additionally, ISL should be coded to *other* if there is any ambiguity as to who the internal state is attributed to.	*"You thought I wouldn't find the treasure but I've"* – It is not clear that this is a character's cognition, therefore it is coded as another's cognition. *"You wanna eat it?"* – Speech is in response to the experimenter, the desire is the experimenters' desire.

Table 6.4. Reliability statistics (ICC) for the coding of children's use of internal stage language during the CAMGame.

Internal state language category	ISL to self	ISL to avatar	ISL to character	ISL to other	**ISL Category Total**
Perception	.93	0 variance	.91	.92	**.93**
Physiology	1.00	.79	.83	1.00	**.89**
Preference	.97	0 variance	1.00	1.00	**.97**
Intention	.89	0 variance	.97	.79	**.93**
Desire	.93	0 variance	.86	.81	**.96**
Emotion	.96	0 variance	.89	1.00	**.95**
Cognition	.99	0 variance	.95	.91	**.99**
ISL referent total	**.98**	**.79**	**.94**	**.90**	

Note. 0 variance indicates an instance where both coders agreed the item from the coding scheme did not occur for the reliability sample. Therefore, the reliability is equal to 1.

6.3. Results

6.3.1. Comparing Children’s Imaginative Engagement with the Playmobil Free Play Activity and their Immersion in the CAMGame

To compare children’s imaginative engagement with play in the two contexts, the factor scores generated from the factor analyses in Chapters 4 and 5 were analysed in terms of their associations with each other. Additionally, the factor scores measuring children’s engagement with the CAMGame were compared according to the children’s cluster group membership from the cluster analysis in Chapter 4 which grouped the children according to the styles in which they engaged in the Playmobil free play activity.

In relation to the factor scores from the principal components analyses investigating children’s engagement with the two activities, only the children’s engagement in the free play activity as an *actor* and their *immersive engagement* with the video game were positively correlated with each other, $r(249) = .19$, $p < .01$ (see Table 6.5). Table 6.6 displays the inter-correlations of the individual items from the verbal engagement with play, use of objects during play, and immersion coding schemes, which reveals a similar pattern of findings to the analysis of the factor scores. However, an additional association of note is that although the *narrator* factor score was not associated with any of the factor scores relating to children’s engagement in the CAMGame, the individual item from the coding scheme categorising children’s speech as verbally narrating a story was significantly associated with creating narratives in the CAMGame, $r(251) = .14$, $p < .05$.

Figure 6.1 displays the factor scores from the principal components analyses investigating children's immersion in the CAMGame for the clusters extracted from the cluster analysis investigating children's engagement with the free play activity. A series of one-way ANOVAs revealed that only one of the factor scores significantly differed according to the cluster groups. Post-hoc tests, adjusted for multiple comparisons using the Bonferroni statistic, revealed that the *managers* had significantly lower *immersive engagement* factor scores than the narrators, actors, and non-players ($p < .05$).

Table 6.5. Inter-correlation of factor scores from the factor analyses investigating children's engagement with the free play activity (left), and children's immersion in the CAMGame (top).

	Immersive engagement	Functional engagement	No engagement
Actor	.19**	-.08	-.05
Narrator	.11	-.04	-.01
Less engaged	.07	.02	.05

Note. * $p < 0.05$, ** $p < 0.01$.

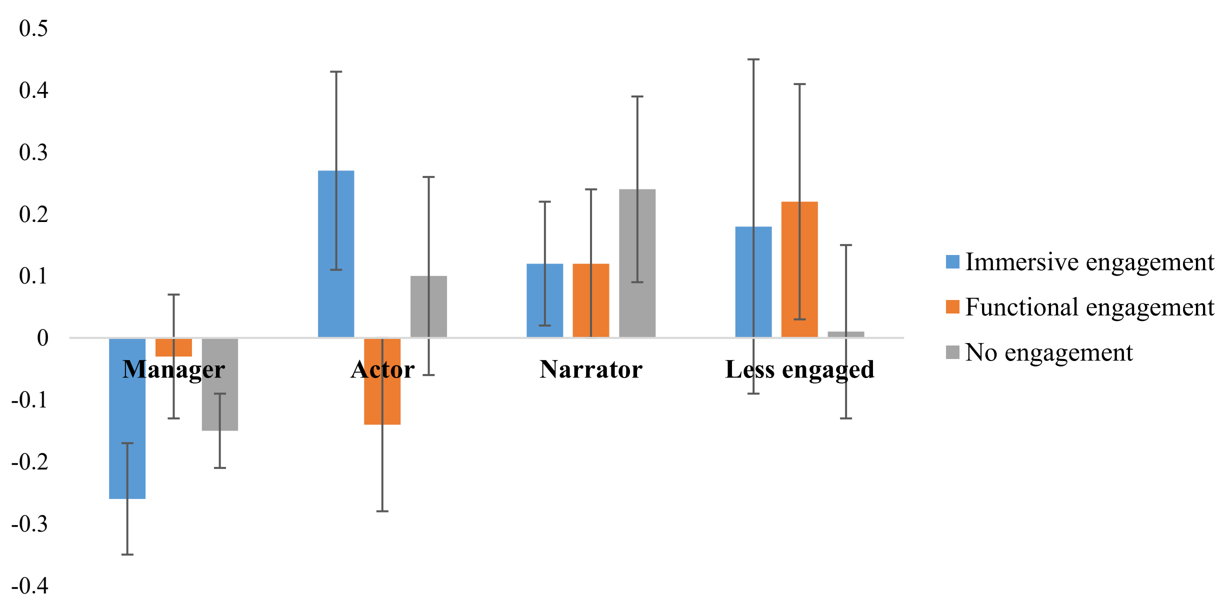

Figure 6.1. Factor scores representing children's engagement in the CAMGame for the clusters categorising children's engagement with the free play. Error bars represent ± standard error of the mean

Table 6.6. Inter-correlation of items from the imaginative engagement with play, use of objects during play, and immers

	CAMGame Talkativeness score	Speech to characters	References to characters	Characteristics of characters	Creation of narrative	Use of controller	Rules of game	Future thinking	Help seeking	Unc Help
Playmobil talkativeness score	.49**	.33**	.30**	.27**	.24**	.23**	.21**	.20**	.14*	
PE: Enactment	.12	.28**	.15*	.12	.15*	.03	.04	.10	-.07	
PE: Sound effects	.16**	.25**	.08	.10	.16*	-.03	.04	.09	-.02	
PE: Narrative	.19**	.13*	.13*	.09	.14*	.17**	.09	.05	.07	
PE: Management	.20**	.09	.09	.08	.01	.07	.04	.07	.12*	
PE: Reality	.14*	-.01	.03	.05	.05	0	.21**	.11	.06	
OU: Handling	-.07	.03	.03	.05	-.05	.01	-.04	.04	-.13*	-
OU: Set up	-.04	-.16	-.16*	-.11	-.12	-.02	-.12	-.13*	.13*	
OU: Expected use	.02	.20**	.08	.04	.12	.06	.07	.07	-.06	
OU: Creative use	.07	.07	.05	.05	.08	-.02	.01	-.02	.03	
OU: No use	.12	-.02	.11	.03	.11	-.05	.17**	.06	-.01	

Note. PE=Play Engagement, OU=Object Use. * $p < 0.05$, ** $p < 0.01$. The items from the coding scheme measuring children's engagement wi along the left, the items from the immersion coding scheme are across the top.

6.3.1.1. Controlling for children's gender in comparing their engagement with play in the two contexts

In the analyses in Section 6.3.1, factor scores reflecting children's engagement with the free play activity as an actor and their immersive engagement in the CAMGame were associated with each other. However, the mean factor scores were significantly higher for the boys in the CCDS sample than for the girls (see Table 6.7, and see Sections 4.3.5.1 and 5.3.4).

In order to establish the relative contribution of gender to the association between children's engagement as an actor and immersive engagement factor scores, these variables were entered into a linear regression analysis (see Table 6.8). When entered into the same model, both gender ($\beta = .24$, $p < .01$), and children's engagement in the free play as an actor ($\beta = .14$, $p < .05$), significantly predicted children's immersive engagement in the CAMGame.

Table 6.7. Factor scores (mean [SD]) for children's engagement as an actor during the free play activity and immersive engagement in the CAMGame according to gender.

	Boys (*N*=138)	Girls (*N*=111)	T-test
Engagement as an actor	.21 (1.15)	-.24 (.73)	$t\ (234.80) = -3.78, p < .01$
Immersive engagement	.23 (1.07)	-.29 (.82)	$t\ (248.73) = -4.43, p < .01$

Note. Degrees of freedom are a fraction as a reflection of the correction for unequal variances.

Table 6.8. Prediction of children's immersive engagement factor scores from gender and their factor scores reflecting engaging in the free play as an actor.

Variable	ΔR^2	*B*	*SE B*	*ß*
Step 1	.07 **			
Constant		-.83	.20	
Gender		.54	.12	.27 **
Step 2	.02 *			
Constant		-.74	.20	
Gender		.48	.13	.24 **
Engagement as an actor		.14	.06	.14 *

Note. * $p < 0.05$, ** $p < 0.01$. The coefficients presented are those obtained in the final model: $F(2, 246) = 12.17$, $p < .01$, $R^2 = .08$.

6.3.2. Exploring Children's use of Internal State Language during the Free Play Activity and the CAMGame[4]

6.3.2.1. Children's use of internal state language during the free play activity

The descriptive statistics for the use of internal state language directed towards the self, characters or others during the free play activity are presented in Table 6.9 and Figure 6.2. A repeated measures ANOVA revealed that there were significant differences in the referents of the internal state language, $F(1.69, 421.97) = 50.09$, $p < .01$. Pairwise comparisons, adjusted for multiple comparisons using the Bonferroni statistic, revealed children's references to the internal

[4] The analyses in contained in this section are focused on the referent of the internal state language. For further analyses in relation to the internal state language categories, see Appendix 6.

states of other people present was the least common ($p < .05$), and there were no differences in children's attributions of internal states towards themselves and to the Playmobil figures.

The inter-correlations of the referent of the internal state language during the Playmobil free play activity are displayed in Table 6.11. There was a positive association between the use of internal state language attributed to the self and internal state language attributed to other people, $r(251) = .14$, $p < .05$.

Children's talkativeness scores and use of internal state language during the free play activity were not found to be associated with their age, and receptive vocabulary and did not differ according to their gender.

6.3.2.2. Children's use of internal state language during the CAMGame

The descriptive statistics for the use of internal state language attributed towards the self, avatar, characters or others during the CAMGame are presented in Table 6.9 and Figure 6.2. A repeated measures ANOVA revealed significant differences in the referents of the internal state language, $F(1.10, 274.36) = 125.76$, $p < .01$. Pairwise comparisons, adjusted for multiple comparisons using the Bonferroni statistic, revealed that children attributed internal states to themselves more so than any other referents. Children attributed internal states to the virtual characters more so than to the avatar or others. Children attributed internal states to others more so than to the avatar (all ps $< .05$)

The inter-correlations of the referent of the internal state language during the CAMGame are displayed in Table 6.11. There was a positive association between the use of internal state language attributed to the self and to the avatar, $r(251) = .15$, $p < .05$, to the virtual characters, , $r(251) = .39$, $p < .01$, and to others, $r(251) = .32$, $p < .01$. The use of internal state language attributed to the avatar was also associated with attributing the virtual characters with internal states, $r(251) = .18$, $p < .01$. Finally, there was a positive association between the attribution of internal states to the virtual characters and to others, $r(251) = .23$, $p < .01$.

Children's talkativeness scores and use of internal state language during the CAMGame were not associated with age. There were significant associations with receptive vocabulary; children with a higher receptive vocabulary referred to the internal states of the virtual characters less, $r(247) = -.16$, $p < .05$, and the internal states of others more, $r(247) = .15$, $p < .05$. There was only one significant difference according to gender; compared to girls, boys made more references to the internal states of the virtual characters, $t(237.91) = -2.81$, $p < .01$ (see Figure 6.3).

6.3.2.3. Comparing children's use of internal state language during the free play activity and during the CAMGame

The descriptive statistics for children's talkativeness scores and use of internal state language for the free play activity and the CAMGame are displayed in Table 6.9 and Figure 6.2. In terms of the proportion of speech in the two contexts, children spoke more during the free play activity compared to during the CAMGame, $t(250) = 11.56$, $p < .01$.

Overall, children used more internal state language in general during the free play activity than during the CAMGame, $t(250) = 2.98$, $p < .01$. In terms of the referents of the internal state language, children referred to the internal states of the characters in the Playmobil free play activity more so than they did the virtual characters in the CAMGame, $t(250) = -9.68$, $p <.01$. Children similarly referred to the internal states of others in the free play activity more so than during the CAMGame, $t(250) = -2.87$, $p < .01$. However, children referred to their own internal states during the CAMGame more so than they did during the free play activity, $t(250) = 4.10$, $p < .01$.

The inter-correlations of the talkativeness scores and referents of the internal state language during the two activities are displayed in Table 6.11. Children's talkativeness during the two activities were found to be positively correlated with one another, $r(251) = .49$, $p < .01$. In relation to the internal state language, children's references to their own internal states were correlated in the two activities, $r(251) = .21$, $p < .01$, as were the references to characters' internal states, $r(251) = .20$, $p < .01$, and the internal states of others, $r(251) = .13$, $p < .05$.

As highlighted in the analyses in Section 6.3.2.2, boys made more references to the internal states of the virtual characters in the CAMGame than the girls (see Figure 6.3), and there was a negative association between referring to the internal states of the virtual characters and receptive vocabulary. In order to establish the relative contribution of gender and receptive vocabulary to the association between children's references to the internal states of the characters in the two contexts, these variables were entered into a linear regression analysis (see Table 6.10). When entered into the same model, gender ($\beta = .16$, $p < .05$), receptive vocabulary ($\beta = .15$, $p < .05$), and children's references to the internal states of the characters in the Playmobil free play activity ($\beta = .20$, $p < .01$), significantly predicted children's references to the internal states of the virtual characters in the CAMGame.

There was a positive association between references to the internal states of others in the CAMGame and receptive vocabulary (Section 6.3.2.2). To establish the relative contribution of receptive vocabulary to the association between references to the internal states of others in the two contexts, these variables were entered into a linear regression analysis. When entered into the same model, receptive vocabulary ($\beta = .14$, $p < .05$) and children's references to the internal states of others in the Playmobil free play activity ($\beta = .12$, $p = .05$), predicted children's references to the internal states of others in the CAMGame.

Table 6.9. Children's mean (SD) use of internal state language (ISL) according to the context.

	Playmobil free play	CAMGame
Talkativeness score	.62 (.26)	.45 (.19)
ISL to self	.05 (.06)	.07 (.05)
ISL to avatar	N/A	.00 (.00)
ISL to character	.04 (.05)	.01 (.01)
ISL to other	.01 (.02)	.00 (.01)
Total ISL	.10 (.09)	.08 (.06)

Note. Scores for both contexts are as a proportion of the task length.

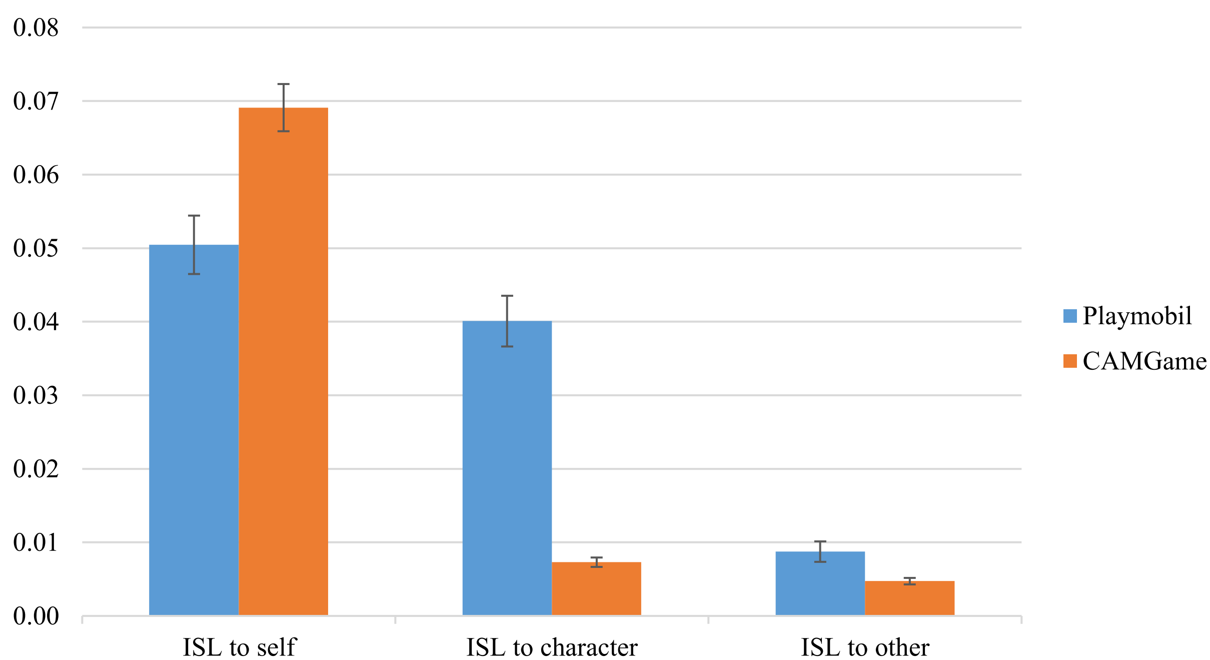

Figure 6.2. Children's mean use of internal state language (ISL) according to the context. Error bars represent ± standard error of the mean.

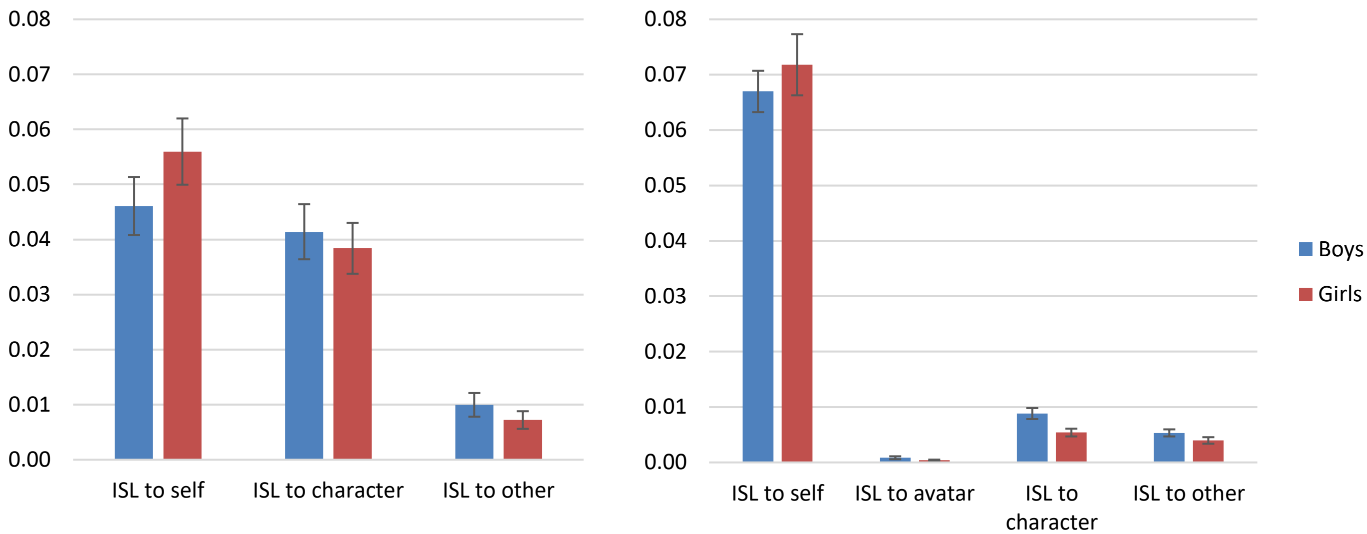

Figure 6.3. Use of internal state language according to the referent during the Playmobil free play activity (left) and CAMGame (right). Error bars represent ± standard error of the mean.

Table 6.10. Prediction of children's use of internal state language (ISL) towards the virtual characters in the CAMGame from gender, receptive vocabulary and their use of ISL towards characters in the free play activity.

Variable	ΔR^2	***B***	***SE B***	***ß***
Step 1	.05**			
Constant		.014	.006	
Gender		.003	.001	.16**
Receptive vocabulary		.000	.000	-.14*
Step 2	.04**			
Constant		.013	.006	
Gender		.003	.001	.16*
Receptive vocabulary		.000	.000	-.15*
Character directed ISL in free play activity.		.038	.011	.20**

Note. * $p < 0.05$, ** $p < 0.01$. The coefficients presented are those obtained in the final model: $F(3, 243) = 8.185$, $p < .01$, $R^2 = .08$.

6.3.3. Exploring associations between children's imaginative engagement with the free play, engagement in the CAMGame and use of internal state language in the two activities.[5]

Table 6.11 displays the inter-correlations of the factor scores reflecting children's imaginative engagement with the free play activity, and their engagement in the CAMGame, in addition to the referents of internal state language in the two activities. Figure 6.4 presents children's use of internal state language in the two contexts according to their cluster group membership.

6.3.3.1. Associations between the factor scores reflecting children's imaginative engagement with the free play activity and children's use of internal state language

With regards to the factor scores generated to indicate the styles in which children engaged with the play frame during the free play activity, engagement in the role of an *actor* was positively associated with children's references to the internal states of characters in the free play activity, $r(249) = .26$, $p < .01$, and in the CAMGame, $r(249) = .14$, $p < .05$, in addition to the avatar during the CAMGame, $r(249) = .14$, $p < .05$, but was negatively associated with referring to their own internal states during the free play activity, $r(249) = -.20$, $p < .01$.

Engagement in the role of a *narrator* was significantly associated with references to the characters' internal states in the free play activity, $r(249) = .35$, $p < .01$.

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[5] As the relevant significant associations between the variables of interest in Sections 6.3.1 and 6.3.2 remained when controlling for gender and verbal IQ, neither were included in the subsequent analyses.

Being *less engaged* in the free play activity was positively associated with children's references to their own internal states in the free play, $r(249) = .32$, $p < .01$, but was negatively associated with referring to the characters' internal states in the free play activity, $r(249) = -.15$, $p < .05$.

6.3.3.2. Associations between the factor scores reflecting children's engagement with the CAMGame and children's use of internal state language

In relation to the factor scores generated to indicate the styles in which children engaged with the CAMGame, *immersive engagement* was positively associated with children's references to their own internal states in the free play activity, $r(251) = .14$, $p < .05$, and in the CAMGame, $r(251) = .46$, $p < .01$. Immersive engagement was also associated with children's references to characters' internal states in the free play activity, $r(251) = .17$, $p < .01$, and in the CAMGame, $r(251) = .74$, $p < .01$, in addition to references to the avatar's internal states in the CAMGame, $r(251) = .32$, $p < .01$. Immersive engagement was associated with referring to the internal states of others in the free play activity, $r(251) = .16$, $p < .05$, and during the CAMGame, $r(251) = .27$, $p < .01$.

Functional engagement was associated with the children referring to their own internal states in the free play activity, $r(251) = .19$, $p < .01$, and during the CAMGame, $r(251) = .46$, $p < .01$. Functional engagement was additionally associated with referring to the characters' internal states in the free play activity, $r(251) = .16$, $p < .05$, and others' internal states during the CAMGame, $r(251) = .26$, $p < .01$.

The factor score reflecting *no engagement* with the CAMGame was not associated with internal state language in either activity.

6.3.3.3. Comparing children's use of internal state language between the groups identified from the cluster analysis reflecting the children's styles of engaging in the Playmobil free play activity.

Figure 6.4 displays the referents of internal state language used by the children in the two activities according to their cluster group membership reflecting their style of engaging with the free play activity. A series of one-way ANOVAs revealed significant differences between the groups in terms of internal state language attributed to the self in the free play activity, $F(3, 245)$, = 15.73, $p < .01$, and during the CAMGame, $F(3, 245)$, = 3.53, $p < .05$, in addition to references to the internal states of the fictional characters during the free play activity, $F(3, 245)$, = 10.50, $p < .01$.

Post-hoc tests, adjusted for multiple comparisons using the Bonferroni statistic, revealed that *less engaged players* attributed internal states to themselves during the free play activity more so than any of the other groups and the *narrators* referred to their own internal states in this activity more so than the managers and actors. Further, the *narrators* and *actors* referred to the internal states of the characters in the Playmobil free play activity more so than the managers and the less engaged players, who did not differ significantly in their attribution of internal states to the fictional characters. Finally, *narrators* referred to their own internal states more than the actors during the CAMGame (all ps < .05).

Table 6.11. Inter-correlation of the factor scores from the factor analyses investigating children's engagement with the free play activity, children's immersion, and their use of internal state language (ISL) in the two activities.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Playmobil talkativeness score	-														
2. Actor	.13*	-													
3. Narrator	.44**	.01	-												
4. Less engaged	.05	.00	.01	-											
5. Playmobil ISL to self	.36**	-.20**	-.01	.32**	-										
6. Playmobil ISL to character	.41**	.26**	.35**	-.15*	.03	-									
7. Playmobil ISL to other	.19**	-.08	.12	.12	.14*	.03	-								
8. CAMGame Talkativeness score	.49**	.06	.03	.08	.25**	.14*	.08	-							
9. Immersive engagement	.34**	.19**	.11	.07	.14*	.17**	.16*	.65**	-						
10. Functional engagement	.19**	-.08	-.04	.02	.19**	.16*	-.01	.47**	-.00	-					
11. No engagement	.08	-.05	-.01	.05	.02	-.05	.01	.09	.01	-.00	-				
12. CAMGame ISL to self	.36**	.06	.07	.10	.21**	.18**	.00	.74**	.47**	.46**	.11	-			
13. CAMGame ISL to avatar	.17**	.14*	.05	-.01	.07	.06	.04	.19**	.32**	.11	.05	.15*	-		
14, CAMGame ISL to character	.20**	.14*	.03	.01	.10	.20**	.04	.46**	.74**	.06	-.03	.39**	.18**	-	
15. CAMGame ISL to other	.18**	-.10	-.02	-.00	.09	.05	.13*	.35**	.27**	.26**	.05	.32**	.06	.23**	-

Note. * $p < 0.05$, ** $p < 0.01$.

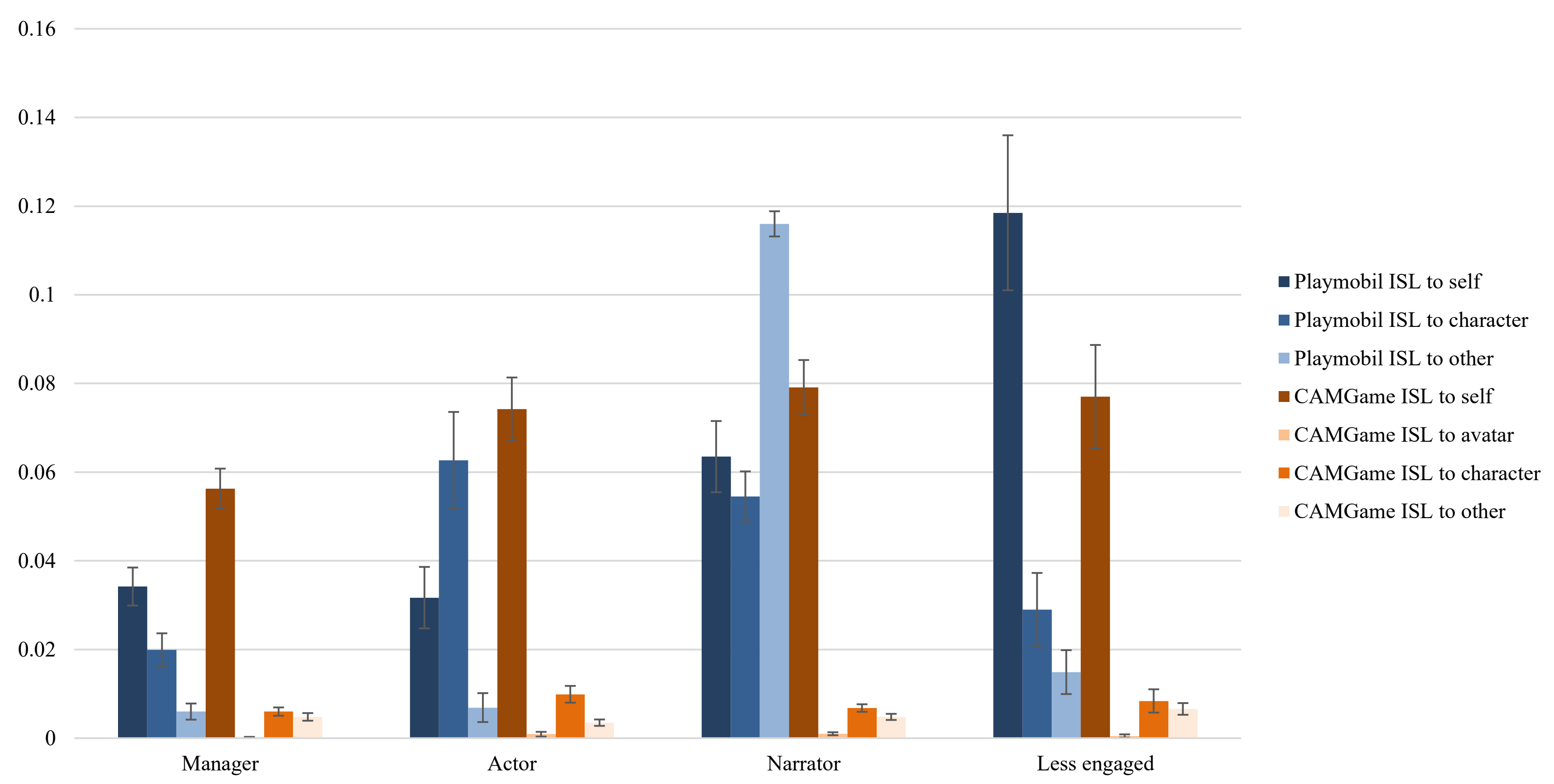

Figure 6.4. Children's mean use of internal state language (ISL) according to their cluster group membership. Blue bars indicate use of ISL in the free play activity, orange bars indicate use of ISL in the CAMGame. Error bars represent ± standard error of the mean.

6.4. Discussion

6.4.1. Are there similarities in children's imaginative engagement with play in non-virtual and virtual contexts?

One of the aims of this chapter, and in this thesis, was to compare children's imaginative engagement with play activities in a non-virtual and virtual context. In relation to the factor scores generated in Chapters 4 and 5, there was a positive association between the factor scores reflecting children's engagement with the play frame as an *actor* and children's *immersive engagement* with the video game. This finding suggests that there is some relationship between behaviours that reflect enacting a role within the *play frame* (see Figure 4.1; Auwärter, 1986; Garvey, 1991; Giffin, 1984; Kane & Furth, 1993) and children's immersion within a virtual world (Brown & Cairns, 2004; Calleja, 2011; Ermi & Mäyrä, 2007). Further, this suggests that children may engage with *virtual* worlds in a similar way to the way in which they do so in non-virtual *fictional* worlds. This supports the viewpoint that video games are a form of play present in the middle childhood period that children approach in a similar way to more 'traditional' forms of play (see Section 3.1.2.5).

Although the *narrator* factor score was not associated with any of the factor scores relating to children's engagement in the virtual world, the individual items that categorised children's speech as verbally narrating a story were associated between the two contexts. As above, this finding supports the argument that children approach the two contexts of play in similar ways and behaviour across the virtual and non-virtual play activities are, to an extent, relatively stable. However, the lack of an association between the *narrator* and *immersive engagement* factor scores can also be understood in relation to Giffin's (1984) view that storytelling in children's play occurs further 'out' of the play frame (see Figure 4.1), and as noted above, children's immersion can be regarded as analogous to enacting roles in the play frame.

6.4.2. Are there similarities in children's use of internal state language in non-virtual and virtual contexts?

A second aim of the investigations in this chapter was to compare the non-virtual and virtual contexts of play in terms of the ways in which internal state language was used by the children as they engaged in the two activities. Internal state language in general was used by the children more in the non-virtual free play activity than during the virtual video game. Similarly, children referred to the internal states of the fictional characters and others more in the free play activity than during the video game. Therefore, this supports previous research suggesting that free play activities are a rich context for investigating the use of internal state language in middle childhood (Leach et al., 2016). Further, this indicates that there are important differences between the two contexts in terms of the perspectives of characters and others being taken more in the non-virtual context as compared to the virtual world (Bartsch & Wellman, 1995; Harris, 2000; Howe, 1991; Tessier et al., 2016).

However, children referred to their own internal states more when playing the video game than when engaging in the free play activity. This could further reflect differences in the two contexts that lead to differences in internal state language use. For example, the CAMGame is a goal-directed activity in which there were a series of challenges the child had to complete in order to proceed through the game. Therefore, as compared to the free play activity in which the child was able to do what they liked, the CAMGame could naturally evoke more references to their own internal states. Mothers' references to internal states, though relatively stable in general (Carr et al., 2018), have subtle differences in terms of categories of internal states referenced in different contexts of assessments, potentially as a result of the properties of the context of assessment (Howe, Rinaldi, & Recchia, 2010). Indeed, the CAMGame in particular could have evoked more references to children's own internal states due to the visual quality of the game and challenges to find specific items (magic statues, doors and treasure) resulting in more references to specific internal states, such as their own perceptions (see Appendix 6).

Finally, the referents of children's internal state language were consistent across the non-virtual and virtual contexts of play, even when controlling for gender and verbal ability. These findings add to those discussed in Section 6.4.2 suggesting that children engage in the non-virtual and virtual contexts of play in similar ways. Further, children's use of internal state language is relatively stable from the pre-school period into later childhood (Carr et al., 2018). Therefore, the present study extends these findings by demonstrating stability in the referents of internal state language between two contexts of play, and therefore supports the suggestion that children's use of internal state language can be regarded as a cognitive-behavioural trait, a conclusion that has been similarly noted for *mothers'* references to internal states (Carr et al., 2018; Meins, Fernyhough, Artnott, Turner, & Leekam, 2011; Paine et al., 2018).

An anecdotal comment in relation to the internal state language used in the CAMGame is noteworthy. In these investigations, I attempted to distinguish between internal state attributions made to the self, and those attributed to the avatar. This was an aim of the study that, to my knowledge, had not been attempted in previous literature, and so a conservative method was used as stated in Section 6.2.3.5. This resulted in only coding references to the *physiology* of the avatar as this was the only category in which there was no possibility that the internal state was intended to be attributed to the self. In itself, this could be interpreted as an indication that the children's language reflected their integration of themselves with the avatar resulting in the referent being difficult to separate. Therefore in respect to this, it is likely that some of the references made to children's own internal states are in fact attributions to the avatar and reflect further engagement with the fictional world. However, this conclusion is tentative, and warrants further research in regard to coding attributions of internal states to an avatar.

6.4.3. Is children's use of internal state language (ISL), particularly when referring to the internal states of fictional or virtual characters, associated with their imaginative engagement with the activities?

A final aim was to explore the associations between children's imaginative engagement in the non-virtual and virtual contexts of play and their attribution of internal states to the characters in particular. The factor scores reflecting children's engagement as an *actor* in the free play activity and their *immersive engagement* in the video game were both positively associated with attributing internal states to the fictional characters in the free play activity, and both the virtual characters and avatar in the video game. Therefore taken together, these findings support the argument then when children are in the 'frame' of play in both non-virtual and virtual contexts, they adopt a perspective within the frame which is reflected in their attributions of internal states to characters within the frame (Bretherton, 1984; Harris, 2000; Garvey, 1991).

6.4.4. Limitations

It is important to note potential limitations in terms of the contexts in which children's imaginative engagement and use of internal state language were examined. Firstly, the Playmobil free play activity was a relatively short task where the coding of the activity was capped at the three minutes the CCDS protocol allocated for the task. It is possible that due to the short nature of the task, children did not have enough time to engage in the play in the same way they would have in a longer session. However, given that the factor scores reflecting children's imaginative engagement and use of internal state language were relatively stable between the free play activity and the much longer video game activity, it can be considered that this is an accurate reflection of their play and use of internal state language.

Secondly, it must be acknowledged that although the two contexts for play share similarities, they are not equivalent tasks. As noted in Section 6.4.2, the free play activity was an open-ended activity in which the child was unconstrained in regards to what they did in the time. During the CAMGame however, the child had a series of goals and challenges to complete in order to progress through the game. Indeed, the challenge of the game to some of the children may have been a barrier to their imaginative engagement, as indicated by the literature on immersion (Brown & Cairns, 2004; see Section 5.1.1), in a way that was not present for the free play activity. Future work can address this by investigating children's imaginative engagement in more open ended video games, such as *Minecraft*, where children can play in the virtual world in a more analogous way to a free play activity.

6.4.5. Summary of the chapter

In summary, the present investigations have expanded our understanding of children's engagement with play in non-virtual and virtual contexts. Firstly, behaviour that reflects children's perspective being within an imagined or virtual 'frame' was relatively stable between the two contexts and was associated with attributing internal states to other characters within this imagined frame. Secondly, children used internal state language more often in the open-ended non-virtual context using Playmobil figures, though children referred to their own internal states more often in the virtual context. Further, the associations between the two contexts in the referents of internal state language indicate further consistency across the two contexts.

Chapter 7.

Discussion

The overall aims of this thesis were to identify playful and imaginative activities present in the middle childhood period, and to explore the ways in which children engaged with fictional worlds in non-virtual and virtual play activities as a reflection of their imagination. In Chapters 1 and 3, I highlighted that there is a paucity of research investigating play and imagination in the middle childhood period, and playing video games has traditionally not been considered as a form of play that is analogous to other play activities that have been investigated at this age. Therefore in this thesis, I attempted to synthesise the theoretical perspectives of developmental psychologists, play researchers, and human-computer-interaction scholars in order to investigate whether there are similarities present in the styles in which children engaged in a free play activity with toy figures and played a bespoke video game. These investigations took place in the context of the childhood wave of assessment of the Cardiff Child Development Study (CCDS) when the children were seven years old (M=6.96). In the following sections of this chapter, the key findings of each of the empirical chapters of this thesis will be summarised; the implications and impact of these findings will be discussed; and finally the limitations of these investigations and future avenues for research will be addressed.

7.1. Summary of Findings

7.1.1. Chapter 3: The playful and imaginative activities present in the middle childhood period

In Chapter 3 of this thesis, I reviewed how 'play' is defined and conceptualised in research. From this, it was concluded that children's behaviour, motivations and the surrounding context were key elements in identifying whether a particular activity can be regarded as 'play', which therefore warrants the use of multiple methods of investigation.

I synthesised findings of published research regarding what playful and imaginative activities are present in the middle childhood period, a time during which it had been argued that play was either absent, or only present in particular forms (Piaget, 1962; Vygotsky, 1967). However, several issues with the research emerged, the most relevant being that rarely did a single study include a range of activities that would be present in the middle childhood period. Only two studies included video games as a form of play (Case-Smith & Kuhaneck, 2007; Howard et al., 2017), despite their popularity at this age and theoretical arguments for including such activities as play. Further, while some researchers explored individual differences in children's participation in certain playful activities, the extent to which these factors affect other playful activities was unclear.

Therefore, in the investigations in Chapter 3, caregivers' reports of the activities their children enjoyed engaging in were analysed to explore popular activities in the middle childhood period. Further, I investigated child- and family-related factors (e.g., child gender, sociodemographic adversity) as potential correlates of these activities. In the middle childhood period, children were reported as enjoying a wider variety of playful and imaginative activities than previously theorised, including certain activities previously considered absent, or not included in previous research. Girls were reported to enjoy reading, drawing and painting, and sociodramatic play more than boys. Conversely, boys were reported to enjoy playing video games more. Further, gender differences emerged in play with toy figures, reflecting a preference for gender-stereotyped toys (Ruble et al., 2006). Only one activity was related to sociodemographic background; those who were exposed to more social risk factors were more likely to enjoy playing ball games.

7.1.2. Chapter 4: Children's styles of engagement with the play frame when playing with toy figures

Although in Chapter 3 it was established that a variety of playful and imaginative activities are enjoyed in the middle childhood period, any differences in the ways in which children engage with such imaginative activities could not be established based upon the caregivers' reports due to the limitations of the specific questions asked. Therefore in Chapter 4, I aimed to develop a coding scheme of children's engagement with play during a free play activity. In particular, the styles in which children engaged with the fictional world created during play, which has been referred to as the *play frame* (Kane & Furth, 1993; Scarlett & Wolf, 1979). I reviewed how children might engage with play, and it was concluded that children's engagement with the play frame could be in the form of an actor, a narrator or manager of the play (Scarlett & Wolf, 1979). Further, several potential sources of individual differences were identified including gender, sociodemographic background, executive function and verbal ability.

After developing the coding scheme and establishing excellent reliability, I explored children's engagement with a free play activity with Playmobil figures using variable- and person-centred analyses. The children in the CCDS verbally engaged with play most frequently in the role of a narrator of events, though many of the children were engaging with play in the form of enacting roles, and the most common use of the objects was to set up and organise the play scenario. Further, both the variable- and person-centred analyses supported the literature in the ways in which children engage with the play frame, as an actor, manager or narrator of the play (Auwärter, 1986; Giffin, 1984; Howe et al., 1998; Scarlett & Wolf, 1979). Finally, only gender emerged as a source of individual variation in how children engaged with the play, with boys being more likely to engage in the role of an actor in the play frame.

7.1.3. Chapter 5: Children's engagement and immersion whilst playing a bespoke video game

As highlighted in Chapter 3, playing video games is a form of playful activity largely neglected in traditional research on children's play, particularly in the middle childhood period, but is one that children enjoy (Chapter 3). However, as with children's engagement with the play frame when playing with toy figures, differences in the ways in which children engage with playing a video game could not be established based upon caregivers' reports. Therefore, I developed a measure of children's engagement with playing a video game, a process labelled *immersion* (Cairns et al., 2014), which was based on the literature. Although there had been prior attempts at developing observational schemes of immersion that would be suitable for use on videos of children as they played a game (e.g., Martinovic et al., 2016; von der Pütten et al., 2012), these schemes lacked applicability to other samples and were inconsistent with the other literature on immersion. In the literature review, I also established potential sources of individual variation in children’s immersion, including their previous experience playing video games, sociodemographic characteristics, gender, motor control, and executive function.

In the analyses in Chapter 5, the items from the coding scheme were entered into a principal components analysis, and indicated that children could engage with the *functional* components of playing the game or be *immersed* in the virtual world in terms of the narrative and characters. This supports the current research on immersion, but also extends the literature by demonstrating similar findings in children (Brown & Cairns, 2004; Calleja, 2011; Ermi & Mäyrä, 2007). Further, when controlling for the potential sources of individual variation identified from the literature, only gender remained a significant predictor of children’s immersion, with boys having a higher immersive engagement factor score.

7.1.4. Chapter 6: Do children engage in the fictional world of the play frame and virtual world of a video game in similar ways?

Finally, in Chapter 6, I firstly compared children’s styles of engaging with the two play activities in terms of their style of engaging with the play frame and immersion in the virtual world of the video game. There was a positive association between the factor scores reflecting children’s engagement with the play frame as an *actor* and children’s *immersive engagement* with the video game. This suggests that there is a relationship between behaviours that reflect being within the *play frame* (see Figure 4.1; Auwärter, 1986; Garvey, 1991; Giffin, 1984; Kane & Furth, 1993) and being immersed within a virtual world (Brown & Cairns, 2004; Calleja, 2011; Ermi & Mäyrä, 2007). In line with previous research suggesting the creation of fictional worlds is more common in boys than girls (Cohen & MacKeith, 1991), engagement as an actor and immersive engagement were both more common in boys than girls, although this did not explain the association between the two styles of engaging with play overall. Therefore, this finding supports the notion that there are individual differences in children's imaginative style of engaging in play that are expressed in two different contexts of play.

In addition to comparing the styles in which children engaged with the play frame and virtual worlds, I explored children's engagement with the fictional worlds of both contexts in terms of their attributions of internal states to individuals in and out of the fictional world. Indeed, the literature reviewed in Chapters 1 and 6 suggested that references to the internal states of characters within a fictional world reflects an individual adopting a perspective from within this fictional world (Bretherton, 1984; Bruner, 1986; Harris, 2000; Garvey, 1991).

In the analyses in Chapter 6, there was stability in children's use of internal state language, in terms of the referents of the internal states being associated between the two contexts. In particular, referring to the internal states of fictional characters in the play frame was associated with referring to the virtual characters in the video game. Additionally, the factor scores reflecting children's engagement as an *actor* and their *immersive engagement* were both positively associated with attributing internal states to the fictional characters in these two play activities. Therefore, these converging findings support the conclusion that children engage with the fictional worlds of the play frame and virtual world of the video game in similar ways.

7.1.5. Overall summary of findings

In summary, the investigations in this thesis yield several important findings. Firstly, children in the middle childhood period were reported as enjoying engaging in a variety of playful activities, including some considered to be absent in this age range. Secondly, there were similarities present in children's engagement with the imagined world of the play frame and immersion in the virtual world of a video game. Associations were found between speaking and acting in a way that indicated that they were ‘in’ the virtual or imagined worlds. Additionally, associations were found in terms of children’s use of internal state language between the two contexts, particularly in terms of references to the internal states of the fictional characters. This further supports the notion that children’s engagement in the fictional worlds of the two contexts can represent an expression of an underlying imaginative characteristic. Further, as children engaged in similar ways when playing with the toy figures and when playing a video game, this suggests that video games are a form of play.

7.2. Implications and Impact of the Thesis

7.2.1. Contribution to the existing literature

The findings in this thesis contribute to literature on imagination, play, and video game research. Firstly, as noted in Section 1.4, there are converging findings that suggest imagination can be regarded as a stable characteristic in which children vary. The findings from this thesis support this notion in demonstrating that children who were imaginative in a play activity in a non-virtual context, in terms of engaging with the play frame, were also immersed in the virtual world of a video game. In both processes, imagination has been suggested to play a key role (Hannaford, 2012; Søndergaard, 2013). This conclusion is further strengthened by associations between these styles of engaging and referring to the internal states of characters in the fictional and virtual worlds, another process in which imagination is considered to play a role in terms of facilitating an individual adopting a perspective within the fictional world (Harris, 2000). Therefore, these converging findings from multiple indicators of imaginative engagement in two contexts of play support the notion of imagination being a characteristic in which children differ.

The findings in this thesis also contribute to the literature in terms of how playing video games can be viewed. Children in the CCDS engaged in similar ways when playing with toy figures and when playing a video game in terms of their engagement with the fictional worlds, and in their use of internal state language to refer to the self, the fictional characters, and to others. These findings support the arguments that playing video games can be considered as a form of play that is engaged in by children in the middle childhood period and is analogous to other forms of play (Lillard, 2014; Singer & Singer; 2005; 2013). Indeed, this finding addresses claims in the mainstream media that playing video games and increased 'screen time' are a detriment to imagination (Bernstein, 2016), by showing that children who are imaginative in other contexts bring their imaginative behaviour to a video game context. This finding indicates that video games can be considered as a different context in which similar play behaviours occur.

Finally, the findings in this thesis relating to children's engagement in the fictional worlds of the play frame and virtual world of the video game contribute to the wider literature on engaging in fictional worlds reviewed in Section 1.3. Engaging in fictional worlds results in emotional reactions in various contexts (Bateson, 1955; Harris, 2000; Taylor, 1999). However, the present investigations extend these conclusions beyond emotional *reactions*, and demonstrate that children's *actions* in relation to the fictional worlds show similarities across different contexts. Although the extent to which these conclusions support or contradict the influential theories reviewed in Section 1.3.1 regarding how pretence is represented is not an aim of this thesis, these theories must be able to account for the similarities found in children's engagement with the play frame during free play, and their immersion in a video game.

7.2.2. Therapies and education

As highlighted in Section 1.5, the investigations in this thesis have important implications for educators and therapists who make use of play and video games. For video games in particular, being engaged with the content is associated with increased learning of the content

(Barclay & Bowers, 2018; Cheng, et al., 2015; Hamari et al., 2016), and similar arguments have been suggested in relation to play (Lillard, 2013). Therefore, the findings in this thesis indicate that there may be underlying individual differences in how children engage with these activities, that is related to their imagination, that could influence what children take away from play and video games for education and therapies. Further, the findings in this thesis indicated that boys interact with these tasks in a more engaged and immersed way than girls. Therefore, there may be gender effects present in terms the outcomes of play- and video game-based learning and therapies that can be explained by these differences in their engagement.

7.2.3. Applications for play and video game companies

The findings in this thesis also have implications for companies that produce toys and technology for children's play. For example, the investigations of engagement with the play frame in this thesis involved a free play activity using Playmobil figures, which in the year 2017 were sold in over 100 countries and made a total of €679 (~£609) million (Playmobil, 2018). The investigations of children's immersion in a video game used a modified version of the commercially available game *The Elder Scrolls V: Skyrim,* which has been estimated to have generated over $1.3 (~£1.0) billion in sales revenue from 2011 to 2016 (Berman, 2016). Consequently, the findings in this thesis might inform further market research and branding for these companies. For example, while less than 50% of children were reported as enjoying playing with Playmobil figures (Chapter 3), only seven children (2.73%) actually refused to engage in the Playmobil free play activity. Further, while parents reported a gender difference for children's enjoyment of video games (Chapter 3), there were no gender differences in terms of the *no engagement* measure from the observational findings (Chapter 5). Therefore, this indicates that girls were engaged in playing the video game, though were not as *immersed* as the boys.

Finally, previous experience with video games did not influence children's engagement when the effects of gender were controlled. Therefore, such findings can be used by play and video game companies for their marketing and branding: these activities are still enjoyed and engaged by children of both genders in the middle childhood period as a form of play, regardless of prior experience or exposure.

7.3. Limitations and Future Directions

One limitation of the conclusions from this thesis relates to the interpretation of the effects of gender noted in all empirical chapters. Preferences for gender-stereotyped toys and activities were noted in Chapter 3, and the boys in the CCDS were more engaged as an actor in the free play activity and more immersed in the video game. However, it should be noted that the gender differences were more marked in the caregivers' reports of whether children enjoyed certain activities, and so may, to an extent, reflect gender-stereotyped bias in the caregiver reports. Although the findings in relation to gender differences were noted as replicating those in the existing literature, an investigation of why these differences were present, particularly for children's engagement in fictional worlds, was beyond the scope of this thesis. However, several interpretations and explanations are possible. As with research on toy preferences, it may be that cultural stereotypes in relation to children's play that are entrenched in children through socialisation and branding can explain these differences. For example, content analysis of Lego building sets revealed gender-stereotyped messages in how children should play with the toys, with boys being encouraged to enact professions, heroism and expertise; and girls being encouraged to enact domestic and social roles (Reich, Black, & Foliaki, 2018). Further, it has already been noted that children may use the content of media, such as television and books, as a source material for their play, which may portray gender-stereotyped styles of playing

(Desmond, 2001; Galda, 1984; Singer & Singer, 1990). For example, in one study boys who watched more ‘superhero’ television programmes were found to display more ‘male-stereotyped’ play, in the form of increased aggression and violence in their play (Coyne, Linder, Rasmussen, Nelson, & Collier, 2014). In another study, girls who watched more media that included Disney princesses were more likely to engage in ‘female-stereotyped’ behaviour, which included their toy preferences, playing dress up, and playing house (Coyne, Linder, Rasmussen, Nelson, & Birkbeck, 2016). Additionally, it may be that differences in parental styles, particularly in relation to play, according to either the child’s or the parent’s gender could explain the presence of these differences. For example, research has found that parent-daughter dyads, irrespective of parent gender, display more joint pretend play than parent-son dyads (Lindsey & Mize, 2001). Finally, it should be considered that the gender differences found may reflect sex differences that are not a result of socialisation. Indeed, some research has demonstrated that males show increased activation of the mesocorticolimbic pathway in the brain when playing computer games compared to females, which was unrelated to their actual performance on the game (Hoeft, Watson, Kesler, Bettinger, & Reiss, 2008). Therefore, further research is needed to understand the nature of gender differences in children’s play, particularly in terms of why boys appear to be more engaged in fictional worlds than girls.

An additional limitation of the investigations contained within this thesis, particularly in relation to children’s engagement with video games, is the rate at which technology has advanced. It is likely that there are already differences in the presence of technology in children’s lives which may impact children’s engagement with it, particular in relation to playing video games. For example, since data collection for the childhood wave of the CCDS began in 2013, Amazon has released a budget ‘kids’ edition of their tablet range; Apple have released 11 new iPad models; Microsoft, Sony Playstation and Nintendo have all released at least one new games console; and mobile virtual reality gaming technology has become accessible to consumers (for example, the Oculus Go). This is similarly noted in research, for example in an analysis of the literature on immersive technology research, Suh and Prophet (2018) found that 43% (n=23) of the studies published from 2010 were published between 2016 and 2017. This was attributed to the widespread availability of mobile technology in this time period, in addition to the general advancements in technology. However, the study reported in this thesis used a video game play format, using a games controller to move an avatar on the screen, which is still popular. Further, the game that was modified to be the CAMGame is representative of games available and popular amongst consumers; indeed *The Elder Scrolls V: Skyrim* was re-released as a remastered edition in 2016. Therefore despite advances in technology since the data were collected, the conclusions in relation to children's engagement with video games remain relevant.

Future research however can aim to investigate any changes in the presence of different technologies in children's lives, and whether there are such differences in children's immersion as a result of the advances in technology. For example, games such as *Minecraft* can now be played on tablets, smartphones, computers and video games. A question of interest therefore, particularly if immersion is affected by familiarity with the controls of a game (Brown & Cairns, 2004; Ermi & Mäyrä, 2007; Calleja, 2011), is the extent to which children's immersion differs across these devices, and whether this is still related to engaging in play in different non-virtual contexts.

A further limitation of the analyses in this thesis is in relation to the data that were scores as a proportion of the length of the respective task (Chapters 5 and 6). The decision to use proportion scores allows for meaningful comparisons to be made between children for the data from the CAMGame, which varied in how long children took to complete the game. However, this was a limitation in terms of the frequencies of most items being disproportionately lower than the overall task length, resulting in low proportion scores. For example, the mean proportion scores for the items from the immersion coding scheme ranged from .00 to .06, with the highest score being .24 (see Table 5.4). This translates as the item with the highest score, referring to game characters, being present only for under a quarter of the time that a child played the game. Therefore, a limitation of using the proportion data was that this was not distributed normally and was skewed towards lower values. However, the data used in this thesis was not transformed as the proportion scores represent a meaningful unit for interpretation and drawing conclusions. For example, as highlighted above the score of .24 meaningfully indicates that an item from the coding scheme was common for almost a quarter of the task length, which can be meaningfully compared to other children in addition to other items from the coding scheme. The use of transformed or the raw scores would not allow for this ease of interpretation and comparison. Further, it has also been suggested that transforming proportion scores to meet assumptions of normality does not affect the significance results of inferential statistics (Chen, Cheng, Berkout, & Linfhiem, 2017). Therefore, these proportion scores were considered as the most appropriate way to meaningfully analyse the data.

A final limitation of the investigations in this thesis, and one that was already mentioned in Chapter 3, is that the original purpose of the CCDS was not to study children's imagination and play. The limitations in relation to the questions of the activities the children enjoyed have already been addressed in Section 3.4.3. Additionally, in relation to the CAMGame, the game was primarily designed to assess children's decision making in response to social and emotional challenges and taunts made by the children from the rival school, not their immersion in the fictional world of the game. However, the secondary analysis of this task provided the opportunity to investigate individual variation in immersion in the same game, and compare this style of engagement to engagement in other forms of play. Further, as these play activities were a part of a battery of tasks that also included measures of executive function and verbal ability, any effects of these variables were able to be controlled for. For verbal ability, this is particularly important as previous research has highlighted the necessity of including measures of verbal fluency when investigating imagination through children's language (Singer & Singer, 1990). Therefore, the investigations reported in this thesis are a first step in exploring children's imagination and engagement with fictional worlds of play in non-virtual and virtual contexts.

Future research can explore children's engagement in these contexts further in investigations specifically designed for this purpose. For example, an investigation of immersion in which additional measures of immersion are included, such as an adapted questionnaire measure of immersion suitable for children or measuring eye movements, found previously to be associated with immersion (Jennet et al., 2008). An additional and related avenue for future research is in exploring children's engagement in a wider variety of imaginative activities, particularly in terms of children's creation of fictional worlds. For example, it would be expected that if children's engagement with fictional worlds is an expression of an underlying imaginative characteristic, that similar styles of engagement would be present in relation to engaging with the fictional worlds of novels (Harris, 2000). Further, it would be hypothesised that children who engage more with the fictional worlds of imaginative activities are those who have imaginary friends (Singer & Singer; 1990; Taylor, 1999), are reported as having higher scores on measures of *imaginative/fantasy disposition* (see Section 1.4), and go on to engage in imaginative activities such as 'cosplay' in adulthood (Peeples et al., 2018). In general, research that can inform a deeper understanding of the different aspects of imagination and incorporate insights from streams of research that appear unrelated, including children's engagement with fictional worlds, is an important next step for research in this area.

7.4. Reflecting on the Approach of the Thesis

In relation to the exploratory nature of the approach taken in this thesis (see Section 1.7), the investigations have furthered our understanding, particularly in terms of the original research question as to whether children express their imagination when playing video games. I have found similarities in children's engagement with playing a video game and when playing with toy figures, which I have argued reflects an expression of imagination in both contexts. In answering the research questions, I used principal components analyses and a cluster analysis to group the data that emerged from the coding schemes I developed, in order to assess whether these grouping reflected how children have been theorised to engage in these two activities. The argument that children's immersion with the video game is an expression of their imagination was particularly supported by the findings that children's immersion was associated with their playing with toy figures as an actor, which is an activity that the literature reviewed in Chapters 3 and 4 indicates is an imaginative one, and with their use of language to attribute internal states to fictional characters.

However, there are caveats to the overall approach that should be noted in terms of how they influence the conclusions made and the interpretations of the findings. Firstly, the principal components analysis and cluster analysis are exploratory techniques used to reduce, sub-group, and describe data-sets in terms of capturing associations at the variable or person level (Bergman & Magnusson, 1997; Mandara, 2003; see Section 4.4.3 for further discussion on the limitations of using cluster analysis). In these investigations, both analyses were used to group the data generated from coding schemes developed for the specific tasks used in the Cardiff Child Development Study, and so should be regarded as exploratory cluster groups and factors in order to describe the patterns in the data. Further research is necessary in other samples to both validate that the coding schemes developed are applicable to other samples using similar tasks, and to validate that the factors resulting from the principal components analysis and cluster groups that emerged from the cluster analysis are confirmed in other samples. Therefore, the conclusions emerging from the investigations using these exploratory techniques should be considered as tentative and warrant future research in other samples.

Further, the use of both the principal components analysis and factor analysis could be considered as having limited the investigations in this thesis. In using these methods, the data that emerged from the coding schemes were separated into particular categories that were argued to reflect styles of engagement. In turn, this limited the outcome in terms of these categories reflecting these distinct styles of engagement. Further, the use of such analytic methods influenced the choices of the subsequent analyses, in terms of needing to account for the continuous nature of the factor scores, or groupings from the cluster analysis. However, as noted in Section 1.7, these strategies were chosen due to the constraints related to the design of the Cardiff Child Development Study. Future research that is not constrained in this way can make use of other methods, such as thematic analysis of interviews and questionnaires, to investigate children's engagement with fictional worlds during their play.

A second caveat to the overall approach was in the unexpected consistency in the findings in relation to gender, with boys being more engaged with the play in the role of an actor and being more immersed in the bespoke video game. In the development of the ideas and questions for the investigations, it was not expected that gender differences would be present for children's engagement with the play activities. Indeed, it was expected that any differences in relation to children's engagement with the video game would have been accounted for by boys having more prior experience with video games than girls. Possible interpretations of this difference have been described in Section 7.3 as possibly reflecting cultural gender-stereotypes in relation to play that are entrenched via direct and indirect mechanisms, such as gendered differences in parent-child play and toy-branding respectively. Future research designs that can capture both children's engagement with play and the extent to which they have experienced indirect and direct gender-stereotypic messages regarding play are a necessary next step in further understanding these gender differences in children's engagement with the fictional worlds during play.

A final caveat in relation to the overall approach taken in the thesis is in relation to how imagination was defined, measured, and conceptualized in these investigations. As highlighted in Section 1.7, imagination in this thesis was considered to be measured by children's engagement with the play frame during a free play activity with toy figures. However, imagination is a multifaceted concept that encapsulates phenomena such as ruminations about possible, past or future events, fantasies, rehearsals for social interactions, and the production of creative outcomes (Lyon, 2013; Singer & Singer, 2005; Taylor, 2013; see Section 1.1). In regard to play, imagination is not only considered as being expressed in children's engagement with pretense and fictional worlds, but also in the *creation* of novel ideas and worlds (Fein, 1981; Lillard et al., 2013; Sachet & Mottweiler, 2013; Singer & Singer, 1990; Taylor, 2013; see Section 1.2.1). Therefore, it should be highlighted that the conclusions from the investigations in this thesis that immersion is associated with imagination, relate to the aspect of imagination of engaging with the fictional world created during play. It could be argued that this association does not reflect a shared imaginative component underlying immersion and engagement with the play frame, but is instead a reflection of other factors that were not measured in this thesis. Indeed, a general limitation of the approach taken in the thesis is that the similarities in these constructs was one of the influences that led to the development of the analytic and conceptual strategy (see Section 1.7). Therefore, to further validate that children's immersion with the video game and engagement with the play frame are both activities associated with imagination, further research is necessary with a broader conceptualization and measurement of imagination, such as the creation of novel ideas, future thinking or imagery.

In reflecting on the overall approach taken in this thesis, it is important to consider how these investigations can inform future work. In this discussion, I have highlighted the need for future research to understand better the presence of playful and imaginative activities in middle childhood using clearer, qualitative measures with children and not parents; to compare children's engagement in a wider variety of imaginative activities as a further investigation as to whether this represents the expression of imagination (Harris, 2000); to replicate the approach taken in this thesis in other samples to validate the coding schemes and results of the principal components analysis and cluster analysis; and finally to better understand the nature of the gender effects found for children's engagement with fictional worlds during play.

However, future work can also extend beyond the approach taken in this thesis in several ways. Firstly, in order to further explore whether imagination is a somewhat stable characteristic that is expressed in multiple imaginative activities, future research can make use of longitudinal designs with multiple measures of both imagination and imaginative engagement in various contexts. In doing so, we will be better able to understand the construct of imagination, and the stability of the concept over time and context. Further, to better understand the extent to which children's immersion and engagement with the play frame reflects their imagination, future research can move beyond purely observational approaches. For example, if engagement in fictional worlds does reflect imagination, then interventions designed to improve individual's imagination and creativity (e.g., Karwowski & Soszynski, 2008) should lead to increase engagement with fictional worlds. Further, as noted in Section 1.1.1, activation in the default mode network has been found to be associated with aspects of imagination. Research that can incorporate observational and brain imaging methods can further validate that children's engagement in fictional worlds is an imaginative activity. Therefore, future research can extend the approach taken in this thesis by using the exploratory findings from these investigations as a basis to further investigate the ways in which children express their imaginations in different play activities.

7.5. Final Conclusions

Studying children's play using multiple methods of investigation revealed an interesting pattern of findings regarding play and imagination in the middle childhood period. In this study, children in the middle childhood period were enjoying a variety of playful and imaginative activities. When playing with toy figures and playing a video game, children tended to engage with these fictional worlds in a similar way. Although some gender differences were noted throughout the study, other potential sources of individual variation did not play a role, and so these styles of engagement can be argued to reflect the preferences of individual children. These findings have important implications for educators and therapists; for companies that design video games and toys; and finally, for scientific theories of how imagination is expressed in middle childhood, a time at which some claim that imagination has moved 'underground'.

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Appendix 1.

Play and Peer Relationships

C.1. ACTIVITIES

C.1. What kind of things does ……. like to do?
(Place a tick next to each activity that the child participates in)

C.1. ENJOYABLE ACTIVITIES

1 = Outside Play	11 = Dress-Up
2 = Climbing Frames	12 = Draw and Paint
3 = Swinging	13 = Clay/Playdough
4 = Sliding	14 = Build
5 = Ball Games	15 = Board Games
6 = Hide & Seek	16 = Read alone
7 = Play with Dolls	17 = Video/Computer games
8 = Action Figures	18 = Play mobile figures
9 = Trucks/Cars/Trains	19 = Other *(please specify)*
10 = Playing House	

C.1.2. Do you read to ………….. ? If so, how often?

0 = No	1 = Yes, occasionally	2 = Yes, weekly
3 = Yes, most days	4 = Yes, daily	

C.1.3. Does .... watch television? If so how often on average?

0 = Never	1 = weekly	2 = daily, 30 minutes
3 = daily, 1-2 hours	4 = daily, 2-3 hours	5 = daily, 3 hours plus

C.1.4. Does ....play computer games? If so how often on average?

0 = Never	1 = weekly	2 = daily, 30 minutes
3 = daily, 1-2 hours	4 = daily, 2-3 hours	5 = daily, 3 hours plus

Appendix 2

The Castell Arth Mawr Adventure Game

In this section, the narrative of the Castell Arth Mawr Game (CAMGame) will be described, including a description of the possible choices, outcomes and speech from the characters (for a video demonstration of the CAMGame, visit https://youtu.be/SpixvsHypg8). The nature of the game allowed for children to explore or use their mallets in any way that they liked; however, for the purposes of this section, the description of the choices in relation to the use of the mallet are restricted to those recorded by the testers on the day as analysed in Hay and colleagues (2017).

When the game was loaded, experimenters demonstrated how to use the controller to move around, and how to look around. They then gave the children the following information: "*In this game, you can pretend that you are on a school trip to Castell Arth Mawr with your teacher and your friends. Some of the people might speak to you in the game, so it's important that you stop and listen carefully to everyone that talks to you, as they will tell you what to do and where to go in the game,*" (experimenters did vary in this script, but gave the same information).

The Beginning Level

Figure 1. The beginning scene of the game. Figure 1a is on the left and 1b is on the right.

As the child moves the avatar forwards towards the teacher and the children wearing red sweatshirts (see Figure 1a), a voice is heard saying: *"Welcome to the Castell Arth Mawr adventure. To move forwards push the white button forwards. To move sideways, press the white button left or white. To look around, use the black button."* As the child approaches the teacher, she says: *"Hello there, I'm your teacher Mrs Williams, Castell Arth Mawr is just up ahead."* When the child continues forwards towards the children in the red sweatshirts from the red school, the boy introduces them both: *"Hi! I'm Tom, this is Cerys. We're here to see Castell Arth Mawr."*

As the child walks forwards towards the golden door, the children wearing the red sweatshirts and the teacher can also be seen moving towards the door (see Figure 1b). When the child reaches the door, the teacher says: *"This is a door, to go through doors press the white button forwards."*

The Bottle Scene

Figure 2. The second scene of the game.

After the child walks up to the door and goes through to the next level, the teacher and children from the red school walk towards a hill on the right, at the top of which the next gold door can be seen behind some bottles (see Figure 2). In front of the bottles, there is a man standing facing down the hill. As the child approaches the bottles, the man says: *"Look at these bottles, what a mess! You've been given a mallet you can use to help you get to the door. To get your mallet out, press the purple button. To swing the mallet, press the purple button again. To put the mallet away, press the yellow button."*

CHOICE: Use the mallet to hit the bottles and go to the door **or** walk through the bottles to the door.

The First Push Scene

Figure 3. The third scene of the game.

After the child goes through the door and walks forward, the teacher says: *"If that mallet is in your hand, press the yellow button to put it away please."* In front of the gold door leading to the next scene, there is a child from another school in a blue sweatshirt (see Figure 3).

As the child walks up the path, Tom says: *"Who's that,"* and Cerys says: *"He's from that blue school!"* As the child approaches the boy from the blue school and the door, the boy says: *"You red school loser,"* and the child is 'pushed' backwards.

CHOICE: Use the mallet to hit the boy from the blue school and go to the door **or** walk passed the boy from the blue school to the door.

The Castle Gates Scene

Figure 4. The opening of the Castle Gates Scene.

When the child goes through the door, there is a blacksmith standing next to an anvil and a workbench directly in front of the avatar (see Figure 4). When the child walks towards him, he says: *"Hello there, I'm the castle blacksmith, could you help me? I see you have a mallet there, could you hit this piece of armour a few times? It's for a game later. To get your mallet out, press the purple button. To put it away press the yellow button."*

<u>CHOICE</u>: Use the mallet to hit the armour and continue passed the blacksmith **<u>or</u>** just continue passed the blacksmith.

Figure 5. The stepping stones, bridge and river from the Castle Gates Scene.

Behind the blacksmith there is a lady standing next to some stepping stones leading across a river (see Figure 5). As the child walks towards her, she says: *"Hello there. Can you* *jump like me? Press the green button to jump. Try crossing these stepping stones. To move forward and jump, press the green button and move forwards."* The child can either cross the river by jumping across the stepping stones, or walk across the bridge that is behind the lady.

On the other side of the river there are some stairs leading up to the castle gates, and when the child reaches the stairs, the teacher says: *"There it is, Castell Arth Mawr!"* (see Figure 6a). When the child goes up the stairs and to the castle gates, a voice can be heard that says: *"These are magic gates, they only open when you talk to the magic statue. You'll have to go looking for it."* The magic statue can be found by the child across from the stairs (see Figure 6b). When the child approaches the magic statue, a voice can be heard saying: *"Well done, you have found the magic statue. The magic gates are now open."* The child can then walk back to the gates and through the door into the castle.

Figure 6. The stairs to the castle gates and location of the magic statue in the Castle Gates Scene. Figure 6a is on the left and 6b is on the right.

The Castle Main Hall Scene

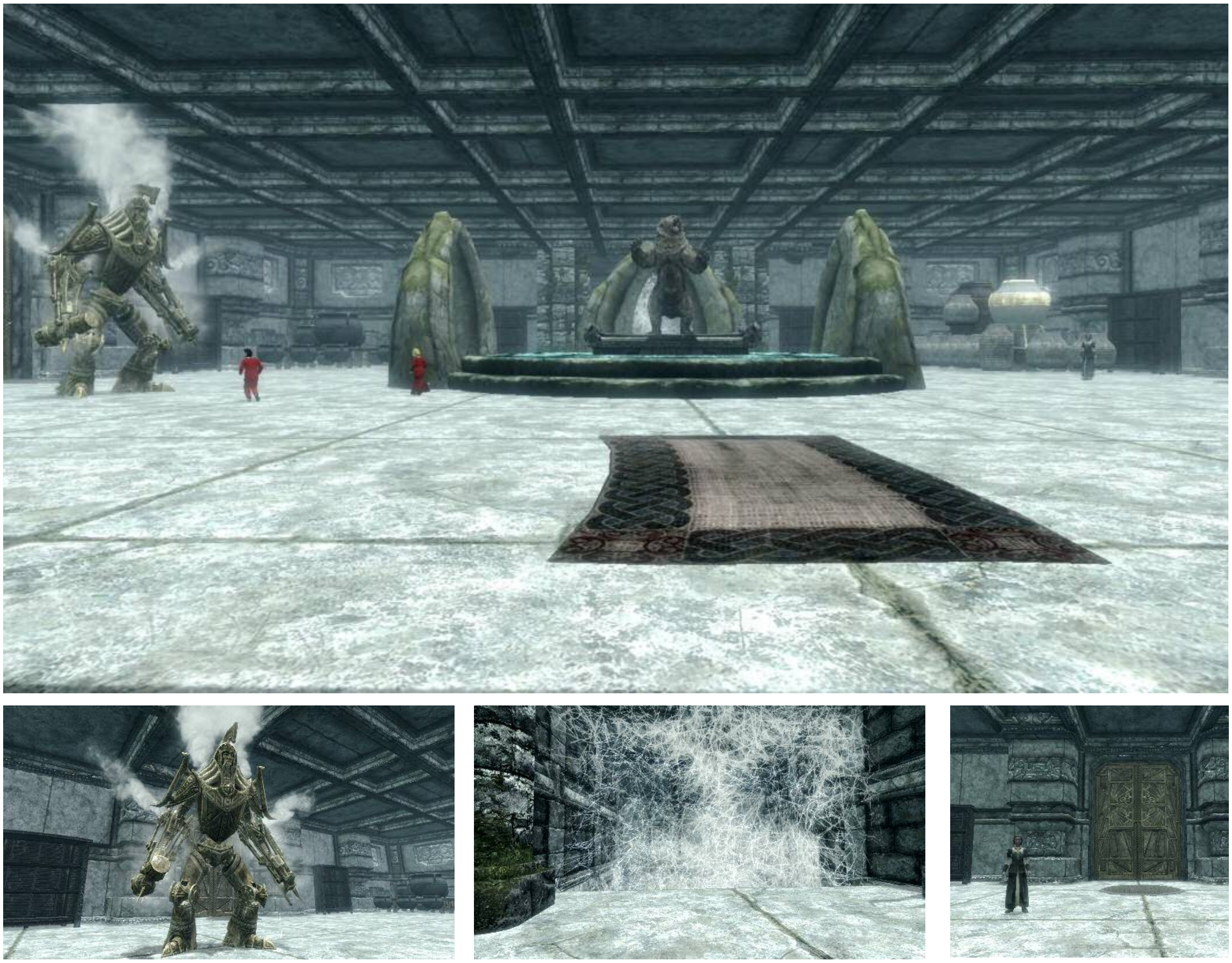

Figure 7. The Castle Main Hall Scene

When the child enters the main hall of the castle, there is a bear on a statue directly in front of them (see Figure 7). To the left of the bear statue, there is a golden robot standing in front of a door emitting steam; behind the bear statue there are some cobwebs leading down some stairs to a barely visible door; and to the right of the bear statue the teacher is standing in front of another door (see Figure 7).

If the child approaches the golden robot, he says: *"Hello there! I am the Castle Guardian! Go through this door and I shall guide you!"*

If the child approaches the teacher, she says: *"Are you ready? Okay let's go this way."*

If the child uses the mallet to hit the bottles or furniture in this area, the teacher says: *"Don't do that please!"* which prompts a choice.

CHOICE: Use the mallet to hit the bottles or furniture and stops when asked **or** uses the mallet to hit the bottles or furniture and does not stop after being asked to.

CHOICE: Goes through the door by the Castle Guardian **or** goes through the door behind the cobwebs **or** goes through the door by the teacher.

The Broken Bridge Scene

Figure 8. The Broken Bridge Scene. Figure 8a is on the left and 8b is on the right.

As soon as the child enters the next scene, a ledge can be seen in front of them and Cerys can be heard saying: *"I'm here with Tom, we both fell down here!"* (See Figure 8a). Behind the child, the teacher can be seen standing on the stairs in front of a golden door (see Figure 8b).

If the child approaches the teacher, she says: *"Okay, you two go on ahead. We'll find another way round."*

If the avatar walks forwards off of the ledge, it will land on the platform with the other children from the red school (and the Castle Guardian if they went through his door in the previous scene) and Cerys will say: *"Phew you made it! Let's go this way."* A golden door is visible down some stairs from this platform.

CHOICE: Go through the door up the stairs behind the teacher **or** fall down off of the ledge and go through the door that is accessible from the platform.

The Storyteller Scene

Figure 9. The Storyteller Scene

When the child goes through either door and enters into this scene, an elderly character, the Storyteller, can be seen sitting in a chair reading a book in front of the golden door (see Figure 9). As the child walks towards the storyteller, she says: *"Hello children I am the Storyteller! This was the castle of the Bear King, before he left he buried treasure in the caves! If you're quick you might find it, before those blue school kids do."*

CHOICE: Use the mallet to hit the storyteller **or** walk past the storyteller towards the door.

As the child approaches the door to the next scene, the Storyteller says: *"Before you go, could you help me? Could you hit that woodpile with your mallet? I need it for later to warm up."*

CHOICE: Use the mallet to hit the woodpile and go through the door **or** just go through the door.

The Cave Scene

Figure 10. The Cave Scene.

As soon as the avatar enters into this scene, it is pushed backwards and the girl from the blue school can be heard saying: *"You red school loser!"* followed by the boy from the blue school saying: *"I pushed you and that means go away."* In front of the child, the blue school children can be seen standing in front of a door on the left; there is a door up some stairs straight ahead; and the red school children can be seen in front of a door on the right (see Figure 10). Only the door that at the top of the stairs will take the child to the next scene. As the child walks forwards, Tom can be heard saying: *"Oww! They pushed me!"*

If the child approaches the red school children, Tom says: *"Oh thank you, I'll be okay,"* and Cerys says: *"I'll stay with Tom. We're going to try this door, you try the door up the stairs."*

If the child approaches the blue school children, the boy from the blue school says: *"Yeah we pushed you and your friends, so what? We're gonna get the treasure before you."*

<u>CHOICE</u>: The child approaches the red school children and stops **<u>or</u>** does not.

<u>CHOICE</u>: The child uses the mallet to hit the children from the blue school **<u>or</u>** does not.

Alternatively, the child can do neither of these actions and proceed to the next scene by going through the golden door at the top of the stairs.

The Ditch Scene

Figure 11. The beginning of the Ditch Scene.

When the avatar goes through the door, it is presented with a dark corridor to walk forwards through (see Figure 11). As they walk forwards, Cerys can be heard saying: *"Hey! What are you doing you meanies?"* The boy from the blue school can then be heard saying *"Haha, you won't find the treasure now losers."* When the child reaches the end of this corridor, two bridges can be seen to the left where they need to cross (see Figure 11).

Figure 12. The end of the Ditch Scene.

When the child reaches the middle of the second bridge, the blue school children can be seen directly ahead (see Figure 12) and Tom can be heard saying *"Those mean bullies pushed us down here!"* As the child continues moving forwards, the girl from the blue school says: *"Oh look, it's stupid again."* At the end of the bridge there are some stairs leading down to where the red children are who are standing in front of the door to the next scene (see Figure 12).

<u>CHOICE</u>: The child uses the mallet to hit the children from the blue school **<u>or</u>** does not.

<u>CHOICE</u>: The child approaches the red school children and stops **<u>or</u>** does not.

Alternatively, the child can do neither of these actions and proceed to the next scene by going through the golden door.

The Racing to the Treasure Scene

Figure 13. The beginning of the Racing to the Treasure Scene.

As the avatar enters this scene, it is presented with a dark corridor with the children from the red school (see Figure 13). When it reaches the end of the corridor, it is presented with a large cavern with a winding path surrounded by foliage and waterfalls (see Figures 13 & 14). Ahead along the path, the Storyteller is sat on a chair next to the children from the blue school and when she is approached she says: *"Oh hello again children, I hope you've all been getting along. The treasure's not far from here, you'll have to go looking for the magic statue. It's somewhere around here."*

<u>CHOICE</u>: The child uses the mallet to hit the children from the blue school **<u>or</u>** does not.

Figure 14. The Racing to the Treasure Scene

Along the path to the door there is a golden door which the child cannot get to and a picturesque surrounding to explore. When the child reaches the end of the path, there is a large tree in front of the gates to the castle with the magic statue next to the gates (see Figure 14). As the child approaches the gates, the boy from the blue school says: *"This stupid door won't open,"* and the girl from the blue school says: *"This statue won't do anything."* When the child approaches the statue, the gates can be heard to open and the child can proceed through the door.

The Bear King Scene

Figure 15. The Bear King Scene.

As soon as the child proceeds through the door, which can take a while to load, the Storyteller and children from both schools are directly in front (see Figure 15). The Storyteller immediately says: *"Yes*, *well done*, *you have found the treasure! And this is the Bear King!"* On the other end of the room, the Bear King is standing by a throne (see Figure 15) and when approached says: *"Hello children! I am the Bear King! Well done, you have found my treasure. The game is over."*

Appendix 3.

Procedure for the Development of the Coding Schemes, Reliability Testing and Implementation of the Coding Schemes.

Development of the Play Engagement Coding Scheme

The coding scheme to measure children's verbal engagement with the play task was adapted from existing coding schemes to measure children's meta-communication during social play with a peer (see Section 4.2.3.2). These were initially compiled and piloted on a random 12% of the available transcripts. During this initial piloting, the definitions and labels for the coding scheme were refined continuously. The coding and data from this piloting stage were *not* included in the final analyses and were re-coded with the final coding scheme following the reliability testing.

Development of the Immersion Coding Scheme

The coding scheme to measure children's immersion in the CAMGame was adapted from existing measures of assessing immersion, largely questionnaires (see Section 5.2.4.2). A pilot version was initially adapted and used on a random 11% (n=30) of the available transcripts. During this pilot coding, the definitions and labels for the coding scheme were refined continuously. The coding and data from this piloting stage were *not* included in the final analyses and were re-coded with the final coding scheme following the reliability testing.

Reliability Testing of all Coding Schemes used in the Thesis

The reliability testing for all coding schemes used in the thesis followed the same procedure. Two coders coded a random sub-sample of the transcripts that were available for the respective tasks. The same random 25% (*n*=67) of transcripts were used for the verbal engagement and use of objects coding schemes in Chapter 4; a random 25% of transcripts (*n*=65) were used for the immersion coding scheme in Chapter 5; a random 26% of transcripts (*n*=67) were used for the use of internal state language (ISL) during the Playmobil free play; and a random 20% of transcripts (*n*=52) were used for the use of ISL during the CAMGame. I was the primary coder, and the second coder was either a PhD student or a post-doctoral researcher who had worked on the Cardiff Child Development Study. Therefore, the reliability coders were not blind to the general aims of the study.

Initially, I met with the coders to discuss the coding scheme and clarify any initial queries in regard to definitions of the criteria. We coded an initial 5 randomly selected transcripts where we discussed our coding and implementation of the coding schemes. Following this any clarifications were implemented and certain definitions were reworded, and this was considered as the final coding scheme. Both coders then coded the random 'reliability' sample that did not include the initial 5 transcripts that were considered as 'training' transcripts.

Reliability analysis were conducted for items of the coding schemes using Intra-Class Correlations after all reliability transcripts had been coded by both reliability coders, and is reported with the descriptions of the respective coding schemes. The transcripts coded by the primary coder (myself) were retained and used in the final analyses.

Implementation of all Coding Schemes used in the Thesis

Following the reliability testing, I coded the remaining transcripts using this final coding scheme. The coding of the transcripts, both for reliability and in the final coding, was done according to the coding schemes and were recorded on separate transcripts (the example transcripts presented in Appendix 4 and 5 are to illustrate examples of the items of the coding schemes. They do not represent fully coded transcripts). Therefore coding was done for the Playmobil free play activity firstly for children's verbal engagement with the free play activity, then for their use of the objects, and finally for their use of internal state language. Similarly, for children's engagement with the CAMGame, the transcripts were firstly coded using the immersion coding scheme, followed by the internal state language coding scheme.

For both tasks, the coding was done primarily using the transcripts that had been created prior to the coding schemes being finalised. However, in certain situations the videos were consulted to aid in coding if the transcripts did not provide sufficient information or to resolve an ambiguity, and this was noted in the coding of the transcript. For example, when coding children's engagement with the CAMGame, the videos had to be referred to on occasion to establish if the child was talking to the game characters, experimenter or other person. A conservative approach was taken to the coding, whereby any instances of speech or action by the child that was ambiguous in terms of whether it met criteria according to the coding schemes, either from the transcript or after consulting the video, were not coded.

Appendix 4.

Example Transcript from the Playmobil Free Play Activity

The example transcript presented below is not a fully coded transcript, only certain examples of the coding have been highlighted for illustrative purposes.

Minutes	Seconds	Speech	Observations of Behaviour	Example Coding
00	00- 05	*(E: I wanna see what you wanna do)*	No actions with toys	OU: No use
00	05- 10		No actions with toys	
00	10- 15	***Hmm*** *(E: What do you want to do with them?)* ***Err***	No actions with toys	
00	15- 20	***I know, it's toy day!*** *(E: Okay)*	No actions with toys	ISL: Cognition(Self)
00	20- 25	***Where, where everyone brings in one of their toys*** *(E: ooh)*	No actions with toys	
00	25- 30	***Where's Alex gone? Here's Alex***	X picks up Alex#1(male)	
00	30- 35	***Hey, it was Alex that was sitting at a table***	X puts Alex#1 in standing position	OU: Set up
00	35- 40	*(E: It was yeah)* ***Alex***	X is holding Alex#1	OU: Handling
00	40- 45	***And Kate***	X picks up mum	
00	45- 50	***Were at home first***	X stands mum inside of yellow box, picks up blackboard and places it outside of yellow box	
00	50- 55	***So this, no***	X picks up Nick and Kate, stands Kate and Alex#1 up inside of yellow box facing one another. Moves mum to stands facing children	
00	55- 60	***And then Nick, Nick's over here. He's, I know***	X picks up Alex#2(female)	
01	00- 05	***I'll sort it out. These are all the ski...these are all the school things***	X puts Nick and Alex#2 down outside of yellow box, picks up teacher	
01	05- 10	*(E: Okay)* ***These are all the home things***	X puts teacher down outside of yellow box. X holds play mat	
01	10- 15	*(E: Okay)* ***I'll***	X picks up play mat with animals on it, picks up chair off play mat and puts it down in yellow box	
01	15- 20	***I'll put the all home things in this area cause this is where I'm playing***	X moves to put play mat in yellow box (knocks Alex#1 over)	ISL: Intention(Self)

01	20- 25	*(E: Okay)* ***Then that one goes on here***	X puts play mat down next to mum, picks up Noah's Ark and places it on play mat	PE: Management 4 (Arrangement)
01	25- 30	***This***	X picks up animals and puts them on the play mat. X picks up cupboard	
01	30- 35	***And then I can just, cause this is mum doing, and, and then***	X puts cupboard down in yellow box, picks up Kate and Alex#1, stands them up in yellow box	
01	35- 40		X stands Kate up in yellow box	
01	40- 45	***And then***	No actions with toys	
01	45- 50	***Kate and Alex are fighting***	X picks up Kate and Alex#1	PE: Narration 1 (Storytelling)
01	50- 55	***Over that cause they both wanna bring it in for toy day*** *(E: Okay)* ***But Alex has...***	X puts Alex#1 down in yellow box	ISL: Desire(Character)
01	55- 60	***Forgo...because Alex, I'm gonna make him in reception***	No actions with toys	
02	00- 05	***And in reception in my school they don't do toy day***	No actions with toys	PE: Reality
02	05- 10	*(E: Oh do they not?)* ***So Alex has forgotten that he doesn't do toy day***	No actions with toys	
02	10-15	*(E: Oh)* ***Cause she's, cause he's got***	No actions with toys	
02	15-20	***He only brings in like on toy a little toy and erm***	No actions with toys	
02	20-25	***And Kate can bring any, as big a toy as she wants***	X stands Kate up outside of yellow box	
02	25-30	*(E: Okay)* ***So, that's not really what happens, what happens really is***	X picks up Kate, holds her standing in yellow box	
02	30-35	***Er I think reception don't bring in anything***	X stands Kate up in yellow box facing mum, picks up Alex#1	
02	35- 40	***And year one and up do. Er so I'm just pretending here***	X stands Alex#1 up in yellow box facing mum	PE: Management 2 (Initiation of pretend)
02	40- 45	***And then, and then mum comes home and reminds him***	X picks up mum, stands her up facing Alex#1	
02	45- 50	In play voice: ***"Alex, you can only bring like two liitle toys in"***	X is holding mum facing Alex#1, lets go	PE: Enactment OU: Expected use
02	50- 55	***And Alex says:*** In play voice: ***"Oh yes, I forgot"*** ***And he brung***	X picks up animal from play mat	PE: Enactment ISL: Cognition(Character)
02	55- 60	***And he brung, the...***	X puts animal down outside of yellow box	

Note. The child's speech is presented in bold italics, any experimenter or sibling speech is presented in italics in brackets.
ISL= Internal State Language. OU=Object Use. PE=Play Engagement.

Appendix 5.

Example Transcript from the Castell Arth Mawr Game and Transcript Guide

Castle Arth Mawr Transcript Guide

This document details the rules used when transcribing the Castle Arth Mawr game in order to minimise any variation in the way the task was introduced to the child and to ensure the speech captured reflects the child being in control of the game.

Task start: The task is considered as beginning for the sake of transcribing in the segment in which the teacher introduces herself. This is due to variations in how and when experimenters introduced the game and explained how to use the controller.

Task end: The task is considered as ending for the sake of transcribing two segments after the Bear King speaks to the child. This allows sufficient time for the Bear King to finish the speech, and gives a consistent end point for all participants as some children played on in this final scene for some time, whilst others did not.

Exclusions: The following segments are excluded from any coding, calculations of talkativeness scores or task length:

- Any segments during which the child is not at the laptop for the full segment.
- Any segment in which the experimenter has taken control of the game or controller in order to correct a glitch or move the character along without asking the child or the child asking.

- **Note – if the child asks the experimenter to help them/take control of the game, or the experimenter asks to take control and the child agrees, then the segment should be transcribed and included.**

- Any segment which includes the child repeating a part of the game, for example if the task is done over two visits. The transcriber should try to ensure that there is as little overlap as possible.

Example Transcript

The example transcript presented below is not a fully coded transcript, only certain examples of the coding have been highlighted for illustrative purposes. Each 5 second segment was read to establish if the speech in the segment met criteria for any of the items of the coding scheme (see Section 5.2.4.2 and Appendix 3), and it should be noted that a single segment could meet criteria for multiple items. For example, at 01:05-10 of the example transcript, the segment meets criteria to be coded as a reference to their own internal state of intention, as well as referring to the game characters. If there were any ambiguities as to whether the speech met criteria, the videos were consulted in the first instance to assess whether this resolved the ambiguity. If not, a conservative approach was taken and the speech was not coded.

Minutes	Seconds	Speech	Example Coding
00	00- 05	TEACHER INTRODUCES SELF	
00	05- 10	*(E: Brilliant should we follow and see what these children say?)* ***I'm following the teacher***	IMM: Reference to Game Character
00	10- 15	*(E: Go forward a bit more)* ***To there*** TOM INTRODUCES SELF	
00	15- 20	***Yeah I'm here to see them*** *(E: Yeah you're all there together)*	
00	20- 25	*(E: So shall we go see the castle?)*	

		Where, they're running to catch up	
00	25- 30	*(E: Okay)* ***I'm coming. What are they gonna say?***	
00	30- 35	TEACHER TALKS ABOUT DOORS	
00	35- 40	***Where's the white button?*** *(E: This is the white button, we'll pretend that it's white okay)*	
00	40- 45	***Push the white button down?*** *(E: Forward, so just go forward)* ***Forward. So all I do***	IMM: Use of Controller
00	45- 50	*(E: There we go)* ***I'm on the other side of it*** *(E: You are yeah, so that's the door you just came through)*	
00	50- 55	*(E: Very clever)* ***It looks exact, what's that?*** *(E: That's a bottle)*	
00	55- 60	***Looks a big bottle. What do I, where do i...ah yes. I have to run with the teacher***	
01	00- 05	*(E: Okay)* ***They're not saying anything***	
01	05- 10	***I'm going to follow my friends*** BOTTLE SCENE	ISL: Intention(Self)
01	10- 15	***Ey?***	
01	15- 20	*(E: Purple button's there)*	
01	20- 25	***I can't hear*** *(E: Can you not hear him?)*	ISL: Perception(Self)
01	25- 30	*(E: What he's saying is you've been given a mallet, and if you want to use your mallet, press the purple button)*	
01	30- 35	*(E: To bring it out)* ***So what's a mallet?*** *(E: a mallet is like a big big hammer)*	
01	35- 40	***Oh yeah, to like smash those?*** *(E: That's up to you. You can do what you want in this game)*	
01	40- 45	*(E: And [inaudible] there. And if you want to swing it, you press that button again)*	
01	45- 50	***Oh*** *(E: But only if you want, it's up to you)* ***I wanna smash things***	ISL: Desire(Self)
01	50- 55	*(E: Okay)*	
01	55- 60	***Ah, I need to go forward. Slash***	
02	00- 05	***I'm just getting them all, alright I'm gonna***	
02	05- 10	***Look at the waterfall!***	

02	10-15	***Er, I need***	
02	15-20	***Do I need to break my way through these?*** *(E: What do you think?)* ***I'm not sure***	IMM: Help Seeking
02	20-25	***Cause there's, I'm gonna look for my teach, there's my teacher***	
02	25-30	*(E: Maybe she's waiting to see what you wanna do first)*	
02	30-35	***I can, I can go through there. I got some space***	
02	35- 40	***I'm just trynna get so I can***	
02	40- 45	***Look, so I can just, imagine now, aww I can just run through them***	ISL: Cognition(Other)
02	45- 50	*(E: Oh right)* ***Do I need to get through the door?***	
02	50- 55	*(E: What do you think?)* ***Yes*** *(E: There you are)* TEACHER TALKS ABOUT MALLET	
02	55- 60	***Where's the yellow button?***	
03	00- 05	***I put it away, and if I need it again***	
03	05- 10	***Where are you gone? What do you, what are you gonna say?***	IMM: Speech to Game Character
03	10- 15	***You gonna say anything? No***	
03	15- 20	***I think they're just waiting to...Who's that?!*** *(E: He's from the blue school, so the other school on this trip)*	
03	20- 25	SKIP OCCURS	
E takes control of game to address the skip.			
03	25- 30	*(E There we go, so carry on, let's see what happens next)*	
03	30- 35	***Who are that boy? I dunno he's from*** PUSH SCENE	
03	35- 40	***What's he doing?*** *(E: Dunno, what do you think he just did?)* ***Punched me back***	
03	40- 45	*(E: Did he?)* ***He doesn't like me*** *(E: Does he not?)* ***Well he must not like me if he punched me***	IMM: Characteristic of Game Character ISL: Preference(Character)
03	45- 50	*(E: Oh dear)*	
03	50- 55	***He's walking away now***	
03	55- 60	***Shall I go, I'll go down***	
04	00- 05	***I went, who's that man?*** *(E: Can you see the screen okay lovely?)*	

		Yeah	
04	05- 10	***I can see that man, who's...*** BLACKSMITH SCENE	ISL: Perception(Self)
04	10- 15	***Yeah***	
04	15- 20	***I got my mallet erm***	
04	20- 25		
04	25- 30	***There I know, he told me to do that did he?***	
04	30- 35	***What did he tell me to do?*** *(E: Yeah that's what he said)* ***There that's all I need to do***	
04	35- 40	***I, oh wrong thing. How do you put your mallet (inaudible)*** *(E: The yellow button)*	
04	40- 45	***Yellow. I don't need it for now. Ah I go through the door***	
04	45- 50	***There's no other way to go*** *(E: I think you may have just come through that door)*	
04	50- 55	*(E: What about over there, what's over there?)* ***I, no that's just a wall. No I think I came through***	
04	55- 60	***The, a door over there*** *(E: Okay)* ***Did I? I'm just gonna check this door***	
05	00- 05	***Just*** *(E: okay)* ***It see , it see***	
05	05- 10	***Hey***	
05	10- 15	***AH I can't go through that. I must have already gone through it***	
05	15- 20	*(E: Oh okay)* ***AH. There's no other way to go through*** *(E: If you go up here)* ***Ah yeah***	
05	20- 25	*(E: Around that wall there's some steps. And then turn around and go forward)*	
05	25- 30	***I went through the bushes*** *(E: [inaudible] more, look there's a lady there to go to)*	
05	30- 35	STEPPING STONES SCENE	
05	35- 40	***Where's the...***	
05	40- 45	*(E: Good job)*	
05	45- 50	***I like this*** *(E: Good)*	ISL: Preference(Self)
05	50- 55	***I'm going on***	
05	55- 60	***Oh! There's something in the water***	

06	00- 05	***The water's going down fast*** *(E: it is)* ***What is the***	IMM: Creation of Narrative
06	05- 10	***Why is the lady not doing it? Why was she telling me to do it*** *(E: Cause that's all her job is)*	
06	10- 15	*(E: To tell you what to do, she doesn't need to cross)*	
06	15- 20	***Aww I nearly fell. I can get back, back on dry land***	
06	20- 25	***Oh am I in the water?*** *(E: little bit, but it doesn't matter)*	
06	25- 30	TEACHER: *"There it is, Castle Arth Mawr!"* ***Hey, what do I***	
06	30- 35	***Oh I can't get, oh. I'm gonna see if there's a door round here***	
06	35- 40	*(E: These are some steps, perhaps you can go up the steps)* ***I'll go up the steps***	
06	40- 45	MAGIC GATES	
06	45- 50	***Ah they only, what only talks?***	
06	50- 55	*(E: The gates only open, when you find the magic statue. So you have to go find the magic statue)*	
06	55- 60	*(E: For the gates to open)* ***DO I have to go back?*** *(E: I dunno. Where do you think the magic statue might be?)*	IMM: Help Seeking
07	00- 05	***It might be down, gates only open down here***	
07	05- 10	*(E: When the magic statue, when you find the magic statue)* ***That looks like that magic statue***	
07	10-15	*(E: Well, shall we go and see)* ***Oh I can't go down there***	
07	15-20	***I'll go down the steps. I did not know, I didn't see the***	ISL: Intention, Cognition, Perception(All Self)
07	20-25	***Hey, how do we get to it? It's up there now*** *(E: It is yeah)*	
07	25-30	*(E: It's a bit higher than the bottom isn't it. It's not quite at the top)* ***No***	
07	30-35	***If I go here*** *(E: What's that?)* ***Aah***	
07	35- 40	***Oh. We go. Oh, I know how to jump***	
07	40- 45	***What, what's the jump button?*** *(E: Green. Perfect)*	IMM: Use of Controller
07	45- 50		
07	50- 55	MAGIC STATUE FOUND	

		I can go back	
07	55- 60	*(E: Good job, that was really good)* ***I get, I get to go in***	
08	00- 05	***Oh*** *(E: Yes you do)* ***Ah I fall down*** *(E: Oh dear, doesn't matter)*	
08	05- 10	***Climb back up the steps. The gates are open. I'm going straight in***	
08	10- 15	***I'm going through the door. Wow what's this***	
08	15- 20	*(E: Wow that's the inside of the castle)* ***What's that?***	
08	20- 25	***What's going on? That looks like it's on fire or something***	
08	25- 30	*(E: it does doesn't it. It's not on fire though, don't worry)*	
08	30- 35	***So I just look round the castle do I?*** *(E: In this room there are three doors)*	IMM: Help Seeking
08	35- 40	*(E: You can go through whichever one you want)* ***I'll just find a door and go through it***	
08	40- 45	***There's one. I'll just go through*** *(E: One's with the teacher, the other door's the spider web, and the other one's with the castle guardian)*	
08	45- 50	*(E: So it's up to you)* ***So can you go through the spider one***	
08	50- 55	*(E: It's up to you what you do)* ***I'll go, hey how do you, how do you even get through***	
08	55- 60	***Do you just walk through them or something? There's no door here***	
09	00- 05	*(E: Keep going then you come to it eventually)* ***Ah***	
09	05- 10	BROKEN BRIDGE SCENE ***Where are you?***	IMM: Speech to Game Character
09	10- 15	***I can't see. Where?***	ISL: Perception(Self)
09	15- 20	***Ah there they are. what do I do?***	
09	20- 25	***Do I run down and help them?*** *(E: It's up to you, do you want to do that?)*	
09	25- 30	***Yeah*** *(E: Go down)*	
09	30- 35	***Hey what, oh*** BROKEN BRIDGE SCENE FALLS OFF	
09	35- 40	***Which way? Er this is the only way, there's a door!***	
09	40- 45	***Let's go through it***	

09	45- 50	***I went through the...ooh, who's this?***	
09	50- 55	***Place. It looks like some kind of, nice carpet. That looks like...***	
09	55- 60	***...the king or something*** *(E: She's the storyteller, shall we listen to what she's got to say?)*	
10	00- 05	***Oh*** STORYTELLER SCENE	
10	05- 10		
10	10- 15		
10	15- 20		
10	20- 25	***Oh the blue school kids are evil*** *(E: Are they?)* ***They must be cause before***	IMM: Characteristics of Game Character
10	25- 30	***The, and he punched me. They must be!***	
10	30- 35	***SO I must go through that door*** *(E: Okay)* ***Sometimes I do***	
10	35- 40	***Is when I go forward on...*** STORYTELLER SCENE WOODPILE ***Yeah***	
10	40- 45	***Where's the woodpile?***	
10	45- 50	***Where's the woodpile? Can't see any woodpile***	
10	50- 55	*(E: By the door)* ***By that door?*** *(E: Yeah)* ***I'll get the, my wood...***	
10	55- 60	***How do you, oh*** *(E: But it's up to you what you do)* ***I forgot how you, when the wood***	ISL: Cognition(Self)
11	00- 05	***How do you get your mallet out again?*** *(E: Purple button)* ***Purple***	
11	05- 10	***Got it, I'm gonna***	
11	10- 15	***Oh, let's chop the wood for 'em. (inaudible). There***	
11	15- 20	***I'll hit this one too***	
11	20- 25	***Am I hitting it? Am I whack it with my***	
11	25- 30	***Where, how did you. How do you put your mallet away again?***	
11	30- 35	*(E: Yellow button)* ***There put it away***	
11	35- 40	***Sib knows!***	ISL: Cognition(Other)

		CAVE SCENE ***Aww red school***	
11	40- 45	***Loser. How do, what....*** CAVE SCENE TOM	
11	45- 50	***Who? Aww he fell down. The*** *(E: So these are in your school)*	
11	50- 55	*(E: Remember?)* ***He's, they're my friends*** CAVE SCENE RED	IMM: Characteristics of Game Character
11	55- 60	***Oh I try the door up the stairs they said***	
12	00- 05	***So. What do I have to do?***	
12	05- 10	***I'm going to get the treasure*** DITCH SCENE CERYS	
12	10-15	***Where, where are you? Where are you?***	IMM: Speech to Game Character
12	15-20	***Where's the person that. Okay***	
12	20-25		
12	25-30	***SO I have to, do I have to***	
12	30-35	DITCH SCENE BLUE BOY ***So I'm finding the treasure?***	
12	35- 40	***So I'm finding the treasure right?*** *(E: Yeah)*	
12	40- 45	*(E: you gotta try and find the treasure)* ***Before the blue school does***	
12	45- 50	***I can't get through here*** *(E: Let me see)*	
12	50- 55	*(E: There we go, oh)* ***NO*** *(E: Keep looking round)*	
12	55- 60	***Hmm*** *(E: not quite down there)*	
13	00- 05	*(E: Keep looking round)*	
13	05- 10	***I'm gonna look for any secret passages. That looks like some***	
13	10- 15	***That did look like some kind of secret passage*** *(E: Do you want me to help, show you where to go?)*	IMM: Creation of Narrative
13	15- 20	***Yeah. I wanna go*** *(E: Go over that bridge there)* ***Yeah I just came back***	ISL: Desire(Self)
13	20- 25	***I just came back over that bridge***	

		(E: And then over that bridge)	
13	25- 30	***Wait, aah I didn't see that*** DITCH SCENE TOM ***Aah there's*** *(E: Blue school children there)*	
13	30- 35	*(E: And red...)* DITCH SCENE BLUE GIRL ***Aah there's not my friends***	
13	35- 40	***They came through that door. And I came through the door over there***	
13	40- 45	*(E: They did, so they're waiting for you down there now)* ***There's the blue kids***	IMM: Reference to Game Character
13	45- 50	***Come on guys, what have you got to say guys? Nothing***	IMM: Speech to Game Character
13	50- 55	***Come on, come on***	
13	55- 60	***Hey so which, this?*** *(E: What do you wanna do now? Do you wanna see the blue kids?)*	
14	00- 05	*(E: Or do you wanna go to the reds?)* ***I'll see what the blue kids are gonna do***	
14	05- 10	***They're not gonna do anything***	
14	10- 15	***What do I do?*** *(E: SO go back over that side of the bridge)*	
14	15- 20	*(E: Remember over, I can't see now, over here and)*	
14	20- 25	***I can't see the bridge*** *(E: There)* ***Where?*** *(E: There, down here a bit more)*	ISL: Perception(Self)
14	25- 30	***Oh. (inaudible)*** *(E: Down a bit more, and to the left)*	
14	30- 35	***There's the...*** *(E: And then down the steps)* ***(inaudible) guys***	
14	35- 40	***Let's go through the door. I can't. ah yeah I can***	
14	40- 45	***Wow***	
14	45- 50	***Is this where I came through? No*** *(E: This is a new room)* ***This*** *(E: You're outside now)*	
14	50- 55	***There's the blue kids***	
14	55- 60	RACE TO TREASURE STORYTELLER	

15	00- 05		
15	05- 10	***Ah I've got....again?!***	
15	10- 15	***I gotta, I gotta get before the blue kids*** *(E: Okay)*	
15	15- 20	***Cause otherwise the blue kdis*** RACE TO TREASURE BLUE GIRL	
15	20- 25		
15	25- 30	***I don't need, maybe I need my mallet***	
15	30- 35	***For something, my big hammer. For something***	
15	35- 40	***Play (inaudible). Might come in handy on my adventure***	IMM: Future Thinking
15	40- 45	***Couldn't it? Oh I don't wanna go through the bushes***	
15	45- 50		
15	50- 55	***Which way shall I go?*** *(E: Think you need to go up)* ***Up there***	
15	55- 60	***I may find a magic statue near soon***	
16	00- 05	***Aww. Go up this***	
16	05- 10	***So***	
16	10- 15	***Which way, there is no other way***	
16	15- 20	***Let me get on the path, I can't get on***	
16	20- 25	***Can't see any magic statue yet*** *(E: Keep looking)*	
16	25- 30		
16	30- 35	***No. where's the boy? Where's the boys?***	IMM: Reference to Game Character
16	35- 40	***Let's see where they've gone. So I'm gonna go over here***	
16	40- 45	***Hey, where are the place? Where is it?***	
16	45- 50	***Keep looking***	
16	50- 55	***Huh! Look!***	
16	55- 60	***Come look here, look!*** *(E: What's that?)* RACE TO TREASURE BLUE BOY	
17	00- 05	*(E: What do you think that could be?)* ***Dunno*** *(E: Do you wanna have a look?)* ***There's the magic statue!***	
17	05- 10	***The gold statue*** RACE TO TREASURE CERYS	
17	10-15	***What, who's saying that?***	

17	15-20	***They said far in, what's going on with the gates?***	
17	20-25	***I just went by it, and it does nothing*** *(E: I think it unlocked)*	
17	25-30	*(E: I think those unlocked)* ***Oh*** *(E: Give it a go, see what happens. These are heavy doors mind)*	
17	30-35	*(E: So they do take a couple of minutes to open. So we have to be quite patient)*	
17	35- 40	***Waiting***	
17	40- 45	*(E: There we go)* BEAR KING SCENE STORYTELLER	
17	45- 50	***Look at all that treasure!***	
17	50- 55	*(E: Well done you, you found the treasure, that's amazing)* ***There's loads of it***	
17	55- 60	*(E: There is)* ***Blue kids. What's that? What's, look at the big table***	IMM: Reference to Game Character
18	00- 05	***With all the food*** *(E:D o you wanna have a look around)* ***Yeah I'll have a look at the ooh***	
18	05- 10	***That doesn't look like treasure*** *(E: What do you think Sib?)*	
18	10- 15	***Looks like blocks doesn't it?***	
18	15- 20	***(inaudible), I go***	
18	20- 25	***Where is he?***	
18	25- 30	***Ah there's the king. Is that the king?*** BEAR KING SCENE BEAR KING	
18	30- 35	*(E: Well done you)*	
18	35- 40	*(E: The game is over, you've completed my game. That's amazing)* ***I like, I like the treasure***	ISL: Preference(Self)

Note. The child's speech is presented in bold italics, any experimenter or sibling speech is presented in italics in brackets.
IMM= Immersion. ISL= Internal State Language.

Appendix 6.

A Further Exploration of Children's Use of Internal State Language in the Playmobil Free Play and Castell Arth Mawr Game

In Chapter 6, I explored children's use of internal state language as they engaged in free play and played the Castell Arth Mawr Game (CAMGame) with regard to the referent of the internal state language. In the following sections, I conducted further analyses to explore the categories of the internal state language according to the referent of the term in the two contexts.

Results

Exploring Children's use of Internal State Language in the Playmobil Free Play Activity and CAMGame

Figure 1 displays the relative proportions of the use of internal state language categories in the two activities. A repeated measures ANOVA revealed that there were significant differences in the proportions of the internal state categories referenced by the children during the free play activity, $F(3.86, 965.49) = 40.51$, $p < .01$. Pairwise comparisons, adjusted for multiple comparisons using the Bonferroni statistic, revealed that children referred to *cognitions* and *intentions* at comparable levels and more so than any other internal states. Children referred to *desires* at comparable levels to intentions and *perception* and more so than the remaining categories. Children referred to perceptions more so than *physiology*, *preference* or *emotion* which all occurred at comparable levels (all ps < .05).

A repeated measures ANOVA revealed that there significant differences in the proportions of the internal state categories referenced by the children during the CAMGame, $F(3.46, 865.16) = 145.36$, $p < .01$. Pairwise comparisons, adjusted for multiple comparisons using the Bonferroni statistic, revealed that children referred to *cognitions* more so than any other internal state. Children referred to *perceptions* and *intentions* at comparable levels and more so than the remaining internal states. Children referred to *desires* more so than the remaining categories. Children referred to *physiology* and *preference* at comparable levels and more so than *emotion* (all ps $< .05$).

In relation to comparisons of the occurrence of the internal state language categories between the two activities, a series of t-tests revealed that children referred to *physiology*, $t(250) = -2.44$, $p < .05$, and *desires*, $t(250) = -.4.37$, $p < .01$, more in the Playmobil free play activity, but referred to *perceptions* more in the CAMGame, $t(250) = 2.04$, $p < .05$.

Table 1 displays the inter-correlations of internal state language categories between the two activities. In terms of associations between categories of internal states between the two activities, only the use of *intentions,* $r(251) =.15$, $p < .05$, and *cognitions*, $r(251) =.15$, $p < .05$, were positively correlated in the two activities.

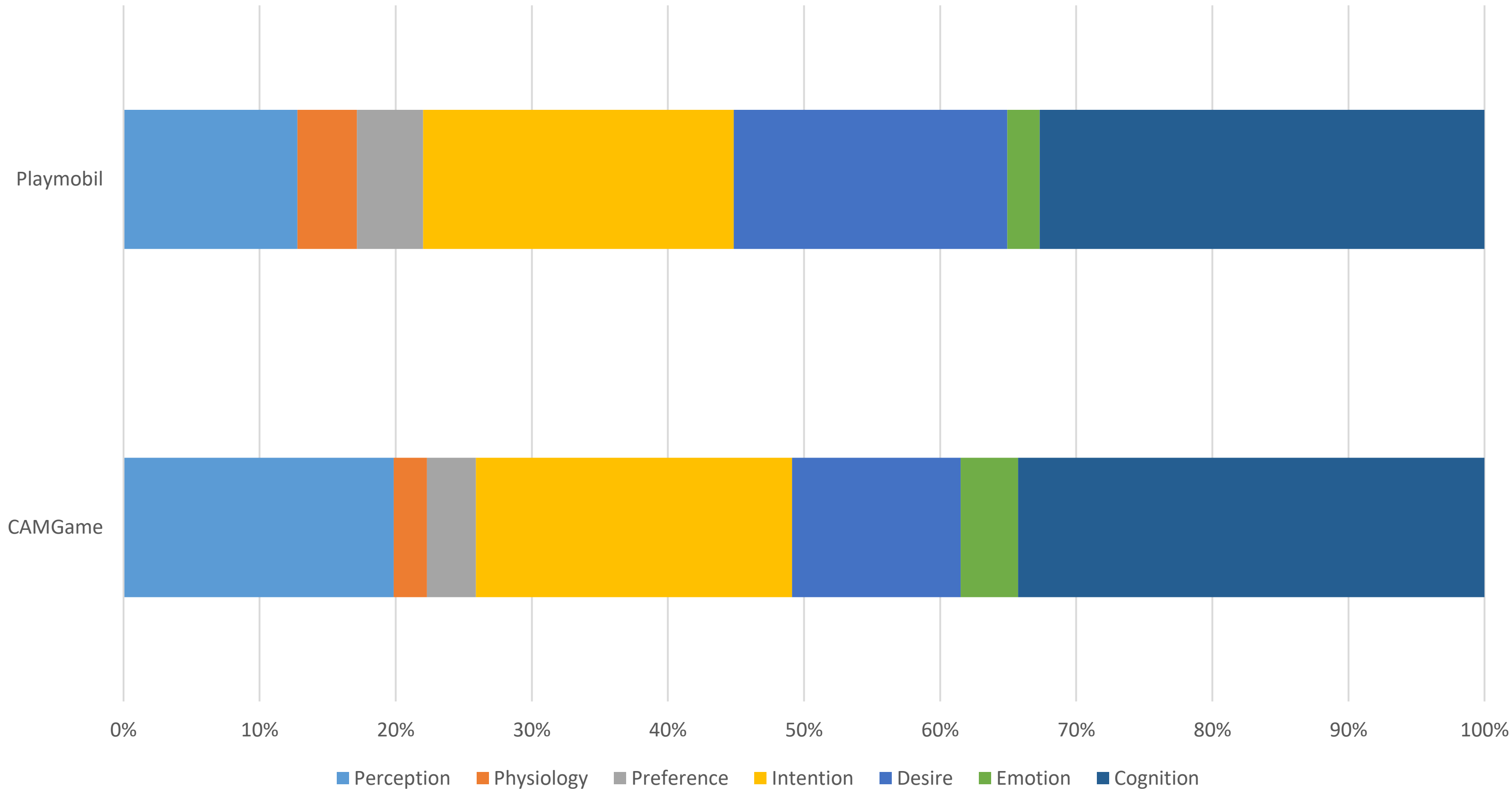

Figure 1. Relative proportions of internal state language categories in the two contexts.

Table 1. Inter-correlations of internal state language categories between the two activities.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Playmobil Perception	-													
2. Playmobil Physiology	-.02	-												
3. Playmobil Preference	.10	.40**	-											
4. Playmobil Intention	.48**	.30**	.33**	-										
5. Playmobil Desire	.29**	.25**	.20**	.29**	-									
6. Playmobil Emotion	.06	.29**	.20**	.23**	.13*	-								
7. Playmobil Cognition	.43**	.12	.21**	.42**	.21**	.23**	-							
8. CAMGame Perception	.02	.10	.01	.06	.16*	.04	.07	-						
9. CAMGame Physiology	.04	.08	-.07	.09	.06	.06	.04	.10	-					
10. CAMGame Preference	.01	.17**	.11	.13*	.12	.13*	.11	.09	.00	-				
11. CAMGame Intention	.19**	.11	-.05	.15*	.12	.16*	.23**	.05	.37**	-.04	-			
12. CAMGame Desire	-.01	.07	.02	.07	.02	.03	.07	-.09	-.03	-.02	.04	-		
13. CAMGame Emotion	-.03	-.02	.08	-.11	-.04	.00	.04	.00	.11	-.03	.10	-.02	-	
14. CAMGame Cognition	.06	.03	.07	.12	.00	.13*	.13*	.09	.10	.10	.19**	.11	.14*	-

Note. * $p < 0.05$, ** $p < 0.01$.

Exploring Children's use of Internal State Language Attributed to the Self in the Playmobil Free Play Activity and CAMGame

Figure 2 displays the proportion of categories of internal states attributed to the self during the Playmobil free play activity and the CAMGame. A series of t-tests revealed that children referred to their own *perceptions*, $t(250) = 11.05$, $p < .01$, *intentions,* $t(250) = 2.04$, $p < .05$, and *emotions*, $t(250) = 5.14$, $p < .01$, whilst playing the CAMGame more than they did during the Playmobil free play activity.

In relation to associations between the two activities, children's references to their own *preferences,* $r(251) = .12$, $p < .05$, *intentions,* $r(251) = .18$, $p < .01$, and *cognitions,* $r(251) = .15$, $p < .05$, were positively correlated between the Playmobil free play activity and the CAMGame.

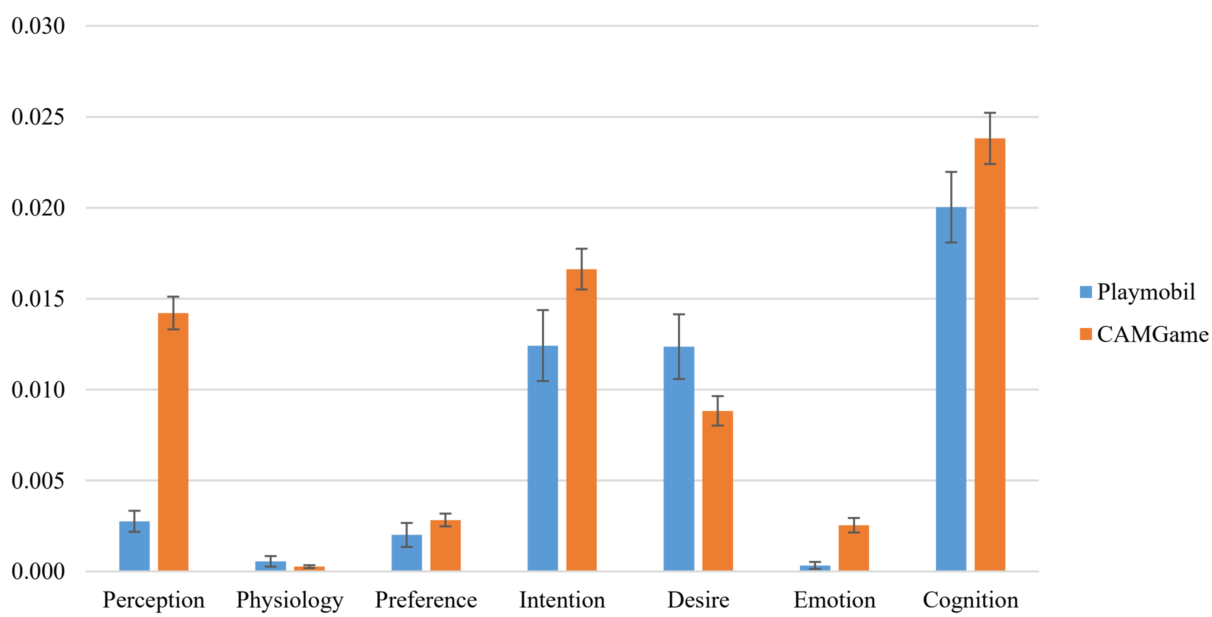

Figure 2. Proportion of internal state language categories directed towards the self in the Playmobil free play and CAMGame activities. Error bars represent ± standard error of the mean.

Exploring Children's use of Internal State Language Attributed to the Characters in the Playmobil Free Play Activity and CAMGame

Figure 3 displays the proportion of categories of internal states attributed to the characters during the Playmobil free play activity and the CAMGame. A series of t-tests revealed that children referred to their own *perceptions*, $t(250) = -6.23$, $p < .01$, *physiology,* $t(250) = -3.16$, $p < .01$, *preferences,* $t(250) = -2.96$, $p < .01$, *intentions,* $t(250) = -4.51$, $p < .01$, *desires,* $t(250) = -5.05$, $p < .01$, and *cognitions,* $t(250) = -5.64$, $p < .01$,whilst engaging in the Playmobil free play activity more so than during the CAMGame.

In relation to associations between the two activities, children's references to the characters' *physiology,* $r(251) = .17$, $p < .01$, and *cognitions,* $r(251) = .14$, $p < .05$, were positively correlated between the Playmobil free play activity and the CAMGame.

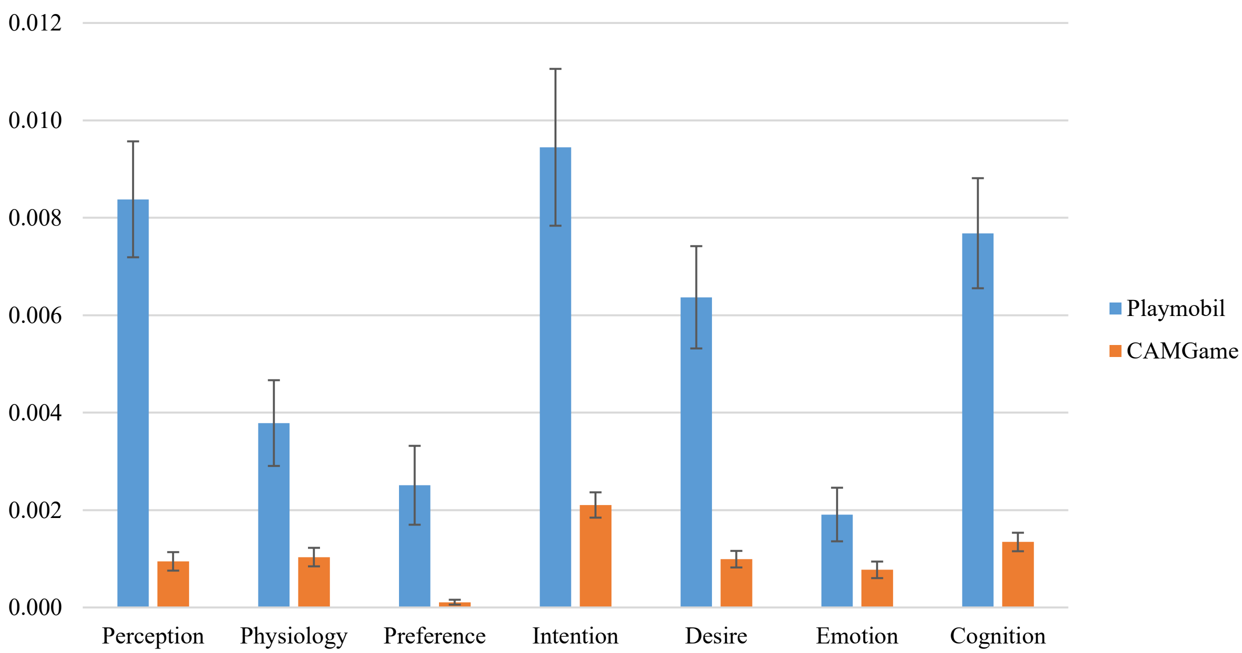

Figure 3. Proportion of internal state language categories directed towards the characters in the Playmobil free play and CAMGame activities. Error bars represent ± standard error of the mean.

Exploring Children's use of Internal State Language Attributed to others in the Playmobil Free Play Activity and CAMGame

Figure 4 displays the proportion of categories of internal states attributed to others during the Playmobil free play activity and the CAMGame. A series of t-tests revealed that children referred to the *desires,* $t(250) = -2.31$, $p < .05$, and *cognitions*, $t(250) = -2.00$, $p < .05$, of others more during the during the Playmobil free play activity than during the CAMGame

In relation to associations between the two activities, only children's references to the *cognitions* of others*,* $r(251) = .17$, $p < .01$, were positively correlated between the Playmobil free play activity and the CAMGame.

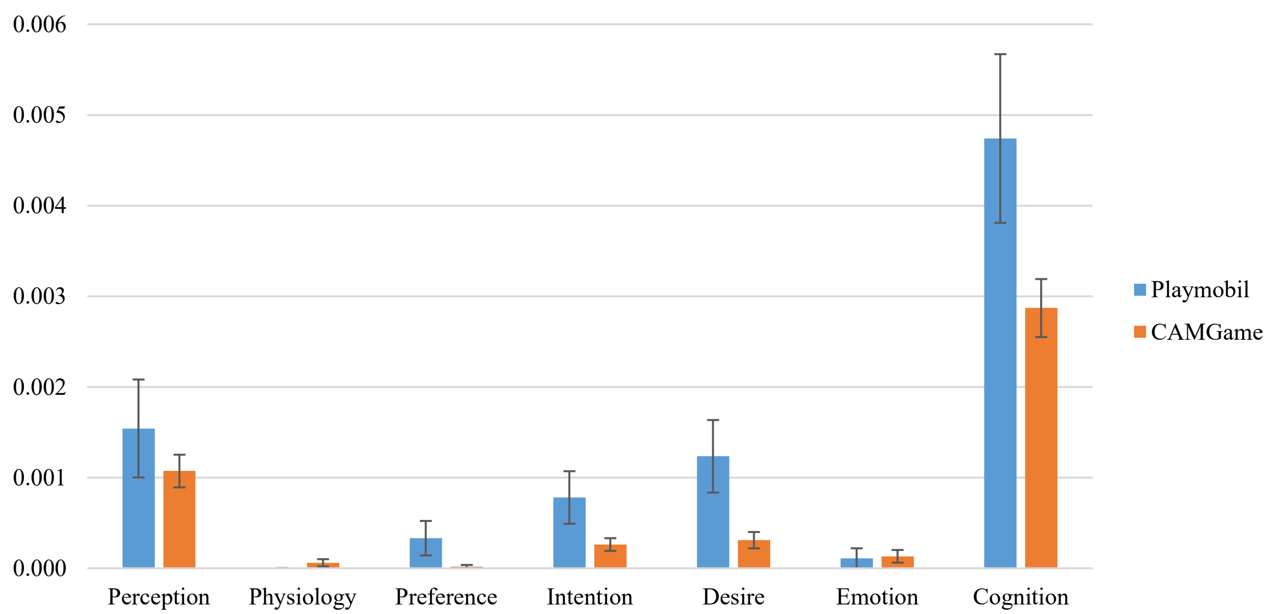

Figure 4. Proportion of internal state language categories directed towards others during the Playmobil free play and CAMGame activities. Error bars represent ± standard error of the mean