Investigating and improving processes necessary for socio-emotional functioning in children with behavioural problems

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Summary of thesis

Although behavioural problems and antisocial behaviour (ASB) that are established in childhood do not always lead to criminality in later life, they do often persist into adulthood and are associated with a range of costly, negative outcomes. Despite this, existing interventions are limited in their effectiveness.

We know that emotion recognition is essential for successful socio-emotional functioning and antisocial individuals often display an impairment in emotion recognition. In addition, the ability to understand the self and to understand others (Theory of Mind; ToM) is important for socio-emotional functioning and an impairment in either is a risk factor for ASB. Furthermore, while lower levels of emotion recognition, ToM and self-esteem have all been implicated in the development of ASB, research has not yet explored the relationship between these three processes and their relationship with behaviour problem severity.

The first two chapters of this thesis aimed to examine emotion recognition and ToM (Chapter 2) and emotion recognition and self-esteem (Chapter 3) in children with behavioural problems compared to typically developing controls. The relationship between these processes and any correlation with behavioural problem severity was also explored. Given the relationship between an impairment in emotion recognition and displays of ASB and previous work that has found that emotion recognition training improves behaviour in youth offenders, Chapter 4 investigated whether emotion recognition training delivered to children with behavioural problems reduced their behavioural problems and improved their mental health and wellbeing.

We found that, in addition to an impairment in emotion recognition, children with behavioural problems showed lower levels of ToM and self-esteem compared to typically developing controls. Moreover, we found that emotion recognition was significantly positively related to both ToM and self-esteem and all three were significantly inversely related to behaviour problem severity. We found that children who showed an initial impairment in emotion recognition and received a short, computerised emotion recognition training

programme showed a significant improvement in negative and neutral recognition and a reduction in problem behaviours, specifically in peer problems, 6 months later. This thesis suggests that targeting emotion recognition, a neuropsychological correlate of ASB, through early intervention represents a relatively easy and efficient way to reduce problem behaviour and improve peer relationships in children.

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Summary of individual role in the research presented in this thesis

Recruitment

I was responsible for all aspects of recruitment for participants who formed the behavioural problems (BP) group. This included liaising with the Early Intervention Partnership Hub, contacting schools, scoring the questionnaires to determine which children were eligible to participate and organising testing sessions.

Data collection

The data collection for both BP and typically developing (TD) participants was split between follow PhD student Laura Hunnikin and me. I conducted research sessions approximately 1h15m long, during which I collected data on children's emotion recognition ability, theory of mind, self-esteem and IQ as well as on empathy and demographic information. For BP participants I also conducted a follow-up research session 2 weeks after participants had received Cardiff Emotion Recognition Training (CERT). I was responsible for the longitudinal aspect of the research and the collection of questionnaires at the six month follow up.

Data analysis and interpretation

I performed all data analyses presented in this thesis and interpreted the results.

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List of Abbreviations

ACE	Adverse Childhood Experiences
ADHD	Attention Deficit Hyperactivity Disorder
AE	Affective Empathy
APA	American Psychiatric Association
ASB	Antisocial Behaviour
ASD	Autism Spectrum Disorder
ASPD	Antisocial Personality Disorder
BP	Behavioural Problems
BP-	Behavioural Problems without emotion recognition impairments
BP+	Behavioural Problems with emotion recognition impairments
CAMHS	Child and Adolescent Mental Health Services
CBT	Cognitive Behavioural Therapy
CD	Conduct Disorder
CE	Cognitive Empathy
CERT	Cardiff Emotion Recognition Training
CU	Callous and Unemotional
DBD	Disruptive Behaviour Disorder
DSM	Diagnostic and Statistical Manual of Mental Disorders
GD	Goal Directed
EIF	Early Intervention Foundation
FER	Facial Emotion Recognition
FFT	Functional Family Therapy
FSIQ	Full Scale Intelligence Quotient
FSW	Family Support Worker
HAB	Hostile Attribution Bias
IES	Integrated Emotion Systems
MANCOVA	Multivariate Analysis of Covariance
MST	Multisystemic Therapy
NICE	National Institute for Health and Clinical Excellence
ODD	Oppositional Defiant Disorder
PCSO	Police Community Support Officer
SDQ	Strengths and Difficulties Questionnaire
SES	Socioeconomic status
SPPC	Self-Perception Profile for Children
SPSS	Statistical Package for the Social Sciences
TD	Typically Developing
ToM	Theory of Mind
UK	United Kingdom
US	United States
VIQ	Verbal Intelligence Quotient
WASI	Wechsler Abbreviated Scale of Intelligence

1. General Introduction

"If we do not understand the mechanisms by which disorders unfold we are in a very limited place to develop preventative models of health"

(McCrory, as in Science and Technology Committee, 2018, p.19)

1.1   Overview

In the UK, the most common developmental psychiatric disorders are those characterised by displays of antisocial and aggressive behaviour (National Institute for Health and Clinical Excellence; NICE, 2013) and ASB that is established in childhood is often maintained, continuing into adulthood (Loeber, Burke & Lahey, 2002). The term antisocial behaviour (ASB) is an umbrella term, covering different clinical diagnoses, judicial terms and a wide range of behaviours, meaning that antisocial individuals represent a heterogeneous group of people. Despite its numerous manifestations and heterogeneous nature, an impairment in emotion recognition has been consistently found in many antisocial populations (Marsh & Blair, 2008).

Numerous theories account for the relationship between an impairment in emotion recognition and displays of ASB. An impairment in emotion recognition has a profound effect on an individual and can result in a fearless disposition (e.g., Eysenck, 1964; Gray, 1987) and a lack of empathy (Blair, 2005), both of which can contribute to the development of ASB. When considering the implications an impairment in emotion recognition can have, it is also important to acknowledge the social function of emotions. Accurate emotion recognition is essential for the initiation and maintenance of social relationships and individuals who are good at recognising emotions are more socially skilled and popular (Edwards, Manstead & MacDonald, 1984).

Similarly important for successful social interaction is the ability to understand both the self and others (Fonagy & Luyten, 2018). As with emotion recognition, research has found that antisocial individuals have lower levels of self-perception and self-esteem compared to typically developing controls (Henricsson & Rydell, 2004) and display low levels of Theory of

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Mind (ToM) which is reflective of difficulties in understanding others (Sharp, 2008). Although these three processes, essential for successful social interaction and socio-emotional functioning, have all been implicated in the development of ASB, research has not yet explored the relationship between emotion recognition and the understanding of both the self and others in children with behavioural problems.

Although the majority of crime in the UK is committed by a small group of individuals who displayed behavioural problems during childhood and adolescence (Sainsbury Centre for Mental Health, 2009), research challenges the notion that children displaying behavioural problems inevitably mature into adult offenders (Odgers et al., 2007; Skeem, Scott & Mulvey, 2014). Interventions that target the underlying neuropsychological processes involved in ASB represent the best opportunity to alter antisocial trajectories (van Goozen & Fairchild, 2008; White, Frick, Lawing, & Bauer, 2013; Wilkinson, Waller, & Viding, 2015). An impairment in emotion recognition has been found in numerous antisocial populations and is thought to play a causal role in the development and maintenance of ASB (Blair, 2005). Research has shown that emotion recognition training has a positive effect on behaviour in antisocial adolescents (Hubble, Bowen, Moore, & van Goozen, 2015; Penton-Voak et al., 2013).

In recent years, the importance of early intervention has begun to be recognised and research demonstrates that early intervention is both behaviourally (Skeem et al., 2014) and financially (Chowdry & Fitzsimons, 2016) more effective than late intervention. However, less research has explored whether emotion recognition training can be used to intervene early in children displaying behavioural problems and the research that has been conducted has its limitations. This chapter discusses the importance of researching ASB in children and the impairments antisocial individuals display in emotion recognition and Theory of Mind (ToM) as well as their lower levels of self-perception and self-esteem. It goes on to discuss existing interventions and their limitations as well as outstanding issues surrounding the use of

emotion recognition training as an early intervention technique in children with behavioural problems.

1.2   What is antisocial behaviour?

ASB is an umbrella term that covers: (1) clinical diagnoses of conduct disorder (CD) and oppositional defiant disorder (ODD) which are disruptive behaviour disorders (DBDs) that are characterised by displays of chronic and repetitive aggressive behaviours, a disregard for the rights of others and a violation of social norms (APA; American Psychiatric Association, 2013); (2) more general behaviour that violates social/moral norms (e.g., bullying and lying; Skeem et al., 2014); and (3) judicial terms which consider levels of criminality and delinquency. The prevalence of DBDs in children and young people in the UK is 5% and their prevalence increases through childhood and is higher in boys compared to girls (NICE, 2013). DBDs have a significant impact on health and social care: 30% of GP child consultations are for behavioural problems and DBDs are the most common reason for referral to Child and Adolescent Mental Health Services (CAMHS; NICE, 2013). In addition, in the UK, in the year ending March 2016, 79,600 offences had been committed by young people alone (Ministry of Justice, 2016).

Research has shown that once established, ASB is maintained with research finding that anywhere from 50% to 90% of adults with antisocial personality disorder (ASPD) had been diagnosed with CD during childhood (NICE, 2013; Loeber et al., 2002). As well as predicting future arrests, crime severity and conviction rates (Huesmann, Eron, & Dubow, 2002), ASB displayed during childhood is associated with a range of negative outcomes in later life and 90% of those with ASPD will have another mental health problem (NICE, 2013). In addition, ASB in childhood is associated with poor overall physical health and substance problems (Bardone et al., 1998; Fombonne, Wostear, Cooper, Harrington, & Ter, 1983) as well as violent relationships and erratic employment patterns (Scott, Knapp, Henderson, & Maughan, 2001). In addition to the negative individual consequences, childhood ASB is hugely costly to society and by the age of 28, individuals who displayed ASB during

childhood will have cost ten times more through the use of public services than those who did not (Scott et al., 2001). Research into reducing and preventing ASB in children is therefore crucial to both the individual displaying these behaviours and to society as a whole.

1.2.1   Risk factors for antisocial behaviour

A multitude of risk factors contribute to the development of ASB (Farrington, 1995). These risk factors can be broadly categorised into five different domains: family, individual, school, peer and community (Herrenkohl et al., 2000). A host of different familial risk factors have been identified, including exposure to violence, poor and hostile parenting, parental imprisonment, marital instability and parental substance abuse (Bor, McGee & Fagan, 2004; Coie & Dodge, 1998). Low socioeconomic status (SES) is another risk factor for ASB and children from a low socioeconomic background are three to four times more likely to have CD (NICE, 2013). In addition, poor academic acheivement, (Herrenkohl et al., 2000), rejection by peers (Murray & Farrington, 2005) and involvement with delinquent peers (Herrenkokhl et al., 2000) are all associated with ASB. These risk factors appear to have a cumulative, additive effect and the more risk factors an individual is exposed to early in life, the more serious the offending later on (Stouthamer-Loeber, Wei, Loeber, & Masten, 2004).

1.2.2   Heterogeneity of antisocial behaviour

ASB and conduct problems manifest in many different ways and these different manifestations are associated with distinct aetiologies. As such, children and adolescents displaying conduct problems represent an extremely heterogeneous group. According to the criteria outlined in the Diagnostic and Statistical Manual of Mental Disorders (DSM; APA, 2013) there are 15 symptoms for CD and in order to receive a diagnosis of CD children must have at least 3 CD symptoms, plus impairment (Hudziak, Achenbach, Althoff & Pine, 2007). According to these criteria, there are 32,647 distinct symptom profiles that would qualify for a diagnosis of CD (Nock, Kazdin, Hiripi, & Kessler, 2006). Hudziak et al. (2007) demonstrate how this can be problematic, giving the example that an 11 year old girl with 3 symptoms of CD (skips school, stays out after curfew, has shoplifted) is deemed to be categorically similar

to a 17 year old boy with all 15 symptoms of CD (including using a weapon and forced sex). In an attempt to reduce some of this heterogeneity, researchers have differentiated between different subtypes of ASB to try to identify forms of ASB and subsequently to inform the development of appropriate interventions (e.g. Moffitt, 1993).

One subgroup identified are those individuals who display conduct problems with high levels of callous and unemotional (CU) traits. CU traits are patterns of callousness, uncaring behaviour, reduced guilt and reduced empathy (Blair et al., 2004) and are described as the childhood precursor to adult psychopathy (Barry, Frick, Deshazo, McCoy, & Loney, 2000). CU traits have been incorporated into the latest edition of DSM with the "limited prosocial emotions" (LPE) specifier of CD (APA, 2013). The presence of CU traits is associated with a more severe, aggressive and constant pattern of ASB and in particular is associated with instrumental (cold) aggression, as opposed to reactive (hot) aggression (Frick, Cornell, Barry, Bodin, & Dane, 2003; Frick & White, 2008; Kruh, I, 2005).

Some researchers have attempted to use these two subtypes of aggression (instrumental and reactive) to further reduce the heterogeneity of ASB. Crick and Dodge (1996) hypothesised that displays of instrumental aggression and reactive aggression are due to differences in social information processing patterns. Crick and Dodge (1996) suggest that individuals who display instrumental aggression evaluate aggressive acts as more positive and as an effective means of obtaining (social) goals whereas acts of reactive aggression tend to emerge as an angry response to provocation or because hostile intent is attributed to a peer in an ambiguous situation. However, some research has argued against the existence of these two subtypes of aggression (Bushmman & Anderson, 2001). This argument is supported by the fact that the same individual is capable of displaying both types of aggression (Fanti, Frick, & Georgiou, 2009; van Goozen, Fairchild, Snoek & Harold, 2007).

Other research has suggested that ASB is best conceptualised as consisting of two different dimensions: aggressive and rule breaking (Burt & Donnellan, 2008). These two dimensions, or subtypes, are thought to have distinct aetiologies (Tackett, Krueger, Iacono & McGue, 2005) and research suggests that they are independently and differentially associated with personality dimensions (Burt & Donnellan, 2008). While rule breaking ASB is associated with impulsivity, affective dysregulation and negative emotionality appears to be specific to aggressive ASB (Burt & Donnellan, 2008). As different causal processes appear to contribute to aggressive and rule breaking ASB, it is important to differentiate between these different dimensions when considering intervention options (Tackett et al., 2005).

Age of onset of ASB has also been used to reduce heterogeneity. Moffitt (1993) identified two developmental taxonomies of ASB: adolescence-limited (AL) and life-course persistent (LCP). Moffitt (1993) proposed that those on a LCP pathway begin offending earlier in childhood (before the age of 10) and engage in ASB throughout their lives, resulting in more severe and persistent ASB. It is thought the ASB of these individuals is due to a combination of exposure to adversity and neuropsychological impairments. In contrast, those on an AL pathway display ASB during adolescence but desist during adulthood. Unlike the LCP pathway, the AL pathway does not have a neuropsychological basis and instead an individual's ASB is due to them mimicking the behaviour of their antisocial peers (Moffitt, 1993). More recent work suggests a third developmental taxonomy also exists: childhood-limited (CL; Barker, Oliver & Maughan, 2010). These children display conduct problems before the age of 10 but the problems do not continue into adolescence and adulthood. These children are, however, at an increased risk for depression later in life (Fonagy & Luyten, 2018). In recent years the developmental taxonomy theory has been challenged and it has been suggested that it is the seriousness of ASB, regardless of age of onset, that is associated with neuropsychological impairments (Fairchild et al., 2011; Fairchild, Van Goozen, Calder, & Goodyer, 2013; Fairchild, Van Goozen, Calder, Stollery, & Goodyer,

2009). Fairchild et al. (2013) suggest that differences in the age of onset of ASB are due to environmental adversity, poverty and/or poor parental supervision.

The various attempts to reduce the heterogeneity of ASB have all employed a categorical approach: e.g., low versus high CU traits, early versus late age of onset, aggressive ASB versus rule breaking ASB. Despite attempts to categorically differentiate between different subtypes of ASB, research suggests that antisocial individuals differ in degree rather than kind (Fairchild et al., 2013; Skeem, Scott & Mulvey, 2014) and dimensional approaches, instead of categorical, are needed to understand ASB and to develop treatments and interventions (Hudziak et al., 2007). Despite its heterogeneity, impairments in emotion recognition are thought to be a common theme in the development of ASB (Blair, 2005). This has led to calls for more neuro-psychologically based approaches to conceptualising, studying and treating ASB (Patrick, Durbin & Moser, 2012).

1.3.   Interventions for antisocial behaviour

Several different interventions have been developed that attempt to reduce ASB in different ways. For example, Social Skills Training teaches verbal and non-verbal behaviours to help individuals relate to and interact with other people. Following participation in Social Skills Training, children showed fewer externalising problems, less aggression and more prosocial behaviour (Webster-Stratton, Reid, & Hammond, 2001). Cognitive behavioural therapy (CBT) is another intervention for ASB. It focuses on changing thought processes which in turn should change negative behaviours. In a meta-analysis, Landenberger and Lipsey (2005) found that the means odds ratio of not offending was 1.53 times greater in the CBT group than the control group.

Parent management training and functional family therapy (FFT) target the family dynamics and parenting that are thought to play a role in the development of ASB. Parent management training aims to improve the parent-child relationship and reduce ASB by helping parents learn how to control aggressive behaviour (Kazdin, 1987), while FFT views

ASB as a symptom of dysfunctional family relations and aims to help families to establish and maintain new patterns of family behaviour which replace the existing dysfunctional ones. Dretzke et al. (2009) found that children participating in FFT showed a reduction in the number of difficult behaviour problems while Barnoski (2002) found that FFT was successful in reducing recidivism in 400 families.

Multisystemic Therapy (MST) is one of the most extensively validated and widely used interventions for ASB (Henggeler & Sheidow, 2012). MST works with the antisocial individual's family, school and neighbourhood in order to address the multifaceted nature of ASB. In MST the intervention is guided by an assessment to determine the individual's key problems as identified by the family and others. Research has shown that individuals with CD who took part in MST showed a decrease in psychiatric problems and ASB (Sundell et al., 2008) while youth offenders who participated in MST showed a reduction in self- and parental-reports of ASB (Butler, Baruch, Hickey & Fonagy, 2011).

1.3.1 Problems with current interventions

The multifaceted, heterogeneous nature of ASB poses a challenge to the development of interventions and while current interventions *can* be effective, key limitations remain. For example, while parenting training is effective, it requires parental effort and involvement and some parents cannot or will not participate (Webster-Stratton et al, 2001). Similarly, regarding CBT, there are issues regarding whether children and adolescents will engage with CBT long enough for it to better their behaviour (Singh et al., 2007). Overall, current interventions are only moderately effective despite being time intensive and expensive (Foster, 2010). Given the financial cuts mental health, educational and police services are currently facing, there is a need for cheaper, shorter and more effective interventions that can be accessed by those children and young people most in need of them.

It is of note that some interventions have not only failed to reduce crime, but have actually led to more offending. In the USA, 'Scared Straight' attempted to deter children and

adolescents from future offending by organising visits to prison during which they could observe prison life and interact with adult inmates. However, the intervention increased the chances of offending and was found to be more harmful than if nothing had been done (Peterosino, Turpin-Petrosino, Hollis-Peel & Lavenberg, 2013).

In the UK, the Sure Start scheme was introduced by the government in 1999. It aimed to improve the health and development of children under 4 years old and their families in socially deprived communities. Despite the government investing millions into the scheme it had no significant effect in preventing or reducing CD (Belsky, Melhuish, Barnes, Leyland, & Romaniuk, 2006). This reinforces Moffitt's (2005) finding that finances and resources have been wasted on interventions that have no impact on negative behaviours. Even interventions that have improved behaviour are often not cost effective. For example, the Fast Track Intervention in the USA, which provides guidance in developing social skills and behaviour regulation, led to a reduction in negative behaviours and fewer convictions. However, it cost $58,000 per child (Dodge et al., 2015) and a cost benefit analysis found that it did not show meaningful effects on costly outcomes and as such was not cost effective (Foster, 2010).

In addition to the financial cost, current interventions for ASB also require a lot of time and resources that some agencies may lack (Curtis, Ronan, & Borduin, 2004). For example, as well as being very expensive, the Fast Track Intervention is a 10-year programme necessitating a large commitment (Dodge et al., 2015). Similarly, successful interventions that lead to a reduction in aggression through focusing on the formation of social bonds take on average 45 weeks to complete (Caldwell, McCormick, Umstead, & Van Rybroek, 2007). Meanwhile, MST provides support to the whole family for 4-6 months and therapists are available to families 24 hours a day, 7 days a week (Henggeler, Melton, & Smith, 1992; Littel, Campbell, Green and Toews, 2009).

1.3.2 Targeted interventions

Research has shown that to be effective interventions need to be tailored to the cognitive, emotional and social characteristics of those individuals who display ASB (Fairchild et al., 2009; Hunnikin & van Goozen, 2018; Wilkinson et al., 2015). For example, differences in aggression (instrumental versus reactive) are thought to be due to differences in social information processing patterns and as such may require different interventions. Interventions targeting instrumental aggression may need to target the way in which an individual evaluates aggressive acts whereas interventions targeting reactive aggression should focus on the intent an individual attributes to another person's act. As an individual can display both types of aggression, it may be necessary to use multiple different interventions.

In mental health research more generally, there is a need to increase the mechanistic understanding of mental health problems and to match the right treatment to the right patients (Cuthburt & Insel, 2013). Consequently, dimensional approaches to studying psychopathology and ASB are on the rise (Marsee, Silverthorn & Frick, 2005; Passamonti et al., 2010) as they allow for an increased understanding about the processes underlying mental health problems and ASB and help to explain variation in severity. This is reflected by the development of the Research Domain Criteria (RDoC) research framework.

1.4 The Research Domain Criteria (RDoC)

Established in 2009, the RDoC is a research framework that aims to identify the underlying causes of mental health problems and psychopathology. It advocates studying the underlying and transdiagnostic processes in mental health problems (Insel et al., 2010) to lay the groundwork for the development of personalised, targeted intervention and treatment options for mental disorders (Cuthburt & Insel, 2013). It is based on the integration of different levels of information including biology, behaviour and context (Insel et al., 2010) and adopts a dimensional approach, studying the full range of variation. The RDoC is constructed around six major 'domains' of human functioning, each of which is comprised of

'constructs' which encompass behaviour, processes, mechanisms and responses (Insel et al., 2010).

The six domains of the RDoC are: (1) negative valence systems, (2) positive valence systems, (3) cognitive systems, (4) systems for social processes, (5) arousal/regulatory systems and (6) sensorimotor systems. When considering the processes and mechanisms underlying displays of ASB and conduct problems, the systems for social processes domain is of particular relevance. It encompasses processes, behaviour and mechanisms which "mediate responses in interpersonal settings" (https://www.nimh.nih.gov/research-priorities/rdoc/definitions-of-the-rdoc-domains-and-constructs.shtml) and it is comprised of four constructs: (1) social communication (including emotion recognition ability); (2) perception and understanding of others; (3) perception and understanding of the self; and (4) affiliation and attachment.

By its nature, ASB is characterised by displays of inappropriate interpersonal behaviour (Marsh & Blair, 2008) and therefore, inappropriate responses in interpersonal settings. Fonagy and Luyten (2018) took an RDoC approach to conduct problems in children and young people and determined that impairments in the constructs covered by the systems for social processes domain were central to ASB in children and young people, specifically those necessary for the ability to understand both others and the self. However, it is important to note that they also identified some key issues and limitations of the RDoC criteria, specifically regarding which constructs are covered by which domains. For example, they argue that emotion recognition could be considered either under the negative valence system, which is responsible for responses to aversive situations, or under social communication in the systems for social processes domain.

In Fonagy and Luyten's (2018) view, the domain under which emotion recognition falls seems arbitrary, but it does represent a limitation of the RDoC matrix. It seems particularly odd that an initiative that takes such a unique, dimensional approach to studying mental

illness and its underlying processes and mechanisms would leave little room for overlap between domains and the constructs encompassed by them. This limitation is further emphasised by Fonagy and Luyten (2018) who suggest that it would have been more helpful to place attachment and affiliation in the positive valence domain, rather than the systems for social processes, due to the overlap between attachment and affiliation and reward and reward prediction, which fall under the positive valence domain. Thus, while the RDoC represents a unique, dimensional and extremely helpful approach to the study of mental illness and psychopathology, it is important to accept that it has its limitations. In the context of studying behavioural problems and ASB, it may be more helpful to use the constructs outlined by RDoC to guide research as opposed to focusing on the domains each construct falls under.

1.5   Emotion Recognition

1.5.1   The importance of emotion recognition

Emotions serve a communicative function (Darwin, 1871) and as such, the accurate recognition of emotions is crucial for interpersonal interactions and social functioning (Ekman, 1992; Herba & Phillips, 2004). Emotion recognition is the identification of emotionally salient information in the environment (Phillips, 2003) and can include recognising verbal and nonverbal cues to the emotions of others. Recognition of the emotions of others provides insight into their mental states which allows one to understand their behaviour (Hunnikin & Van Goozen, 2018). Emotion recognition is positively associated with the initiation and maintenance of healthy social relationships (Izard et al., 2001) and young children who are good at recognising the emotions of others have been shown to be more socially skilled and popular (Edwards et al., 1984).

1.5.2   Facial emotion recognition development

Emotion recognition develops during childhood and adolescence. Research has shown that infants as young as four months can differentiate between positive and negative emotional displays (Walle & Campos, 2012) and at 3 years old children are capable of basic

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emotion recognition (Pollak, Cicchetti, Hornung, & Reed, 2000). Berzenski and Yates (2017) showed that from 4-8 years old emotion recognition accuracy increased. The age at which emotion recognition develops appears to be emotion-dependent (Durand, Gallay, Seigneuric, Robichon, & Baudouin, 2007). For example, at age 5 or 6 years old, children's recognition accuracy for happy and sad expressions was similar to adults. In contrast, this ability did not develop for fear and anger until 7 and 9 years old respectively (Durand et al., 2007).

While it is clear that emotion recognition develops during childhood, the research regarding the specific age at which it develops is mixed. For example, Lawrence, Campbell and Skuse (2015) showed that in 6-16 year olds, while the recognition accuracy of facial expressions of happiness, surprise, fear and disgust increased with age, it did not for expressions of sadness and anger. In contrast, Chronaki, Hadwin, Garner, Maurage and Sonuga-Barke (2014) found that in 4-11 year olds, the recognition accuracy for sadness improved with age but not for happiness or anger. Although the emotion recognition tests used in the work by Lawrence et al. (2015) and Chronaki et al. (2014) both used stimuli from the Facial Expression of Emotion Face Set (Ekman & Friesen, 1976) there were key differences in measurement that may account for the different results. While Lawrence et al. (2015) explored the ability to recognise expressions of happiness, sadness, fear, anger, disgust and surprise, Chronaki et al. (2014) examined only angry, happy and sad recognition. Moreover, while the measure used by Lawrence et al. (2015) included 60 faces (10 for each emotion), the measure used by Chronaki et al. (2014) used only 10 expressions, all displayed by the same female model. Regardless of the development of emotion recognition ability during childhood for specific emotions it is clear that these skills continue to develop during the primary school years (Rodger, Vizioli, Ouyang, & Caldara, 2015) and individuals do not reach adult levels of recognition accuracy until early adolescence (Gao & Maurer, 2010; Herba & Phillips, 2004).

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1.5.3   Learning emotion recognition

The recognition of others' emotions is learned through experience (Moulson et al., 2015; Pollak et al., 2000; Van Goozen, 2015). The social constructivist model of emotion recognition suggests that social interactions are critical to the development of emotion recognition (McClure, 2000) and as such caregivers play a key role in the development of children's emotion recognition ability. They expose children to emotional expressions (Malatesta, 1985) and also provide situational context and behavioural responses to emotional expressions so children learn the meaning of these expressions (Pollak & Sinha, 2002). Research has shown that children's emotional understanding is most likely to develop in families where (1) there are regular expressions of positive emotions; (2) negative emotions are displayed less frequently but are still discussed; and (3) parents are sensitive to the child (Laible, 2011; McElwain, Halberstadt, & Volling, 2007). Aberrant caregivers (i.e., abusive or neglectful, Pollack et al., 2000), however, display less positive facial expressions and more negative expressions and consequently children who have been neglected show difficulties in emotion recognition (Pollak et al., 2000; Pollak & Sinha, 2002). For example, Pollack et al. (2000) found that neglected children were significantly worse at discriminating between facial displays of different emotions than typically developing controls were.

1.6   Antisocial behaviour and emotion recognition

1.6.1   Facial emotion recognition impairments in antisocial populations

Emotion recognition is crucial for social functioning and as such an impairment in emotion recognition can have negative consequences, including displays of ASB. A failure to correctly interpret another's emotion and respond appropriately can result in ASB (Blair, 2003). A body of research has shown that individuals who display ASB show an impairment in emotion recognition ability. An impairment in facial emotion recognition ability has been reported in numerous antisocial populations, including antisocial children (van Goozen, 2015), adolescents with CD (Fairchild et al., 2009), youth offenders (Bowen, Morgan, Moore, & Van Goozen, 2014) and adult offenders with ASPD (Dolan & Fullam, 2006). Although

impairments in emotion recognition have been consistently observed in antisocial populations, the specific nature of the impairment has been debated.

A large body of work has found antisocial individuals to be specifically impaired at recognising fear and sadness (Blair et al., 2004; Blair & Coles, 2000; Marsh & Blair, 2008; Montagne et al., 2005). However, other work has found an impairment in the recognition of anger (Fairchild et al., 2009; Schönenberg, Louis, Mayer, & Jusyte, 2013) and disgust (Kosson, Suchy, Mayer, & Libby, 2002). In addition, some work has found a pervasive impairment for the recognition of negative emotions in general (Bowen et al., 2014) while other work has found an impairment in the recognition of all basic emotions (Dawel, O'Kearney, McKone, Palermo & O'Kearney, 2012).

There are multiple reasons that could explain the different findings. The use of different samples could account for the differing results. For example, Dawel et al. (2012) found that adolescents show different emotion recognition impairments compared to adults. In addition, the number of emotions studied and differences in the intensities of emotions shown to participants may contribute to the different results (Bowen et al., 2014). It has been suggested that instead of one central mechanism being responsible for the recognition of all emotions, separate mechanisms may be responsible for recognising different emotions and as such, emotion recognition can be selectively impaired, or unimpaired (Sprengelmeyer, Rausch, Eysel, & Przuntek, 1998; Whalen et al., 2001). It is also important to note that emotional stimuli lead to a range of responses across individuals and thus to individual variability (Hamann & Canli, 2004) and individual differences in emotion processing have been observed (Eugène et al., 2003). Even in antisocial samples individual variability exists and some studies have found that emotion recognition remains intact in some antisocial individuals (Glass & Newman, 2006).

1.6.2 Hostile Attribution Bias

In addition to impairments in emotion recognition, some research has shown that antisocial individuals show a hostile attribution bias (HAB), which is described as the tendency of antisocial individuals to attribute hostile intent to others in ambiguous situations (Nasby, Hayden, & DePaulo, 1980). A HAB has been shown to positively correlate with reactive aggression, CD and interpersonal crimes in young offenders (Dodge, Price, Bachorowski, & Newman, 1990) and to predict violent incidents and more severe verbal aggression in forensic psychiatric inpatients (Brugman et al., 2016).

A HAB is thought to occur due to impairments in social information processing and to develop during childhood (Crick & Dodge, 1996). Schultz, Izard, and Ackerman (2000) found that preschool children who demonstrated an anger bias (i.e., a HAB) lived in family environments at risk for the experience and expression of anger. They also found that an anger bias predicted aggression in males. Crick and Dodge (1996) suggest that the HAB works as a 'self-fulfilling prophecy' whereby an individual attributes hostile intent to a peer and aggresses against them, the peer then responds with increased hostility. The original individual then interprets this hostility as confirmation of the earlier bias, so the HAB is reinforced and the negative cycle continues.

In individuals displaying ASB, a HAB has been shown to extend from interpreting ambiguous situations as hostile to interpreting ambiguous faces as angry (Dadds et al., 2006; Mellentin, Dervisevic, Stenager, Pilegaard, & Kirk, 2015; Schönenberg & Jusyte, 2014). However, the evidence regarding the nature of a HAB in antisocial individuals is mixed. Some research has found that as well as misattributing hostility to neutral faces, aggressive children are *more* accurate at recognising hostile intent when the situation is actually hostile compared to non-aggressive children (Dodge, 2006). In contrast, work by Dadds et al. (2006) and Leist and Dadds (2009) found that while antisocial individuals mistake neutral faces as angry (reflective of a HAB), they also show an impairment in recognising angry faces. Bowen et al. (2014) found that youth offenders showed poorer

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recognition for low intensity anger but increased recognition accuracy for high intensity anger. They theorised that this could be because the individuals in their sample may have experienced repeated exposure to negative social environments which facilitated the learning of more obvious anger signals, but that they may have had less chances to learn milder indicators of anger. The studies conducted by Dadds et al. (2006) and Leist and Dadds (2009), however, both used only one intensity of anger when testing participants ability to recognise angry facial expressions.

However, not all research has found evidence to support the existence of a HAB in antisocial individuals. For example, Jusyte and Schönenberg (2016) explored whether impairments in emotion recognition or a HAB better explained antisocial behaviour in violent offenders. They presented participants with photographs of faces displaying angry-happy and fearful-happy blends and asked them to indicate which emotion they thought was being displayed. Violent offenders showed an impairment in categorising fearful faces compared to control participants, but they showed no enhanced sensitivity for angry faces and their performance did not differ from the performance of control participants. Thus, while they found evidence of an association between emotion recognition impairments, specifically in the recognition of fear and ASB, they found no evidence that a HAB contributed to ASB. Similarly, recent research has found no evidence of a HAB in adolescents with CD (Airdrie, Langley, Thapar & van Goozen, 2018), nor in children at risk for future criminal behaviour (van Zonneveld, de Sonneville, van Goozen & Swaab, 2019).

1.6.3   The link between emotion recognition and antisocial behaviour

Numerous theories have been put forward to account for the relationship between ASB and impairments in emotion recognition.

1.6.3.1 Somatic marker hypothesis

According to the somatic marker hypothesis (Damasio, Tranel, & Damasio, 1991), somatic markers consciously or unconsciously mark behaviours that have negative or

positive outcomes. They are therefore able to help in decision making scenarios when emotions are involved. Although many different brain areas are involved in somatic markers, the amygdala is the primary inducer, and amygdala damage is associated with a reduced somatic response to emotional objects or events. This in turn leads to a reduction in physiological feedback meaning individuals are unable to learn associations between their behaviour and physiological reaction (Syngelaki, Fairchild, Moore, Savage & van Goozen, 2013). Research has shown that antisocial individual display amygdala abnormalities (Fairchild et al., 2011) and as such it has been argued that a reduced somatic response can lead to displays of ASB.

1.6.3.2 Fearlessness theory

According to the fearlessness theory (e.g., Eysenck, 1964; Gray, 1987) individuals engage in ASB because they are insensitive to the negative consequences of their behaviour. This is thought to be underpinned by amygdala dysfunction (van Goozen, 2015). Dysfunction of the amygdala leads to impairments in the recognition of negative emotions causing an individual to become relatively fearless and unemotional which in turn causes them to have difficulties in recognising cues from the environment that signal threat. The 'fearlessness' of antisocial individuals has been demonstrated in studies that have used physiological measures, demonstrating that children with CD show a reduced physiological response to affective pictures and/or blunted cortisol response to stress (Fairchild et al., 2013; van Goozen, 2015).

1.6.3.3 The Integrated Emotions Systems Theory

In a meta-analysis of twenty studies, Marsh and Blair (2008) found that ASB was associated with specific impairments in the recognition of fearful expressions. They suggested that antisocial individuals' specific impairment in recognising fearful expressions is linked to an amygdala dysfunction. This is supported by the Integrated Systems Theory (IES; Blair, 2005) which highlights the importance of the amygdala. Blair (2005) theorises that in typically developing individuals the recognition of a negative emotion, or 'distress cue'

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(i.e., fear), serves as an aversive stimulus that inhibits ASB. The correct processing of others' distress cues is thought to elicit empathy which in turns enables an individual to learn to avoid aggressive acts that cause fear and sadness as they are able to create an association between their antisocial/aggressive act and another person's distress. However, antisocial individuals are impaired in recognising these distress cues and as such they are unable to make the association between their ASB and another person's distress so continue with their negative behaviour. As the amygdala is involved in the formation of stimulus-reinforcement associations (Ledoux, 2003) it is hypothesised that an amygdala dysfunction underlies the impairment in learning that typically follows exposure to a distress cue and therefore increases the likelihood of an antisocial act.

The proposal that amygdala dysfunction underlies the emotion recognition impairments observed in antisocial individuals is supported by structural imaging work that has found that individuals with CD display amygdala abnormalities (Fairchild et al., 2011) and work that has shown that individuals with amygdala damage are impaired in recognising fear (Adolphs et al., 2005). Conversely, functional imagining studies in healthy populations have shown activation of the amygdala in response to fearful stimuli (Morris et al., 1996; Whalen et al., 2001).

1.5.3.4 Dysfunction in attentional mechanisms

In contrast to research indicating a specific fear recognition impairment in individuals displaying ASB, other work has found evidence for pervasive emotion recognition impairments in antisocial individuals (Dawel et al., 2012). Initially, pervasive emotion recognition impairments appear to be at odds with theories linking amygdala dysfunction to ASB. However, some work suggests that the amygdala does not only respond to fearful facial expressions, but also to faces displaying sadness, happiness, anger, disgust and no emotion (Fitzgerald et al., 2006). Thus, it is thought that the amygdala may serve a broader purpose: detecting and processing salient and socially relevant information from facial expressions (Adolphs, 2010). In particular, the amygdala serves to direct attention and eye

gaze to emotionally salient information (Han, Alders, Greening, Neufeld, & Mitchell, 2012; Vuilleumier, 2015).

People naturally show a preference for the eye region of the face (Gao & Maurer, 2010) and in healthy individuals, attention to the eyes is associated with emotion recognition accuracy (Hall, Hutton, & Morgan, 2010). However, patients with amygdala damage (Adolphs et al., 2005) and children with high levels of CU traits (Dadds et al., 2006) show reduced attention to the eyes and this is thought to be due to amygdala dysfunction. Taken together, these findings suggest that a more general dysfunction in attentional mechanisms may underlie the facial emotion recognition impairments observed in individuals who display ASB (Dadds et al., 2006). Although the eye region is important for recognising all emotions (Spezio, Adolphs, Hurley, & Piven, 2007), it is especially important for the recognition of fear, so this may explain why some studies find fear recognition to be selectively impaired (Adolphs et al., 2005).

1.5.3.5 Difficulties in appraisal

Although a body of work suggests that difficulties in attention may underlie the emotion recognition impairments observed in antisocial individuals, more recent research suggests that these impairments in emotion recognition may instead reflect difficulties with appraisal – the interpretation of stimuli that have been successfully encoded (Martin-Key, Graf, Adams, & Fairchild, 2018). Indeed, in a typically developing sample Barabanschikov (2015) found no evidence of an association between emotion recognition and social attention. Airdrie et al. (2018) explored facial emotion recognition and eye gaze in adolescents with attention deficit hyperactivity disorder (ADHD) with and without comorbid CD. They found that while only individuals with ADHD and CD (ADHD+CD) showed an impairment in fear and neutral recognition, both individuals with ADHD+CD and ADHD only looked at the eyes significantly less than typically developing controls for all emotions. This suggests that the emotion recognition impairments observed in the ADHD+CD group were not due to a problem with attending to the eyes. Similarly, Martin-Key et al. (2018) found that although individuals with

CD showed an impairment in fear and anger recognition and displayed abnormal eye fixation patterns compared to typically developing controls, the difference in eye fixation patterns did not explain the association between CD and emotion recognition performance.

The work of both Airdrie et al. (2018) and Martin-Key et al. (2018) suggests that difficulties in appraisal rather than in attention may underlie the emotion recognition impairments observed in antisocial individuals. Difficulties in appraisal could also explain why, in some instances, impairments appear specific to the recognition of fear expressions. In their work, Airdrie et al. (2018) found that individuals with ADHD+CD were more likely to misinterpret fear as anger and fear as sadness than both the ADHD only and typically developing groups. This suggests that there is a specific difficulty in the interpretation of fearful faces. Determining why this may be, however, requires further work.

1.6.4   The role of the amygdala

Section 1.6.3 details several theories that account for the relationship between an impairment in emotion recognition and ASB. *All* of these theories suggest that it is dysfunction of the amygdala that plays a role both in the development and continuation of ASB (e.g., Fairchild et al., 2011; Marsh et al., 2008) and in emotion recognition impairments (e.g., Adolphs et al., 1999; Fairchild et al., 2013). The recurrence of the role of amygdala dysfunction across multiple theories (e.g., somatic marker hypothesis, fearlessness theory, IES theory) indicates that this is a key mechanism underlying the relationship between an impairment in emotion recognition and displays of ASB and reflects the thought behind, and justification, for the research presented in this thesis. Figure 1.1 provides an overview of how the amygdala dysfunction observed in ASB populations is thought to play a key role in the development and continuation of ASB and in emotion recognition impairments.
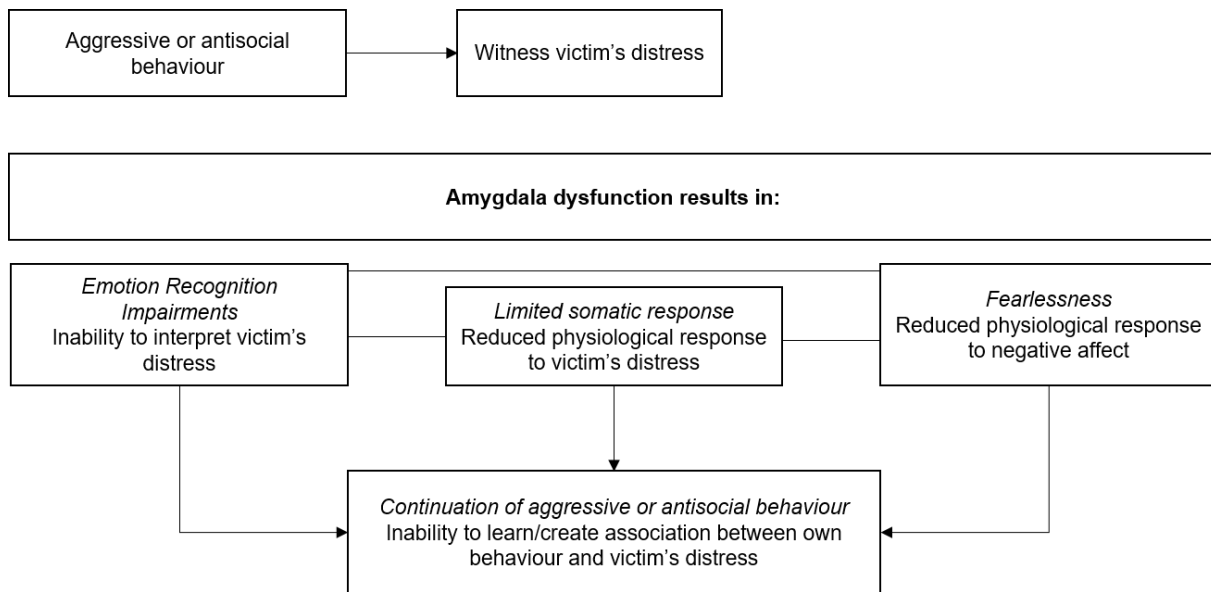
Figure 1.1. Schematic representation of the impact of amygdala dysfunction on emotion recognition and the continuation of antisocial behaviour

1.6.5   The effect of an impairment in emotion recognition on social relationships

Although a number of key theories account for the relationship between ASB and an impairment in emotion recognition, the focus of the majority of these theories is on the effect an impairment in emotion recognition has on the *individual*. However, emotions, and the function of emotions and emotion recognition, can be analysed on multiple different levels (Keltner & Haidt, 1999). When considering the role that an impairment in emotion recognition has on the development of ASB it is important not to ignore the social function of emotions. Accurate emotion recognition is crucial for the development of interpersonal relationships and inaccurate emotion recognition affects how an individual relates to others (Hunnikin & van Goozen, 2018). Thus, emotion recognition is more than an individual experience and also needs to be considered a social process. Although, arguably arbitrary (Fonagy & Luyten, 2018), the RDoC's classification of emotion recognition in the system for social processes underlines the social role emotion recognition.

Research has consistently shown that antisocial individuals show difficulties in developing appropriate peer relationships (Hunnikin & van Goozen, 2018) and often show

inappropriate behaviour in interpersonal situations (Hubble et al., 2015). The ability to understand the self and others is essential for the development of social relationships and an inability to understand the self and/or others has been found to be a risk factor in the development of ASB (Donnellan, Trzesniewski, Robins, Moffitt, & Caspi, 2006; Marsh & Blair, 2008; Sharp & Vanwoerden, 2014). Although accurate emotion recognition and understanding of the self and others have important implications for social relationships, and impairments in these processes predict future ASB, the relationships between these key processes have yet to be examined in children. The relationships between these different risk factors for ASB may have important implications for the development of potential intervention and treatment techniques.

1.7   Perception and understanding of others: Theory of Mind (ToM)

1.7.1   What is ToM and why is it important?

The term Theory of Mind (ToM) was originally coined by Premack and Woodruff (1978) and refers to the ability to represent and understand the mental states (i.e., thoughts, feelings, beliefs) of others (Hein & Singer, 2008). ToM develops during childhood with typically developing children beginning to displaying ToM understanding at 4 years old (Doherty, 2009; Perner & Lang. 1999). It is at this age that children are able to understand false beliefs; when the content of a belief contradicts reality (Wellman, Cross & Watson, 2001). This is demonstrated by the 'false belief task': at age 3 most children will fail this task while at age 4 most typically developing children will pass it (Perner & Lang, 1999).

A high level of ToM is a positive factor and ToM positively relates to a variety of prosocial behaviours essential for successful social interaction, including helping, comforting and cooperation (Imuta, Henry, Slaughter, Selcuk, & Ruffman, 2016), peer relationships (Caputi, Lecce, Pagnin, & Banerjee, 2012) and peer acceptance (Slaughter, Dennis, & Pritchard, 2002). Conversely, research has found that a low level of ToM is associated with ASB (Hughes, Dunn, & White, 1998) and a higher number of HABs (Choe, Lane, Grabell, & Olson, 2013).

ToM is very closely linked to empathy which is broadly defined as the ability to understand and share another's feelings (de Wied, Gispen-de Wied, & van Boxtel, 2010). Empathy is comprised of interrelated but dissociable constructs (Shamay-Tsoory, Aharon-Peretz, & Perry, 2009) including cognitive and affective components. Cognitive empathy (CE) refers to the ability to take the perspective of others (Cox et al., 2011) with some research suggesting that it is effectively ToM (Blair, 2008), while affective empathy (AE) refers to the ability to share the emotional experience of others (Cox et al., 2011). Like ToM, empathy is positively related to prosocial behaviour (Mayer, Jusyte, Klimecki-Lenz, & Schönenberg, 2018) and negatively correlated to undesirable behaviours (Belacchi & Farina, 2012).

1.7.2 Antisocial behaviour and ToM impairments

It has been argued that ToM is a prerequisite to empathy which helps to inhibit ASB (Sharp, 2008). As such, it has been suggested that an impairment in ToM contributes to the development of ASB (Happé & Frith, 1996). However, the research evidence regarding ToM in individuals displaying ASB is mixed. Although some work finds antisocial individuals to show low levels of ToM (Hughes, Dunn & White, 1999), a body of work has found that ToM remains intact (e.g., Blair, 2008; Nions et al., 2014; Schwenck et al., 2011). However, a lot of the work that has found that ToM remains intact in individuals displaying ASB has relied on a narrow definition and conceptualisation of ToM, equating ToM to CE (Sharp & Vanwoerden, 2014).

Recent models of ToM have shown it be a multifaceted, multicomponent construct (Sharp & Vanwoerden, 2014) and equating ToM to CE reflects only one dimension of ToM. Consequently, reliance on a narrow definition of ToM has resulted in research that has often explored just one dimension of ToM. ToM, however, is not a unitary function and instead involves both low-level, bottom up processes and higher level top-down processes. According to Coricelli's (2005) model of ToM it is a two component process comprised of (1) a low level, unconscious, automatic process involving emotion recognition, and (2) a higher

level, conscious, voluntary process based on intentionality and empathy. While the majority of work that has explored the relationship between ToM and ASB has not acknowledged the dual process nature of ToM, Sharp and Vanwoerden (2014) did explore both bottom-up and top-down ToM and found that adolescents with psychopathy were impaired in both.

The narrow definition and conceptualisation of ToM has influenced the tasks researchers have used to measure ToM. Richell et al. (2003) suggest that the lack of impairment in ToM often reported in antisocial individuals may reflect the ease of the ToM task employed. A lot of the work that has found ToM to be intact in individuals displaying ASB has used standard false belief tasks which measure the ability of an individual to understand that people may hold false beliefs (Shamay-Tsoory et al., 2007). However, these tasks fail to capture the real life difficulties associated with low ToM (Abell, Happé, & Frith, 2000) and do not tap into the more cognitively demanding ToM processes (Gillespie, Mitchell, & Abu-Akel, 2017). Research consistently shows that individuals with autism spectrum disorder (ASD) display lower levels of ToM than typically developing controls (e.g., Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2003). However, Abell et al. (2000) found that high functioning individuals with ASD passed false belief tasks despite failing to recognise what others were thinking and feeling in real life. Similarly, Happé and Frith (1996) found that in behaviour that assumes ToM, the behaviour of individuals with CD resembled that of those with ASD. However, those with CD passed false belief tasks.

Recent research suggests that inferences regarding cognitive mental states (e.g., thinking) can be differentiated from inferences regarding affective mental states (e.g., loving) (Shamay-Tsoory et al., 2007). Thus, like empathy, ToM can be thought of as having both cognitive and affective components and there is evidence to suggest that cognitive and affective ToM are differentially impaired in individuals with schizophrenia (Shamay-Tsoory, Aharon-peretz & Levkovitz, 2007). Standard false belief tasks, however, only measure cognitive ToM. This may help explain why studies examining ToM using false belief tasks in

individuals displaying ASB often find no impairment in ToM – there is no measure of affective ToM.

1.7.3   Measuring and assessing ToM

The problems with traditional measures of ToM, like false belief tasks, demonstrate the need for more sensitive measures of ToM that also capture affective aspects. The Reading the Mind in the Eyes Task (RMET; Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997) is one such measure. The RMET requires participants to infer the mental state of an individual purely via the information presented in their eyes. It has been shown to have the ability to reliably detect subtle impairments in ToM (Baron-Cohen, Wheelright, Hill, Raste & Plumb, 2001). Sharp (2008) examined ToM in children with conduct problems using the RMET and she found a relationship between poor performance on the RMET and conduct problems, suggesting that when more affective ToM tasks are used, an impairment in ToM is found in children displaying ASB.

Like the RMET, the Frith-Happé animations, developed by Abell et al. (2000), is another more advanced measure of ToM, incorporating both cognitive and affective components of ToM. The Frith-Happé animations requires individuals to watch several video clips of animated shapes moving around and participants are asked to describe what they think is happening in each clip. Abell et al. (2000) hypothesised that the motion properties of the shapes would "selectively evoke mental state attribution" (p.2). Indeed, they found that individuals with ASD, who would have had a good chance of passing standard false belief tasks despite displaying real life difficulties, scored significantly lower on the Frith-Happé animations compared to healthy controls. Unlike other ToM tasks, the Frith-Happé animations allows for the attribution of affective and cognitive mental states to the shapes and takes into account the multicomponent nature of ToM, measuring two key components of ToM; intentionality and appropriateness (understanding). As such, it appears to be a sensitive measure of ToM and so it may be more likely to detect an impairment in ToM in antisocial children.

1.7.4 The role of the amygdala in ToM

Research has shown that the amygdala responds automatically to socially salient stimuli (Adolphs, 2010; Winston, Strange, O'Doherty, & Dolan, 2002) and as such it has been hypothesised that it may play an important role in the development of ToM (Gallagher & Frith, 2003). In a functional neuroimaging study using the Frith-Happé animations, Castelli, Happè, Frith and Frith (2000) found that animations that showed interactions involving mental states (referred to as 'ToM animations') elicited more activity in the basal temporal region of the brain, immediately adjacent to the amygdala, than animations that did not involve mental states. Similarly, Mier et al. (2010) found that amygdala activation was positively associated with performance on an affective ToM task. Conversely, it has been hypothesised that damage to the amygdala would lead to an impairment in social cognition, including ToM skills (Skuse, 2003). This is indeed what Shaw et al. (2004) found. In a lesion study, Shaw et al. (2004) found that individuals who had suffered amygdala damage early in life were impaired on ToM tasks suggesting that the amygdala is part of the neural system which supports the development of ToM. Amygdala dysfunction is hypothesised to play a key role in the development of conduct problems (see section 1.5.3. p.14) and in a neuroimaging study Sebastian et al. (2012) found that children with conduct problems showed reduced amygdala activity during an affective ToM task compared to a typically developing control group. They suggest that this is reflective of a failure of those with conduct problems to appropriately process emotionally salient cues.

1.7.5 The relationship between ToM and emotion recognition

ToM and emotion recognition are two related but distinct processes, both essential for successful social interaction (Cutting & Dunn, 1999). Although distinct processes, research suggests that the same neural circuits are used for both emotion recognition and ToM (Skuse, 2003) and Coricelli's (2005) model of ToM suggests that emotion recognition is necessary for ToM. In a study examining emotion recognition and affective ToM, Mier et al. (2010) not only found a positive relationship between these two processes, but also found

that there was overlapping amygdala activity during the emotion recognition and affective ToM tasks. Mier et al. (2010) suggest that emotion recognition pre-activates the neural network necessary for affective ToM, thus emotion recognition facilitates affective ToM. Similarly, Sharp and Vanwoerden (2014) explored bottom-up ToM, which they equated to emotion recognition, and top-down ToM in adolescents with psychopathy. They found that CU traits were associated with an impairment in emotion recognition (bottom-up ToM) and suggested that this led to errors in top-down ToM functioning. Empirical work therefore appears to support Coricelli's (2005) theoretical model of ToM.

1.8   Perception and understanding of the self: Self-esteem

Like accurate understanding others, understanding of the self is crucial for successful social interactions (Fonagy & Luyten, 2018).

1.8.1   What is self-esteem and why is it important?

Self-esteem can be defined as how an individual feels about themselves (Leary & Baumeister, 2000) and it is essential for mental and social wellbeing (Mann, Hosman, Schaalma & De Vries., 2004). Self-esteem is crucial for social interaction as it guides behaviour (Mann et al., 2004). High self-esteem is associated with positive factors and prosocial behaviour predicts self-esteem (Laible, Carlo, & Roesch, 2004). Conversely, low self-esteem has been implicated in numerous emotional and behavioural problems (Leary, Tambor, Terdal, & Downs, 1995), including ASB (Donnellan et al., 2006).

Self-esteem is thought to originate from processes related to social cognition, including emotion understanding (McCauley et al., 2017) and develops during childhood. Its development is dependent on individual and social factors including, but not limited to, parental approval and support (Mann et al., 2004). Low self-esteem and negative self-worth can develop, in part, due to exposure to negative parenting, maltreatment and familial discord and disruption (Garber & Flynn, 2001).

1.8.2 The relationship between self-esteem and antisocial behaviour

The vast majority of work that has explored the relationship between self-esteem and ASB has found low self-esteem to be associated with ASB and conduct problems. Flouri et al. (2018) compared self-esteem in primary school age children with and without problem behaviour. They found that those with high levels of problem behaviour were more likely to engage in ASB and have lower self-esteem than typically developing controls. Similarly, Henricsson and Rydell (2004) found that children with externalising problems had lower self-esteem than those without. The relationship between low self-esteem and ASB has also been found in adolescents. Donnellan et al. (2005) found that low self-esteem was associated with externalising problems in 11-14 year olds and that this relationship existed when self-, teacher- and parent-report ratings of self-esteem and externalising problems were used. Similarly, Matsuura, Hashimoto and Toichi (2010) found that juvenile offenders showed lower self-esteem than control participants. In a longitudinal study, Trzesniewski et al. (2006) found that low self-esteem during adolescence predicted criminal behaviour, as well as poor mental and physical health, during adulthood.

While ASB and behavioural problems appear to be associated with low general or global self-esteem, a body of research indicates that children with behavioural problems actually perceive their *social competence* overly optimistically (Hughes, Cavell & Gaur, 2001) and display a self-enhancing bias (Hughes, Cavell and Grossman, 1997). Zakriski and Coie (1996) suggest that this bias is a result of a hyposensitivity to negative feedback. This self-enhancing bias appears to be specific to self-perceived social competence. Diamantopoulou, Henricsson and Rydell (2005) investigated peer relations in children with aggressive behaviour and symptoms of ADHD and found that aggressive behaviour was related to more negative self-perceptions of behavioural conduct and lower global self-worth, but was not related to more feelings of loneliness; it was not related to more negative self-perceptions of social competence.

Although a lot of research exploring the relationship between self-esteem and ASB has found ASB to be associated with low levels of self-esteem and self-perception, with the exception of self-perceived social competence, this is not always the case. Indeed some research has found no direct relationship between self-esteem and conduct problems (Barnow, Lucht, & Freyberger, 2005) while some work suggests that it is in fact high self-esteem that is associated with displays of ASB (Baumeister, Smart, & Boden, 1996; Hughes, Cavell & Grossman, 1997). Methodological differences could be responsible for the inconsistent findings, in particular differences between real-world studies and research conducted in a laboratory setting. Donnellan et al. (2005) suggest that aggressive behaviour in a laboratory setting is not antisocial to the same extent as ASB in the real word as it takes place in a controlled environment and does not lead to any serious harm. They therefore suggest that the correlates of milder types of ASB may differ from other forms of ASB. This is line with Laible et al.'s (2004) suggestion that the findings regarding the association between self-esteem and aggression are often inconsistent because the relationship is dependent on the type and severity of ASB and as such the relationship is complicated.

In addition, it should be noted that the study conducted by Baumeister et al. (1996) that found high self-esteem to be associated with ASB used a measure of narcissism to indicate high self-esteem, therefore assuming that low self-esteem and narcissism are at opposite ends of the same spectrum (Donnellan et al., 2005). It has been argued, however, that narcissism and self-esteem are best conceptualised as distinct but related forms of self-perception (Barry et al., 2007). Moreover, some research indicates that narcissism may actually be an indicator of underlying low self-esteem and as such low self-esteem could be a risk factor that links narcissism to aggression (Barry et al., 2003).

1.8.3 Is there a relationship between self-esteem and emotion recognition?

Research suggests that self-esteem originates from social and cognitive processes, including emotional understanding and ToM (McCauley et al., 2017). Emotion recognition is a key part of emotional intelligence (Rey, Extremera & Pena, 2011) and a positive

relationship appears to exist between emotional intelligence and self-esteem (e.g., Ciarrochi, Chan & Bajgar, 2001; Rey et al., 2011; Schutte, Malouff, Simunek, Hollander & McKenley, 2002). Like children and young people displaying ASB, children with ASD show impairments in processes related to social cognition (e.g., Baron-Cohen, Wheelright, Hill, Raste & Plumb, 2003; Kuusikko et al., 2009). Exploring self-esteem and ToM in children with ASD, McCauley et al. (2017) found that ToM and self-esteem were negatively related and that participants with ASD had significantly lower self-esteem than typically developing individuals. Although research indicates that a relationship exists between emotional intelligence, social cognition and self-esteem, the specific relationship between self-esteem and emotion recognition has not yet been explored.

1.9.   Affiliation and Attachment

As with social communication and the perception and understanding of the self and others, affiliation and attachment are also encompassed by the RDoC's systems for social processes domain (Fonagy & Luyten, 2018) and difficulties with affiliation and attachment have been implicated in the development of ASB (Sousa et al., 2011). As with emotion recognition, there is some argument that affiliation and attachment would be better encompassed by another RDoC domain, the positive valence systems domain due to the extensive behavioural and neurophysiological overlap between affiliation/attachment and reward (Fonagy & Luyten, 2018). Regardless of which RDoC domain affiliation and attachment is best placed in, like an impairment in emotion recognition, problems with attachment are one of the most commonly cited risk factors for ASB (Hoeve et al., 2012).

Bowlby's attachment theory (1969) suggests that attachment experiences in early life shape later adaptation and mental health (Fearon, Bakermans-Kranenberg, van IJzendoorn, Lapsley & Roisman, 2010). Secure attachment is associated with positive social interactions and coping mechanisms (Schore, 2001) along with ToM development, social communication skills, higher self-esteem and better peer relationships (Savage, 2013). Insecure attachment, however, has consistently been found to be associated with aggression (Buist, Dekovic &

Meeus, 2004) and ASB (Marcus & Betzer, 1996; Hoeve et al., 2012). A meta-analysis conducted by Fearon et al. (2010) found that attachment insecurity was associated with behavioural problems across all studies. ASB is associated with dysfunction of the amygdala (Blair, 2005) and Deklyen and Speltz (2004) suggest that insecure attachments can alter fear conditioning processes in the amygdala.

Research has shown that the relationship between attachment and ASB is moderated by severity of behaviour problems and peer relationships. For example, Pasalich, Dadds, Hawes and Brennan (2011) found that coercive parenting was positively related to conduct problems in boys with low levels of CU traits only and CU traits moderated the relationship between parental warmth and conduct problems. Similarly, in a longitudinal study, Lansford, Criss, Pettit, Dodge and Bates (2003) found that peer group affiliation and peer group ASB moderated the relationship between negative parenting and adolescent behavioural problems. While antisocial peers exacerbated the relationship between negative parenting and subsequent behavioural problems, positive peer relationships acted as a protective factor against the effect of negative parenting.

Due to the relationship between insecure attachment and subsequent ASB and behavioural problems, research has suggested that interventions that target and improve the parent-child relationship could be effective in preventing and reducing ASB and aggression (Savage, 2013). Indeed, the effectiveness of certain parenting programmes has been demonstrated (e.g., the Incredible Years programme for 3-8 years olds) and they are the NICE recommended treatment for conduct problems (Scott, 2010). However, while some parenting interventions are effective, not all parents are able or willing to participate in these treatments (Losel & Beelmann, 2003). There is therefore a need to develop alternative interventions that aim to reduce and prevent ASB in children who come from these adverse backgrounds whose parents may not be able to participate in their treatment.

1.10   Reducing antisocial behaviour

1.10.1   Targeting impairments in emotion recognition

Research suggests that, to be effective, interventions should be tailored to the cognitive, emotional and social characteristics of antisocial individuals (Fairchild et al., 2009; Wilkinson et al., 2015) and should target the neuropsychological and neurobiological correlates of ASB (van Goozen & Fairchild, 2008). One of the most consistently identified neuropsychological correlates of ASB is an impairment in the recognition of negative emotions (van Goozen, 2015). The importance of emotion functioning in children and adolescents is continuing to be recognised. NICE (2008) recommends the need for good social, emotional and psychological health in children and adolescents while the Early Intervention Foundation (EIF; 2018) recommends that interventions should focus on children's social and emotional skills as it is these skills that help children to develop resilience and avoid risky situations which prevents the development of future problems.

1.10.2   Emotion recognition training for antisocial behaviour

Interventions that target the neuropsychological impairments that are associated with the development of ASB, such as impairments in emotion recognition, have been predicted to be successful in reducing ASB (White, Frick, Lawing, & Bauer, 2013; Wilkinson et al., 2015) and this is indeed what research has found. In a sample of antisocial youths, the modification of biases to encourage the perception of happiness over anger in photographs of ambiguous facial expressions was associated with fewer self- and staff-reported aggressive incidents in the two weeks following the training (Penton-Voak et al., 2013). Meanwhile, a study by Hubble et al. (2015) was the first to examine the effect of emotion recognition training on objective behavioural measures. They found that in a sample of youth offenders, fear, sadness and anger recognition could be improved following two hours of computerised emotion recognition training. In addition, those individuals who received the emotion recognition training showed a reduction in the severity of crimes committed in the six months follow up period. There was no significant reduction in the treatment as usual group.

In the only emotion recognition training study to be done in children (6-16 years olds), Dadds, Cauchi, Wimalaweera, Hawes and Brennan (2012) found that emotion recognition training was associated with a decrease in the participants' number of conduct problems, as indicated by parent report. However, while there was an improvement in behaviour there was no change in emotion recognition ability following the training and the effect was limited to those children with high levels of CU traits. The training also involved close parent-child interactions that were not mirrored in the treatment as usual group. Thus, the mechanism underlying the reduction in conduct problems remains unclear.

1.10.3 Outstanding matters for emotion recognition training

While the findings regarding the effectiveness of emotion recognition training in antisocial samples are promising some outstanding matters remain.

1.10.3.1 Tailoring

Although emotion recognition impairments are consistently found in children and adolescents displaying ASB (Fairchild et al., 2009; van Goozen, 2015) individual variation does exist (Eugène et al., 2003) and some studies have found that emotion recognition is intact in some antisocial individuals (Glass & Newman, 2006). Work by Bowen et al. (2014) showed that amongst youths displaying ASB there was individual variation in performance on an emotion recognition task and some antisocial individuals performed worse than others. Emotion recognition training may be more effective in those individuals who perform less well at initial emotion recognition assessments. This is in line with the RDoC approach that recommends the development of interventions that target those with clear problems rather than assuming that impairments are present in all those who share similar behaviour problems (Insel et al., 2010). Thus, only those who show an initial impairment in emotion recognition ability should receive emotion recognition training.

1.10.3.2 Timing

Currently, the majority of the work concerning emotion recognition training in antisocial individuals has been reactive in nature. For example, participants in the work conducted by Hubble et al. (2015) had already entered the criminal justice system. However, reactive interventions are less effective at combatting crime and ASB as they intervene at a time when behavioural problems are already entrenched, failing to address problems at their source (House of Commons, 2019). Allen (2011) writes that "decades of expensive late interventions have failed" and "major social problems have got worse" (p.3). He argues that intervention should happen early to avoid the escalation of problem behaviours. Indeed, research suggests that to be most effective, interventions should attempt to help those individuals who are *at risk* of criminal behaviour, rather than already showing it (Skeem et al., 2014). Emotion recognition is a skill that develops with age so intervening at a time when children are already naturally learning and developing this ability could be particularly beneficial (Durand et al., 2007).

1.12 The importance of early intervention

Antisocial individuals often start showing conduct problems early in life (Moffitt, 1993), and once established ASB persists into adulthood, with individuals who show conduct problems before the age of 10 being seventy times more likely to receive a prison sentence by the age of 25 than those who do not (Fergusson, Horwood, & Ridder, 2005). Research consistently shows that the majority of crime is committed by a relatively small group of chronic offenders who display ASB during childhood (Sainsbury Centre for Mental Health, 2009). Thus, if these individuals can be identified early intervention and treatment administered early, future offending may be prevented (Cohen & Piquero, 2009). Indeed, interventions that target individuals at risk for behavioural difficulties lead to better outcomes than those interventions delivered later in adolescence (Skeem et al., 2014). For example, intervening in children aged 6 led to significantly fewer CD symptoms and increased social

skills by the time they reached high school (Hektner, August, Bloomquist, Lee, & Klimes-Dougan, 2014).

Despite the evidence that intervention that begins early is the most effective (US Department of Health and Human Services, 2007), in the UK there has been a 40% decrease in early intervention spending between 2010-2016 and it is estimated that investment in early intervention will have declined by 72% between 2010-2020 (Action for Children, National Children's Bureau and The Children's Society, 2017). Meanwhile, violence rates have risen significantly since 2014, with this increase being marked by a shift to younger perpetrators (EIF, 2018), and there has been a 108% increase in referrals of children to social care services between 2010-2016 (Action for Children, National Children's Bureau and The Children's Society, 2017). The Children's Commissioner for England has acknowledged that 1.6 million children are "invisible" to key services as they have not yet reached the crisis point required for services to intervene (Children's Commission for England, 2018). Indeed, in early 2019 it was found that 75% of children's services spending goes into crisis work (Butler, 2019). This means that when help does eventually reach children it is often too late, resulting in more young people in violent gangs, in care or in the courts system (https://bbc.co.uk/news/education-44440265).

In addition to the arguably moral obligation to provide more effective support to vulnerable children, there is an economic imperative to invest in early intervention services. In 2016 the EIF estimated that late intervention costs the public sector nearly £17 billion every year in England and Wales, with local authorities carrying the greatest cost (Chowdry & Fitzsimons, 2016). Early intervention would reduce the demand on public services and support economic growth (Public Health England, 2018) and in the USA, it is estimated that saving one high risk individual from a life of crime could save up to $5.3 million (Cohen & Piquero, 2009). In addition to public services and government bodies, the economic benefits from early intervention translate to society as a whole and the wider economy (EIF, 2018).

Thus, intervening early in children at risk for ASB will result in a greater improvement in behaviour and is cost effective.

1.12.1 Can emotion recognition training be used as an early intervention?

Despite all three main political parties in the UK stating that they are committed to prioritising early intervention (Allen, 2011) this has not been reflected in funding allocation. Recent joint research by five major children's charities in the UK (Action for Children, Barnardo's, The Children's Society, NSPCC and National Children's Bureau) has found that since 2010 funding for children and young people has fallen by almost a third with early intervention spending facing the biggest cuts (49%; https://www.childrenssociety.org.uk/ sites/default/files/childrens-services-funding-csfa-briefing_final.pdf). Indeed, by 2020 it is estimated that there will have been a real terms reduction of 71% for early interventions services (Action for Children, 2016). This means that more money is now being spent on crisis cases with the number of child protection cases and number of children being taken into care now at their highest for a decade. As Nick Roseveare, the CEO for The Children's Society, acknowledged "these reductions in early help for children…intensify the need for more costly interventions further down the road" (https://www.childrens society.org.uk/news-and-blogs/press-releases/funding-cuts-put-children-at-greater-risk-of-crisis), interventions that, in the current climate, local authorities in the UK simply cannot afford.

Children's social and emotional skills are essential for positive development (Wilkinson & Marnot, 1998) and the period between childhood and adolescence is the time when children are particularly adept at specific types of social and emotional learning (Blakemore, 2008). The brain processes that underlie social and emotional behaviour have not yet matured, meaning there is an increased capacity for learning appropriate behaviour (Spear, 2000). Thus, an early and tailored emotion recognition intervention would represent a cost and time effective strategy that could reduce the development of aggressive and antisocial behaviour and increase prosocial behaviour (Foster, 2010).

1.13   The Early Intervention Partnership Hub

In the UK, the Early Intervention Partnership Hub is a unique initiative set up in Northamptonshire that aims to intervene and provide help to children displaying behavioural problems that do not meet the threshold for Early Help in order to reduce demand further down the line. The Hub was set up due to the high number of young people displaying problematic behaviours in the county (Doran, 2018). It brings together police and social care and works with children from families that are known to police or social services and who have been exposed to multiple Adverse Childhood Experiences (ACEs); childhood experiences that lead to an increased risk of negative social outcomes later in life (POST PN599, 2019), particularly violence, mental illness and substance abuse (Hughes et al., 2017). The aim of the Hub is to "mitigate the negative impact of ACEs, assist young people in building resilience and offer support to families" (https://www.eif.org.uk/blog/police-academy-how-forces-are-on-the-front-line-of-early-intervention). It aims to intervene early to prevent the escalation of behavioural and emotional problems, focusing on primary school age children who are below the age of criminal responsibility. The children who are part of the Hub initiative have no formal mental health diagnosis, but they do already display a substantial number of behavioural and emotional problems. The purpose of the Hub is to help children and families before they reach a crisis point.

The Hub was created to address the gap that existed for children displaying behavioural problems but did not meet the threshold for help. The schools that were part of the Hub were in areas where children were disproportionately at risk of negative outcomes later in life (Doran, 2018). The interim evaluation of the Hub (Doran, 2018) demonstrated that ACEs were prevalent with one in three children growing up in households with domestic abuse and one in two children had a record of contact with either Early Help or social services. However, information on the prevalence of ACEs *specifically* for those participants included in the studies presented in this thesis was not available to the research team.

A key feature of the Hub is Police Community Support Officers (PCSOs). The PCSOs work with children, their schools and their families to provide a variety of universal, group and one to one support. For example, in some schools PCSOs delivered Roots of Empathy (https://uk.rootsofempathy.org/), a universal, classroom based programme that aims to increase empathy and reduce aggression in children. PCSOs also deliver more targeted group work, including the Blue Butterfly project (https://www.northants.police.uk/news/northants/news/news/2019/june-19/blue-butterfly-project-launched-today/); a scheme to help children who may witness domestic abuse in the home. Where more intensive, one to one support is needed the PCSO will create an individualised intervention plan that is tailored to the child's circumstances.

For the research presented in this thesis, children who were part of the Hub were referred to the research team by either a PCSO, family support worker (FSW) or teacher for displaying problem behaviours. In order to ensure objectivity and consistency these problem behaviours were confirmed for each child by completion of the teacher report Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997).

1.13.1 Sample

The participants in the research presented in this thesis were primary school aged children aged 7-11 years old, who were assigned to a behavioural problems group (BP) or a typically developing control group (TD).

1.13.1.1 *Behavioural Problems Group*

Participants assigned to the BP group were children recruited from primary schools in Northamptonshire. They were referred to the research team by either their teacher, FSW or PCSO for showing behavioural and emotional difficulties and/or because they were part of the Early Intervention Partnership Hub.

After referral to the research team, the child's teacher completed the SDQ (Goodman, 1997) to confirm the child's behavioural problems for the last 6 months. To be eligible to be

included in the BP group, participants were required to score in the 'slightly raised' or 'above' range for conduct or peer problems (≥ 3 out of 10) and/or 'slightly lowered' or 'below' range for prosocial behaviour (≤5 out of 10; see https://sdqinfo.org/py/sdqinfo/b3.py?language=Englishqz(UK) for further information regarding the SDQ thresholds). Participants only needed to reach the threshold for one of these three subscales to be eligible. Raised scores on the peer problems subscale are reflective of the interpersonal problems individuals with behavioural problems display (Hunnikin & van Goozen, 2018), while lowered scores on the prosocial subscale provides an indirect measure of CU traits (Blair, Leibenluft & Pine., 2014; Kimonis et al., 2016). The hyperactivity subscale was not used as a recruitment criterion because recent research has shown that emotion recognition impairments in ADHD appear to be specific to those individuals with comorbid CD (Airdrie et al., 2018). Similarly, the emotion problems scale was not used as this is related to more internalising problems (example item: 'often complains of headaches') whereas emotion recognition impairments are related to more externalising problems (Hubble et al., 2015; Hunnikin & van Goozen, 2018). A breakdown of the SDQ items by subscale shows that participants in this sample showed high levels of disobedience, they were not liked by other children, they were not kind to younger children, and they would not help if someone was hurt (see Figure 1.2). See Appendix A for further explanation of the sample including the range of SDQ scores for the BP group, the proportion of participants in different severity groupings for each subscale and the number of participants that met inclusion criteria for one, two and all three subscales.

According to the SDQ scoring criteria and based on a large UK community sample, only 10% of the UK population is classified as above average, or below average in the case of the prosocial subscale, (Goodman & Goodman, 2011). The SDQ has been shown to be an efficient screener for the identification of psychiatric disorders in youth (Warnick, Bracken & Kasl, 2008) and is recommended to be used in the initial assessment for CD (NICE, 2013). It has a diagnostic accuracy of 94% for CD when compared to the Development and Well-

Being Assessment (Johnson, Hollis, Marlow, Simms & Wolke, 2014) and has been shown to predict consistent behavioural problems (Wilson et al., 2012). The severity thresholds used in the studies conducted by Johnson et al., (2014) and Wilson et al., (2012) did differ from the severity thresholds used in the research presented in this thesis which draws on the four band categorisation of the SDQ ('close to average', 'slightly raised', 'high' and 'very high'). Both Johnson et al. (2014) and Wilson et al. (2014) used the original three band categorisation of the SDQ which categorised scores as either 'normal', 'borderline' or 'abnormal'. They both used the abnormal score as their threshold of severity. The range of the abnormal scores from the three band categorisation maps on to the 'high' and 'very high' scores of the four band categorisation of the SDQ (https://sdqinfo.org/py/sdqinfo/b3.py?language =Englishqz(UK). Although it can be convenient to categorise scores, the SDQ can be used as a dimensional measure (Goodman & Goodman, 2009).

In addition, the SDQ is commonly used in epidemiological (Maughan, Collishaw, Meltzer & Goodman, 2008), longitudinal (St Clair, Pickles, Durkin & Conti-Ramsden, 2011) and intervention (Hutchings, Martin-Forbes, Daley & Williams, 2013) research. It has been shown to be an effective outcome measure in numerous samples including children and adolescents referred to child and adolescent mental health services (Mathai, Anderson and Bourne, 2003) and children at risk of developing conduct problems (Hutchings et al., 2013). The teacher-reported SDQ was used because teachers are familiar with a broad range of children, they have expertise regarding normative child development (Viding, Blair, Moffitt & Plomin, 2005) and teacher ratings have greater internal consistency and stability than parent ratings (Gomez, Harvey, Quick, Scharer & Harris, 1999).
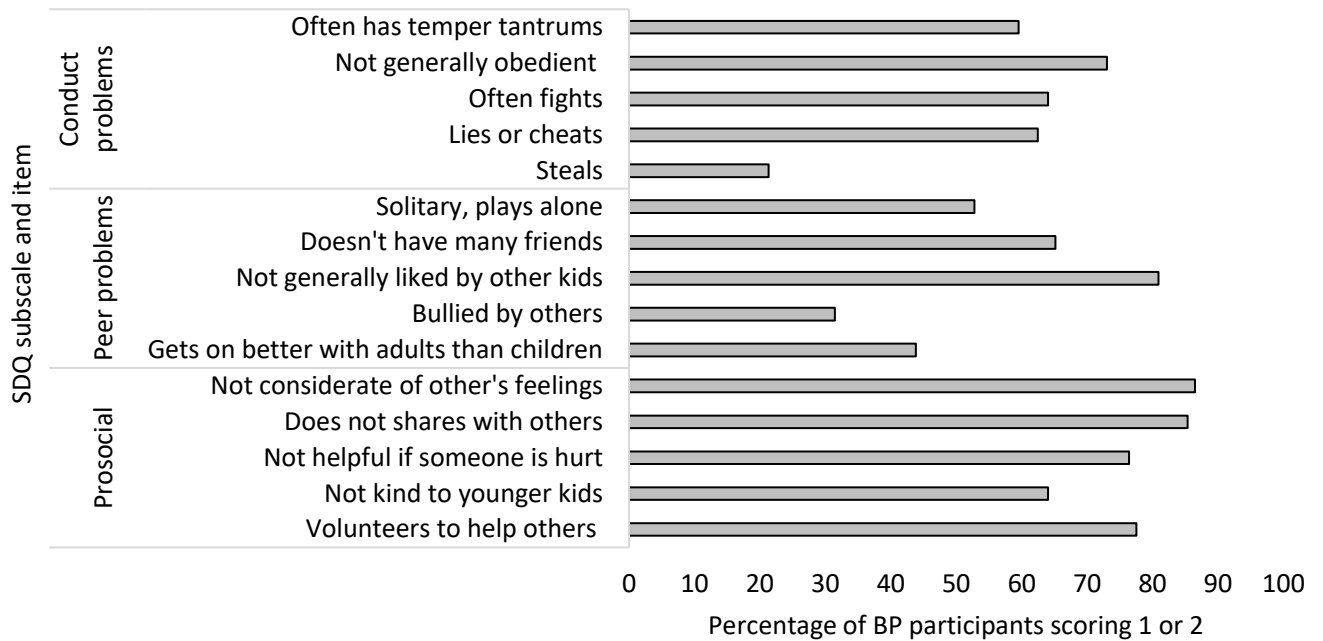
Figure 1.2. Percentage of BP participants scoring one (somewhat true) or two (certainly true) on each item of the three SDQ subscales used to determine eligibility for this study

1.13.1.2 *Typically Developing Group*

Children in the TD group were recruited from primary schools in England and South Wales. They were referred to the research team by their teacher for not showing any behavioural or emotional difficulties. Parent-report SDQ was then used to confirm that participants in the TD group were within the 'close to average' range for total number of difficulties (a score of ≤ 13 out of 40). The total score was used for TD participants to confirm the absence of any behavioural or emotional difficulties, ensuring a 'normal' and typically developing comparison group. Use of the total SDQ score as inclusion criteria avoided the creation of a "super control" group; we wanted the control group to be representative and therefore accepted that there would be variation within this group. The categorisation within the SDQ scoring is adjusted to reflect whether a parent or teacher had completed it, allowing for a comparison to teacher-completed versions.

1.13.2 Project and procedure

The research presented in this thesis was part of a larger and broader project run in collaboration between Cardiff University and the Northamptonshire Police. The overarching aim of the project was to identify socio-emotional impairments in children displaying behavioural problems who were deemed to be at-risk of future criminal behaviour due to their exposure to ACEs and to establish the effect of an emotion recognition training intervention (the Cardiff Emotion Recognition Training; CERT) on emotion recognition ability and subsequent behaviour and wellbeing. Previous PhD research by Laura Hunnikin explored emotion recognition and empathy impairments in this sample, their relationship (Hunnikin, Wells, Ash, & van Goozen, 2019) and the effect of a novel emotion recognition training on emotion recognition ability (Hunnikin, Wells, Ash, & van Goozen, *under review*). The present thesis explores the role of ToM (Chapter 2) and self-esteem (Chapter 3) in the behavioural problems of this sample and their relationship with emotion recognition problems. Furthermore, the final Chapter of this thesis (Chapter 4) will examine the longer-term effects of the emotion recognition training on behaviour and wellbeing.

All parts of the project were completed at the participant's school. All participants (BP and TD) completed an initial, pre-test research session conducted by a trained researcher (myself or Laura Hunnikin), lasting approximately 75 minutes. This research session consisted of three experimental tasks, measuring emotion recognition, ToM and empathy, as well as a self-reported self-esteem questionnaire, an IQ test and the collection of demographic information. In line with the RDoC approach, only children who displayed an impairment in emotion recognition went on to receive the emotion recognition training. BP participants then completed a post-test research session two weeks after completing the emotion training, and their behaviour and wellbeing were re-assessed after 6 months via teacher-report SDQ. TD participants completed one research session only. Although the same sample is used throughout this thesis, the sample sizes reported in the different chapters differ. This is because some of the measures used were only suitable for certain

ages, some of the children were not able to complete all the measures and there was some

attrition due to the longitudinal nature of the research. See Figure 1.3 for a schematic

representation of the procedure.

Typically Developing Participants

- Teacher referral for lack of behavioural and emotional difficulties
  - Parent completed SDQ — Reach SDQ criteria
    - Research session
  - Parent completed SDQ — Do not reach SDQ criteria

Behavioural Problems Participants

- Teacher or PCSO referral
  - Teacher completed SDQ — Reach SDQ criteria
    - Research session
      - Above emotion recognition threshold
        - Research session
          - 6 month follow up: teacher SDQ
      - Below emotion recognition threshold
        - Emotion recognition training
          - Research session
            - 6 month follow up: teacher SDQ
  - Teacher completed SDQ — Do not reach SDQ criteria

Figure 1.3 Schematic representation of the process and procedure of the project

1.14   Overview of thesis, research questions and hypotheses

The two main aims of this thesis were to (1) examine the relationship between emotion

recognition and both ToM and self-esteem and the relationship between all three and

behavioural problem severity and (2) to further examine whether emotion recognition is a

key process in the development of ASB by exploring whether an improvement in emotion

recognition, following an emotion recognition training intervention, was associated with an

improvement in behaviour, mental health and wellbeing 6 months later.

The thesis consists of three empirical chapters all of which use participants from the

sample described in section 1.13.1 (p.38). Chapter 2 investigated ToM and emotion

recognition in a sample of 93 children with behavioural problems in comparison to 44 TD

controls while Chapter 3 investigated self-esteem and emotion recognition in a sample of 78 children with behavioural problems compared to 54 TD controls. Chapter 4 utilised a sub-sample of 62 children with behavioural problems to explore the effect of an emotion recognition training on behaviour and mental health.

It was hypothesised that:

1. Children with behavioural problems would show reduced ToM ability compared to typically developing controls. ToM would be positively related to emotion recognition, and emotion recognition and ToM impairments would both be related to severity of behaviour problems.

2. Children with behavioural problems would show lower self-esteem and self-perception compared to typically developing controls, but would display a self-enhancing bias regarding their self-perceived social competence. Self-esteem and emotion recognition would be positively related, and both would be related to severity of behaviour problems.

3. Children with behavioural problems who showed an initial impairment in emotion recognition and received an emotion recognition training programme would show improved facial emotion recognition and improved behaviour, mental health and wellbeing compared to children with behavioural problems who did not receive the emotion recognition training.

2. Children with behavioural problems misinterpret the emotions and intentions of others

This Chapter is based on:

Wells, Hunnikin, Ash & Van Goozen (2019). Children with behavioural problems misinterpret the emotions and intentions of others. *Journal of Abnormal Child Psychology*

2.1 Abstract

Research indicates that the misinterpretation of others' emotions or intentions may lead to antisocial behaviour. This study investigated emotion and intention recognition in children with behavioural problems and examined their relationship and relations with behaviour problem severity. Participants were 7-11 year old children with behavioural problems (n = 93, mean age: 8.78, 82.8% male) who were taking part in an early intervention program and typically developing controls (n = 44, mean age: 9.82, 79.5% male). Participants completed emotion recognition and ToM tasks. Teachers and parents rated children's emotional and behavioural problems. Children with behavioural problems showed impaired emotion and intention recognition. Emotion recognition and intention recognition were positively related and inversely associated with behavioural problem severity and, independently of one another, predicted behavioural problems. This study is the first to show that children with behavioural problems are impaired in identifying others' emotions as well as intentions. These processes were found to be related and inversely associated with severity of behavioural problems. This has important implications for intervention and prevention programmes for children with behavioural difficulties.

2.2 Introduction

ASB in children is an umbrella term that covers a broad range of behaviours that can be operationalised and studied in different ways, including psychiatric diagnoses of ODD, CD and disruptive behaviour disorder (DBD). Behavioural problems in childhood are associated with subsequent ASB during adulthood (Sainsbury Centre for Mental Health, 2009) and a diagnosis of CD in childhood is a criterion for a diagnosis of ASPD in adulthood (Rhee & Waldman, 2002). Common across diagnoses of ODD, CD and DBD are displays of chronic and repetitive aggressive behaviours, a disregard for the rights of others and a violation of social norms (APA, 2013). Dysfunction in social cognition and in processes necessary for socio-emotional functioning are hypothesised to play a causal role in the development of ASB. Social cognition can be defined as the processing of information which leads to the

"accurate perception of the dispositions and intentions of other individuals" (Brothers, 1990, p.28). As such, emotion recognition and ToM are two key processes related to social cognition (Mier et al., 2010) and impairments in both have been implicated in the development of ASB.

Emotions serve a communicative function (Darwin, 1871) and the accurate recognition of emotions is crucial for interpersonal interactions and social functioning (Herba & Phillips, 2004). As such, an impairment in emotion recognition can have negative consequences, including displays of ASB (Blair, 2003). Research has consistently shown that individuals who display ASB show an impairment in emotion recognition, specifically in the recognition of negative emotions. An impairment in facial emotion recognition ability has been reported in numerous antisocial populations, including antisocial children (Van Goozen, 2015), adolescents with CD (Fairchild et al., 2009) and youth offenders (Bowen et al., 2014). Dysfunction of the amygdala is hypothesised to underlie the emotion recognition impairments observed in antisocial individuals (Marsh & Blair, 2008). In healthy populations, the amygdala is activated in response to fearful stimuli (Whalen et al., 2001). However, structural imaging work has shown individuals with CD have amygdala abnormalities (Fairchild et al., 2011) and individuals with amygdala damage are impaired in recognising fear (Adolphs et al., 2005).

ToM refers to the ability to represent and understand the mental states of others (Hein & Singer, 2008) and one of the main aspects of ToM is understanding the intentions of others (Mohammadzadeh, Tehrani-Doost, Khorrami, & Noorian, 2016). Mohammadzadeh et al. (2016) suggest that displays of ASB may be due to the misinterpretation of another's intentions which then leads them to act inappropriately (i.e., aggressively). This may be reflective of a HAB. A HAB is the tendency of antisocial individuals to attribute hostile intent to others in ambiguous situations (Nasby, Hayden, & DePaulo, 1980) and to consequently display inappropriate or aggressive behaviour. Indeed, studies have found low levels of ToM to be associated with more HABs (Choe, Lane, Grabell, & Olson, 2013).

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However, Jones, Happè, Gilbert, Burnett and Viding (2010) found no difference in intention recognition between boys with behavioural problems and typically developing controls. In their study, Jones et al. (2010) used the Frith-Happé animations (Abell et al., 2000) as a measure of ToM. During the Frith-Happé animations task, participants watch video clips of animated triangles moving around and are asked to describe what is happening. As well as assessing participants' understanding of the clips, the Frith-Happé animations assesses participants' ability to ascribe mental states and intentions to the triangles. Jones et al. (2010) found there was no difference in the ability to ascribe intentions to the triangles between children with behavioural problems and typically developing controls. However, the Frith-Happé animations is a verbal task and previous research has consistently found ToM to be associated with language ability (Cutting & Dunn, 1999); participants' verbal ability was not controlled for in the study conducted by Jones et al. (2010).

Like emotion recognition, the amygdala has been hypothesised to contribute to ToM and the ability to correctly recognise and attribute intentions to others (e.g. Shaw et al., 2004; Skuse, 2003). As such, studies have sought to establish whether these two aspects of social cognition are related. Mier et al (2010) examined emotion recognition and the recognition of emotional intentions in typically developing individuals. They found a positive correlation between emotion recognition and intention recognition and overlapping brain activity during the emotion recognition and intention recognition tasks. They suggest that emotion recognition is a prerequisite for the recognition of emotional intentions as it pre-activates the neuronal network necessary for intention recognition. Corden, Critchley, Skuse and Dolan (2006) explored the relationship between emotion recognition and performance on the Frith-Happé animations. They found that around 10% of a sample of University staff and students showed low fear recognition (<50% accuracy) and those with low fear recognition ascribed significantly less correct intentions to the triangles. Thus, Corden et al. (2006) suggest that poor fear recognition is predictive of a pattern of social cognitive impairments.

Although research suggests that emotion recognition and intention recognition are related, to our knowledge this relationship has not yet been explored in children displaying behavioural problems. Coricelli's (2005) model of ToM suggests it is a two component process comprised of (1) an unconscious, automatic process involving emotion recognition and (2) a conscious, voluntary process based on intentionality and empathy. Thus, if individuals are impaired in recognising emotions, as children with behavioural problems have consistently been shown to be (see Van Goozen, 2015 for a review), we would expect them to also display an impairment in recognising others' intentions.

The current study took place in the context of a broader project that aimed to reduce behaviour problems in children at-risk for future criminal behaviour through an early and targeted intervention. A unique initiative in Northamptonshire, The Early Intervention Partnership Hub, brings together police and social care and aims to intervene at an early stage when cases do not yet meet the threshold for help. In collaboration with researchers at Cardiff University, PCSOs delivered the Cardiff Emotion Recognition Training (CERT; https://emotionrecognition.cardiff.ac.uk/index.php) to children who display an impairment in emotion recognition. Emotional skills are crucial for children's life chances and developing these skills at an early age provides an opportunity to reduce ASB and violence (EIF, 2018). In order for the CERT to be as effective as possible in improving emotion recognition ability and behaviour it is necessary to examine other areas of socio-emotional functioning, such as the ability to recognise other people's intentions, in children displaying behavioural problems.

The current study compared emotion recognition ability and levels of ToM in children displaying behavioural problems to those of typically developing controls. In line with previous literature, we expected children with behavioural problems to show an impairment in emotion recognition, specifically the recognition of negative emotions. Moreover, given the proposed role of misunderstanding intentions in the development of ASB (Mohammadzadeh et al., 2016) we also expected children with behavioural problems to show a specific impairment in intention recognition. Given the previously reported relationship between

emotion and intention recognition (Skuse, 2003) we expected these constructs to be related, and hypothesised that difficulties in emotion and intention recognition would both be associated with severity of behaviour problems.

2.3 Method

2.3.1 Ethical Statement

All aspects of the research were approved by the Cardiff University School of Psychology Research Ethics Committee. Informed written consent was provided by the participant's parents/guardians and informed written assent was obtained for the participants.

2.3.2 Participants

137 children (112 male) aged 7-11 years old ($M = 9.12$, $SD = 1.22$) took part from schools across England and Wales. Participants were assigned to one of two groups: the BP group or the TD group. Participants in the BP group were part of the Early Intervention Hub and were referred into the study by teachers, FSWs or PCSOs. The children in the Hub do not have a formal mental health diagnosis but already show behavioural and/or emotional problems.

After referral to the study, the child's teacher completed the SDQ (Goodman, 1997) to confirm behavioural status for the last 6 months. Children scoring in the 'slightly raised' or 'above' range for conduct and/or peer problems (≥ 3 out of 10) and/or 'slightly lowered' or 'below' range for prosocial behaviour (≤ 5 out of 10) were eligible to be included in the BP group. Children in the TD group were not part of the Hub and were referred by their teachers for not showing any behavioural or emotional problems and showed total SDQ scores in the 'close to average' range (teacher SDQ total score : ≤ 11 out of 40; parent SDQ total score: ≤ 13 out of 40). See Section 1.13.1 (p. 37) for a full description of the sample.

2.3.3 Materials

2.3.3.1 Demographic and behavioural characteristics

The two subset form of the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999; vocabulary and matrix reasoning) was used to provide an estimated full scale IQ (FSIQ) score. The vocabulary subtest was used to provide an estimate of verbal IQ (VIQ). Socioeconomic status (SES) was estimated using the Office for National Statistics estimates of average household total weekly income based on each participant's postcode (Low = £0-£520; Middle = £521-£670; High = £671+; Hubble et al., 2015).

The SDQ (Goodman, 1997) is a 25-item questionnaire that assesses areas of emotional and behavioural difficulties and strengths. The SDQ is a widely used, valid and reliable measure (Stone & Otten, 2010). The prosocial subscale was used as an indirect measure of CU traits given the DSM-5's description of CD with CU traits as "with limited prosocial emotions" (Blair et al., 2014) and Kimonis et al. (2016) have shown significant correlations between the prosocial subscale of the SDQ and CU traits. Cronbach's α for the total SDQ score was 0.73 indicating good internal consistency.

2.3.3.2 Facial Emotion Recognition

The Facial Emotion Recognition (FER; Hunnikin et al., 2019) test was used to measure children's ability to recognise faces displaying happy, sad, fearful, angry and neutral expressions. Pictures from the Radboud Faces Database battery (Langner et al., 2010) served as stimulus material. Children viewed 60 faces on a laptop displaying one of the five expressions at either a low or high intensity. There were 14 target faces (7 male, 7 female) and each target displayed all of the five emotional expressions. Each face was presented alone for three seconds and then with the question "What emotion (if any) is this person showing?" with the five emotion labels presented in a numbered list either to the left or right of the face and participants were asked to indicate their response on the computer.

2.3.3.3 Theory of Mind

The Frith-Happé animations (Abell et al, 2000) was used to assess ToM. The task measures individuals' ability to attribute mental state descriptions to animations of shapes interacting. The task consisted of six video clips of a big red triangle and a small blue triangle moving around on a framed white background. There were two conditions of animation: goal directed (GD) and ToM. In the GD clips interactions between the triangles did not involve mental states whereas in the ToM clips they did. Participants were shown the animations on a laptop and asked to describe what they thought was happening in each clip. Participants' responses were recorded and later transcribed and scored according to the criteria given in Castelli et al. (2002). Responses were scored on three dimensions: (1) intentionality (0-5): participants' ability to ascribe mental states to the triangles; (2) appropriateness (0-2): participants' understanding of the clip; (3) length of answer (0-4): the number of clauses in an answer. Inter-rater reliability was .83 as confirmed between two blind coders using a subset of the data (15%).

2.3.4   Statistical analyses

Differences in demographic and behavioural characteristics between groups were analysed using independent samples t-tests for continuous variables and X^2 tests for binary variables. Spearman's rho correlations were used to examine relationships between behavioural characteristics and ToM and a multiple regression analysis was used to determine whether emotion and intention recognition could, independently of each other, predict behavioural problems. Percent correct for total emotion recognition was calculated by taking the mean score of happy, sad, fear, anger and neutral recognition and percent correct for negative emotions was calculated by taking the mean score of sad, fear and anger recognition. Given the debate regarding the specific nature of emotion recognition impairments in antisocial populations (section 1.6.1), emotion recognition scores for happy and neutral expressions were examined in addition to the total and negative scores. Multivariate analyses of covariance (MANCOVA) were run to determine any between group

differences for emotion recognition (total score, negative, happy and neutral) and for intentionality and appropriateness scores on the Frith-Happé animations. Bonferroni corrections were used to adjust for multiple comparisons. Effect sizes were calculated as partial eta squared (η_p^2; small ~ .03, medium ~ .06, large ≥ .14; Cohen, 1992). Analyses were carried out using SPSS 23 (SPSS Inc., Chicago, Illinois).

2.3.4.1 Covariates

Due to the verbal nature of the FER task and Frith-Happé animations and prior research that shows an association between verbal ability and emotional intelligence (Hogan et al., 2010), on the one hand, and ToM (Cutting & Dunn, 1999), on the other, VIQ was included as a covariate in the categorical analyses for both tasks, and length of answer was included as a covariate for categorical analyses pertaining to the Frith-Happé animations. FSIQ, age and SES were not included as covariates in the analyses. SES was not significantly correlated with performance on either the FER or Frith-Happé animations ($p < .05$). IQ was significantly correlated with performance on the FER but not with performance on the Frith-Happé animations. A hierarchical regression analysis showed that FER significantly predicted behavioural problems even when controlling for FSIQ. Age was significantly correlated with performance on the Frith-Happé animations, but not with performance on the FER. A hierarchical regression analysis showed that while performance on the Frith-Happé animations significantly predicted behavioural problems, age did not. As FER and Frith-Happé animations predicted behavioural problems even when controlling for FSIQ and age respectively these demographic variables were not included as covariates in the analyses. (See Appendix B for the relationships between demographic and outcome variables and Appendix C for full details of hierarchical regression analyses).

2.4 Results

2.4.1 Demographic and behavioural data

Participants in the TD group were significantly older, had a higher SES, FSIQ and VIQ than the BP group (see Table 2.1). Age was significantly correlated with performance on the Frith-Happé animations, $r(135) = .22$, p = .009, but not with performance on the FER, and FSIQ was significantly correlated with performance on the FER, $r(135) = .33$, p <.001, but not with performance on the Frith-Happé animations. See Appendix A for a table detailing the relationship between all the demographic variables and outcome measures. The groups were matched on gender and there was no difference in emotion recognition by gender, $t(135) = -.16$, p = .877, nor was there an effect of gender performance on the Frith-Happé animations, $t(135) = .63$, p = .530. Participants in the TD group exhibited significantly fewer conduct and peer problems, had a lower total SDQ score and higher prosocial score than the BP group.

Table 2.1 Demographic and behavioural characteristics of TD and BP participants

	TD (n = 44)	BP (n = 93)	*p*-value
Age (years)	9.82 (1.12)	8.78 (1.14)	<.001
FSIQ	103.34 (17.45)	92.40 (13.32)	<.001
VIQ	52.68 (10.91)	45.18 (10.57)	<.001
Gender			.646
% Male	79.5	82.8	
% Female	20.5	17.2	
SES			<.001
% Low	0	7.9	
% Medium	18.4	53.9	
% High	81.6	38.2	
SDQ score			
Total	7.22 (3.03)	17.92 (6.27)	<.001
Conduct Problems	1.05 (1.05)	4.12 (2.63)	<.001
Peer Problems	1.71 (1.38)	3.68 (2.38)	<.001
Prosocial Behaviour	7.49 (3.15)	4.48 (2.8)	<.001

Notes: Means are presented with standard deviations in brackets. FSIQ = full scale intelligence quotient (two-subtest WASI), VIQ = verbal IQ (WASI vocabulary subtest) SES = socioeconomic status, SDQ = Strengths and Difficulties Questionnaire, TD = typically developing group, BP = behavioural problem group

2.4.2 Emotion Recognition

BP participants scored significantly lower than TD participants for total, $F(1, 128) = 8.43$, $p = .004$, $n_p^2 = .06$, 95% CI [-11.39,-2.16], negative, $F(1, 128) = 4.66$, $p = .033$, $n_p^2 = .04$, 95% CI [-12.48,-.544] and neutral recognition, $F(1, 128) = 6.11$, $p = .015$, $n_p^2 = .05$, 95% CI [-18.46,-2.05]. There was no difference between BP and TD participants for happy recognition, $F(1, 128) = 3.04$, $p = .084$, $n_p^2 = .02$, 95% CI [-8.71, .55] (see Figure 2.1).
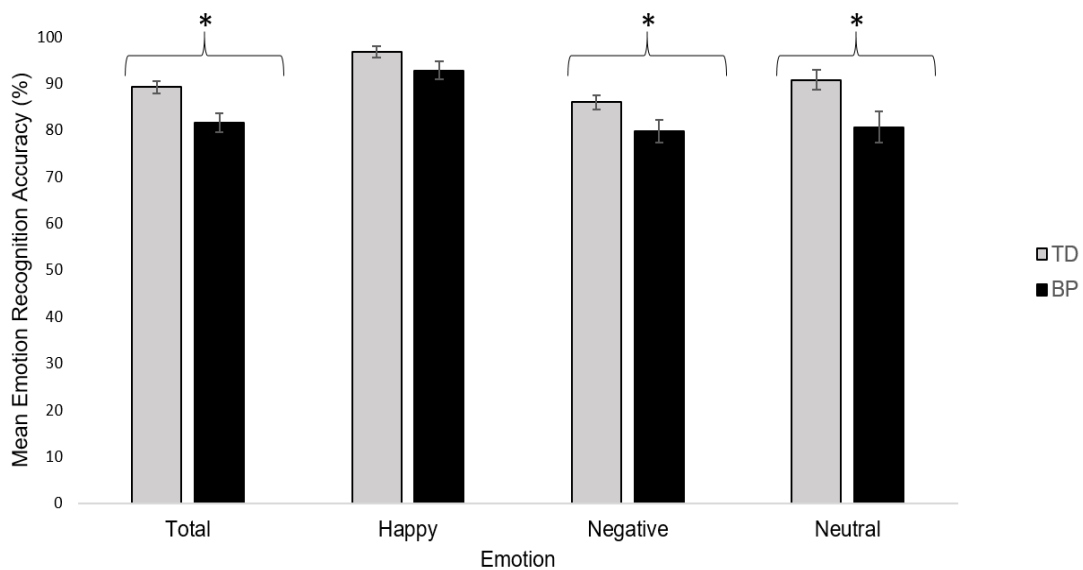
Figure 2.1 Estimated marginal means of total, happy, negative and neutral emotion recognition scores. Error bars are set at ± 1 standard error. * = p < .05. TD = typically developing group, BP = behavioural problems group.

2.4.3 Theory of Mind

BP participants scored significantly lower than TD participants on intentionality for ToM clips, $F(1, 128) = 4.72$, $p = .032$, $n_p^2 = .036$. There was no difference between BP and TD participants on intentionality for GD clips or on appropriateness for either GD or ToM clips (see Table 2.2).

Table 2.2 Participant scores on the Frith-Happé animations

	TD	BP	*p*-value	Partial n²	95% CI
Intentionality					
GD (/10)	5.12	5.59	.202	.013	-.20, .94
ToM (/20)	14.07	13.02	.032	.036	-2.01, -.09
Appropriateness					
GD (/4)	3.45	3.19	.127	.019	-.61, .08
ToM (/8)	4.05	3.49	.090	.023	-1.21, .09
Length					
GD (/8)	5.96	6.43	.173	.013	-1.16, .21
ToM (/16)	13.20	13.25	.933	.000	-1.27, 1.17

Notes: Estimated marginal means are presented for intentionality and appropriateness subscales of the AST for the two conditions of film clip. GD = goal directed, ToM = Theory of Mind, TD = typically developing group, BP = behavioural problems group

2.4.4 The relationship between behavioural problems, emotion recognition and intentionality

Emotion recognition was significantly inversely related to total SDQ score, conduct problems and peer problems, while intentionality score on the Frith-Happé animations for ToM clips was inversely associated with total SDQ score and conduct problems only. Emotion recognition and intention recognition for ToM clips were positively related (see Table 2.5).

Table 2.3 Relationship between behavioural problems, emotion recognition and intention recognition

	SDQ				FER	Intentionality	
	1.Total	2.Conduct	3.Peer	4.Pro-social	5.Total	6.GD	7.ToM
1	-						
2	.736**	-					
3	.633**	-.219*	-				
4	-.438**	-.473**	-227**	-			
5	-.386**	-.213*	-.281**	.082	-		
6	-.035	-.044	-.107	.071	.012	-	
7	-.249**	-.201*	-.120	.104	.200*	.431**	-

Notes: Values represent Spearman's rho. Correlations n = 137. * = correlation is significant at the 0.05 level, ** = correlations is significant at the 0.01 level. SDQ = Strengths and Difficulties Questionnaire, FER = facial emotion recognition, GD = goal directed, ToM = Theory of Mind

Multiple regression analysis was used to determine whether emotion recognition and intention recognition (for ToM clips) predicted behavioural problems (as indicated by total SDQ score). The multiple regression model significantly predicted total SDQ score, $F_{(2,130)}$

= 14.80, p < .001, adjusted R^2 = .17. Both emotion recognition and intention recognition significantly added to the prediction, p < .05 (see Table 2.4).

Table 2.4 Summary of multiple regression analysis

	B	SE_B	β
Intercept	39.24	4.57	
Emotion Recognition	-.22	0.05	-.36*
ToM Intentionality	-.45	0.21	-.17*

Notes: B = unstandardized regression coefficient, SE_B = standard error of the coefficient, β = standardized coefficient, * = p < .05

2.5 Discussion

The first aim of the current study was to assess and compare emotion recognition and intention recognition and attribution in children with behavioural problems and controls. Our results confirm previous findings of emotion recognition impairments in children with behavioural problems. However, for the first time, our results also indicate that children with behavioural problems are impaired in recognising other people's intentions. Specifically, children in the BP group were found to be impaired in ascribing intentions and mental states to the triangles for ToM clips, but showed no impairment in their understanding of the clips or in ascribing intentions and mental states to the triangles for GD clips. However, in addition to differing in behavioural problems, the BP and TD groups differed on demographic variables and, although unlikely to have influenced the results, this needs to be taken into account when considering the findings of the current study. The second aim of the study was to explore relationships between emotion recognition, intention recognition and behavioural problem severity. We found that emotion and intention recognition were positively related and both were inversely associated with behavioural problems and independently of each other predicted behavioural problems.

The results of the current study are in contrast to the findings of the only other study to investigate intentionality in children with behavioural problems using the Frith-Happé animations. Jones et al. (2010) found no significant difference in performance on the Frith-Happé animations between participants with behavioural problems and a control group. There are a number of potential explanations that could account for the contrasting findings

between our study and the one conducted by Jones et al. (2010). In the Jones et al. (2010) study the mean age of participants with conduct problems was 12 years while the mean age of children in the BP group in the current study was 8.86 years old. Schwenck et al. (2012) also used the Frith-Happé animations and compared the appropriateness scores of children and young people with CD with the appropriateness scores of typically developing control group. In their work Schwenck et al. (2012) divided their sample into 'young' and 'old' (below and above 11.9 years old respectively) and found that older children described GD and ToM clips significantly more accurately. The difference in age between the participants in our study and the study conducted by Jones et al. (2010) could contribute to the difference in results. As previously mentioned, the BP and TD groups in the current study did differ in age and IQ so it is possible that this may account for the different findings between the current study and work by Jones et al. (2010). It is also of note that the sample size in the current study is much larger than the sample size used by Jones et al. (2010), who acknowledged that the modest sample size of their groups might mean they may have missed effects of a smaller magnitude.

Mohammadzadeh et al. (2016) suggest that displays of ASB in individuals with behaviour problems may be due to their misinterpretation of another's intention which then leads them to act inappropriately. The specific impairment in intentionality displayed by the BP group in the current study appears to provide support for Mohammadzadeh et al.'s suggestion, although further work is needed to confirm this. In line with the theory that intention misinterpretation may lead to displays of ASB, Choe et al. (2013) found associations between impaired ToM and HABs (Choe et al., 2013). In antisocial individuals a HAB has been shown to extend from interpreting ambiguous situations as hostile to interpreting neutral faces as angry (Leist & Dadds, 2009). The association between emotion and intention recognition in the current study and results of previous work indicating a relationship between emotion and intention recognition (Corden et al., 2006; Mier et al., 2010) suggest that the misinterpretation of other people's emotions and intentions may

contribute to the development of a HAB which consequently may lead to aggressive, antisocial behaviours. Although the current study showed that emotion recognition and intention recognition are related processes, they independently of one another predicted behavioural problems. This highlights the need to consider these two processes, and the role they play in the development of ASB, separately when determining intervention and treatment plans for individuals with behavioural problems.

The current study found an inverse association between emotion recognition ability and the severity of both conduct and peer problems. Work conducted by Hubble et al. (2015) further illustrates the relationship between emotion recognition and the severity of conduct problems. Hubble et al. (2015) showed that fear, sadness and anger recognition can be improved in youth offenders following emotion recognition training and the improvement was associated with a significant reduction in the severity of crimes committed six months later. Previous research has shown that good emotion recognition enables individuals to initiate and maintain social relationships (Hunnikin & van Goozen, 2018) and the negative association between emotion recognition and severity of peer problems in the current study demonstrates that the reverse is also true.

Like emotion recognition, intention recognition was inversely associated with conduct problem severity. This is line with previous research showing that lower levels of ToM in childhood are associated with more externalising problems (Hughes et al., 1998). However, Hughes, White, Sharpen and Dunn (2000) found that ToM in 'hard to manage' pre-schoolers was not related to negative aspects of social interaction such as hurting a peer. The contrasting results may be due to methodological factors. In the study conducted by Hughes et al. (2000) behaviour was assessed by observing twenty minutes of play between the participant and their best friend. This is in contrast to the results of the current study and previous work that has found an association between aspects of ToM and conduct problems when using questionnaire ratings of behaviour.

CU traits are patterns of callousness, uncaring behaviour, reduced guilt and reduced empathy (Blair et al., 2014) and are displayed by a subgroup of children with conduct problems. There is some evidence to suggest that impairments in social cognition in antisocial populations are dependent on the presence of CU traits with individuals high in CU traits showing impairments in both CE, which is effectively ToM (Blair, 2008), and AE (Anastassiou-Hadjicharalambous & Warden, 2008). However, in the current study the prosocial subscale of the SDQ, an indirect measure of CU traits (Kimonis et al., 2016), was not found to be associated with either emotion or intention recognition.

Although the current findings offer promising new avenues for research it is important to acknowledge the limitations of this study. Previous work has consistently found individuals with ASD to show an impairment in ToM. Although in the current study participants were referred due to displays of disruptive behaviour and/or a lack of prosocial behaviour, there was no measure of ASD traits so we cannot rule out a contribution of ASD traits to our findings. Similarly, there was no direct measure of CU traits and previous research has shown that impairments in social cognition can be dependent on the presence of CU traits (e.g. Jones et al., 2010). However, the prosocial subscale of the SDQ was used as an indirect measure of CU traits. As previously mentioned there were differences between the BP and TD groups in terms of demographic characteristics and as such we cannot rule out their contribution to our findings. However, hierarchical regression analyses showed that the outcome measures (emotion recognition and Frith-Happé animations) significantly predicted behavioural problems when controlling for demographic characteristics (see Appendix B), suggesting it is unlikely that demographic differences are responsible for the difference between BP and TD groups in emotion and intention recognition.

Future research should aim to investigate ToM in children and young people displaying behavioural problems across different ages. Previous work has shown that symptoms of behavioural problems change with age (Brocki & Bohlin, 2006) and as such, children's developmental age may influence the relationship between behavioural problems and

aspects of social cognition. Similarly, Dadds et al. (2009) showed that deficits in CE associated with psychopathic traits were greatest in children and decreased with age. This suggests that a 'catch up' in CE occurs over time in individuals high in psychopathic traits. It would be interesting to see whether a similar 'catch up' in intention recognition also occurs. Future studies should ensure participant groups are age matched to determine whether any differences in social cognition are attributable to behavioural problems, and not due to differences in age. In addition, future research should explore the relationship between emotion and intention recognition in children and young people with a diagnosis of CD and in other neurodevelopmental disorders characterised by externalising problems, such as ADHD, to determine whether the same results are found as in the current study.

In conclusion, the current study compared emotion recognition and intention recognition and attribution in children who were identified by their teachers as having behavioural problems to a group of typically developing controls, and also examined the relationship between emotion recognition, intention recognition and severity of behaviour problems. Our results indicate that children with behavioural problems show an impairment in both emotion and intention recognition and that these two processes related. In addition, emotion and intention recognition were both inversely associated with the severity of behavioural problems and independently of one another predicted behavioural problems. Our findings indicate that the well-documented impairment in emotion recognition in those with behavioural problems extends to the recognition of the intentions of others. The possibility of a wider impairment in social cognition and socio-emotional functioning should be taken into account when considering the best intervention and prevention strategies for children who exhibit ASB.

3. Low self-esteem and impairments in emotion recognition predict behavioural problems in children

This Chapter is based on:

Wells, Hunnikin, Ash & Van Goozen (*in press*). Low self-esteem and impairments in emotion recognition predict behavioural problems in children. *Journal of Psychopathology and Behavioral Assessment*

3.1 Abstract

Research indicates that low self-esteem and impaired emotion recognition are risk factors for ASB. Self-esteem and emotion recognition are essential for successful social interaction and previous research suggests that self-esteem and emotional intelligence are positively related. However, to our knowledge the relationship between these two risk factors for ASB has not been explored in children with behavioural problems. Thus, this study investigated self-esteem and emotion recognition, their relationship with one another and with behavioural problem severity. Participants were 8-11 year olds with behavioural problems (BP; $n = 78$) who were taking part in an early intervention program and typically developing controls (TD; $n = 54$). Participants completed a self-esteem questionnaire and a computerised emotion recognition task. Teachers and parents rated children's emotional and behavioural problems. BP participants had significantly lower self-esteem and exhibited an impairment in emotion recognition. Self-esteem and emotion recognition were positively related and inversely associated with behavioural problem severity and they predicted behaviour problems independently of one another. This is the first study to show that self-esteem and emotion recognition are related processes in children with behavioural problems and that both predict behavioural problems. This has important implications for the development of intervention strategies.

3.2 Introduction

Self-esteem, or how an individual feels about themselves (Leary & Baumeister, 2000), is considered to be an important indicator of psychological functioning (McCauley et al., 2017). People with high self-esteem are generally happier and more likely to enjoy close friendships (Leary, Schreindorfer & Haupt, 1995). In contrast, low self-esteem is one of the strongest predictors of emotional and behavioural problems (Leary et al., 1995) and has been implicated in a variety of youth problems (Barry et al., 2007), including the development of ASB (Trzesniewski et al., 2006).

Low self-esteem has been reported in numerous antisocial populations including children and adolescents with conduct problems (Barry et al., 2003), adolescents at-risk of future ASB (Barry et al., 2007), adolescents with CD (Glass, Flory, Martin & Hankin, 2011) and youth offenders (Matsuura et al., 2010). In addition to cross-sectional studies that have found that antisocial individuals display lower levels of self-esteem than typically developing individuals, longitudinal studies suggest that low self-esteem is predictive of subsequent behaviour problems and ASB. For example, Donnellan et al. (2005) found that 11 year olds with low self-esteem showed an increase in aggression by age 13. Similarly, Trzesniewski et al. (2006) found that individuals who had low self-esteem during adolescence were more likely to have received a criminal conviction during adulthood than those with high self-esteem.

Although the majority of literature exploring the relationship between self-esteem and ASB suggests that low self-esteem is associated with ASB (Walker & Bright, 2009), some research indicates that ASB is most likely to occur when a person with *high* self-esteem comes into contact with someone who challenges that self-view (Papps & O'Carroll, 1998; Salmivalli, 2001). Indeed, aggressive children have been found to have higher, idealised self-perceptions of themselves compared to non-aggressive children (Hughes et al., 1997) and narcissism (i.e., a grandiose self-view) has been shown to lead to high levels of aggression (Baumeister, Bushman & Campbell, 2000).

There are different explanations that could account for these seemingly conflicting findings. Crucially, when determining whether low or high self-esteem is associated with ASB it is important to consider how self-esteem was defined and measured. Studies that have found high self-esteem to be associated with ASB have often used measures of narcissism as an indicator of high self-esteem (Bushman et al., 2000; Thomaes, Bushman, Stegge & Olthof, 2008), therefore assuming that low self-esteem and narcissism are at opposite ends of the same spectrum (Donnellan et al., 2005). However, more recent research suggests that narcissism and self-esteem are best conceptualised as two distinct

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but related forms of self-perception (Barry et al., 2007) and as such, narcissism and high self-esteem should not be considered synonymous constructs (Barry et al., 2003).

It has been argued that narcissism may be a defence mechanism to hide an individual's feelings of insecurity and actually be an indicator of underlying low self-esteem (Barry et al., 2003). As such, low self-esteem could be a risk factor that links narcissism to aggression. Indeed, in 9-15 year olds displaying symptoms of ODD and CD, it was the combination of low self-esteem *and* high narcissism that was associated with the highest levels of behavioural problems (Barry et al., 2003), providing further evidence that self-esteem and narcissism should be considered separately and that low self-esteem is associated with conduct problems in children and adolescents.

While ASB and behavioural problems appear to be associated with low general self-esteem, this does not appear to be the case for all dimensions of self-perception. A body of research indicates that children with behavioural problems actually perceive their social competence overly optimistically (Hughes et al., 1997; 2001). Indeed, Hughes et al. (1997) found that, while teachers rated aggressive children as having experienced more peer rejection than non-aggressive children, aggressive children and non-aggressive children's self-rated levels of social competence were comparable. Hughes et al. (1997) propose that a self-enhancing bias accounts for the optimistic self-views that children with behavioural problems hold and suggest that this bias exists as a defence mechanism to protect children's sense of security and self-worth (Hughes et al., 1997). On the other hand, it has also been suggested that the bias is a result of a hyposensitivity to negative feedback (Zakriski & Coie, 1996). Whatever the underlying reason, the self-enhancing bias appears to be specific to self-perceptions of social competence and quality of peer relationships. Diamantopoulou et al. (2005) investigated peer relations in children with symptoms of aggressive behaviour and ADHD and found that aggressive behaviour was related to more negative self-perceptions of behavioural conduct and lower global self-worth but was *not* related to more feelings of loneliness.

Evidence of a self-enhancing bias in children with behavioural problems adds to the large body of literature that suggests antisocial individuals are impaired in a number of processes related to socio-emotional functioning and social cognition (Hughes et al., 1997), including emotion recognition. Research consistently finds antisocial individuals to display an impairment in the recognition of negative emotions, which is thought to contribute to the development and persistence of ASB (Blair, 2003; 2005). An impairment in the ability to recognise facial displays of negative emotions has been found in children with conduct problems (van Goozen, 2015), adolescents with CD (Fairchild et al., 2009), and youth offenders (Bowen et al., 2014).

Emotion recognition is a key part of emotional intelligence (Rey et al., 2011) and research suggests there is a positive relationship between emotional intelligence and self-esteem (Ciarrochi et al., 2001; Rey et al., 2011; Schutte et al, 2002). Although self-esteem and emotional intelligence appear to be positively related, to our knowledge this relationship has not been explored in children with behavioural problems. McCauley et al. (2017), however, did explore the relationship between self-esteem and a social-cognitive process closely related to emotion recognition: ToM. They found that children with ASD showed both, an impairment in ToM and lower self-esteem compared to typically developing individuals. Moreover, ToM and self-esteem were negatively correlated in children with ASD suggesting, not only that self-esteem and socio-cognitive abilities are related, but also that self-esteem is lower in those with impairments in processes related to social cognition. Thus, we might also expect children who show an impairment in emotion recognition to show lower levels of self-esteem than those who do not, and for these two processes to be related.

The current study examined the relation between self-esteem and emotion recognition ability in children with behavioural problems and typically developing controls. We expected children with behavioural problems to report lower global self-esteem and perceive their behavioural conduct more poorly compared to typically developing controls but that the two groups would not differ in their self-perceived social competence. We also expected children

with behavioural problems to display an impairment in emotion recognition. Given the relationship between self-esteem and emotional intelligence (Schutte et al., 2002) and the fact that self-esteem appears to emanate from processes closely linked to social cognition, including emotion recognition (McCauley et al., 2017), we expected self-esteem and emotion recognition to be related and both to be associated with the severity of behavioural problems.

3.3 Method

3.3.1   Ethical Statement

All aspects of the research were approved by the Cardiff University School of Psychology Research Ethics Committee. Informed written consent was provided by the participant's parents/guardians and informed written assent was obtained for the participants.

3.3.2   Participants

132 children (102 male) aged 8-11 years ($M = 9.37$, $SD = .98$) took part from schools across England and Wales. Participants were assigned to one of two groups: the BP group ($n = 78$) or the typically developing group TD ($n = 54$). As with Chapter 2, participants in the BP group were part of an early intervention program and referred into the study by their teachers, FSWs or PCSOs. The children in the BP group did not have a formal mental health diagnosis but showed substantial behavioural and/or emotional problems to be referred into the intervention program. The child's teacher completed the SDQ (Gooodman, 1997) to confirm behavioural status for the last 6 months. Children scoring in above/below average range for key subscales were eligible to be included in the BP group. Children in the TD group were also referred by their teachers but for not showing behavioural or emotion problems and showed total SDQ scores in the 'close to average' range.   See Section 1.13.1 (p.37) for a detailed description of the sample and eligibility criteria.

3.3.3   Materials

3.3.3.1 Demographics and behavioural characteristics

The two subset form of the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999; vocabulary and matrix reasoning) was used to provide an estimated IQ score. The vocabulary subtest was used to provide an estimate of verbal IQ. Socioeconomic status (SES) was estimated using the Office for National Statistics estimates of average household total weekly income based on each participant's postcode (Low = £0-£520; Middle = £521-£670; High = £671+; Hubble et al., 2015).

The SDQ (Goodman, 1997) is a 25-item questionnaire that assess areas of emotional and behavioural difficulties and strengths. It is comprised of five subscales; conduct problems, peer problems, hyperactivity, emotional problems and prosocial. Summing all but the last of these subscales together gives a 'total difficulties' score which provides a measure of mental health and wellbeing (Beardsmore, 2015). Meanwhile, scores on the prosocial subscale provide an indirect measure of CU traits given the DSM-5's description of CD with CU traits as with "limited prosocial emotions" (Blair, 2014). The SDQ is a widely used, valid and reliable measure (Stone & Otten, 2010) and predicts consistent behavioural problems (Wilson et al., 2012). In addition to the total score, the conduct problems and peer problems subscales were used to provide objective measures of children's behavioural conduct and social competence, respectively, in the current study. Cronbach's α for the total SDQ score was 0.72 indicating good internal consistency.

3.3.3.2 Self-esteem

The Self Perception Profile for Children (SPPC; Harter, 1982) was used to provide an indicator of participants' self-esteem and self-perception. The SPCC is a self-report questionnaire that assesses how children evaluate themselves over different areas of their life. It is a valid, reliable measure and is the most widely used questionnaire for assessing self-esteem in children (Muris, Meesters & Fijen, 2003). The current study assessed participants' self-perceived social competence and behavioural conduct as well as their

global self-worth. Social competence refers to the child's perceived knowledge of how to make friends while behavioural conduct refers to the degree to which one likes the way one behaves and global self-worth is analogous to overall self-esteem, referring to how much one likes oneself as a person. Each subscale contains six items and all items are scored on a scale of one to four where one reflects the lowest perceived adequacy and four reflects the highest. Cronbach's α for the current study was 0.82 indicating good internal consistency.

3.3.3.3 Facial Emotion Recognition

See Section 2.3.3.2 (p.49) for a full description of the FER test.

3.3.4   Statistical analyses

Differences in demographic and behavioural characteristics between groups were analysed using independent samples t-tests for continuous variables and X^2 tests for binary variables. Spearman's rho correlations were used to examine relationships between behavioural characteristics, emotion recognition and self-esteem and multiple regression analysis was used to determine whether emotion recognition and self-esteem, could independently of each other, predict behavioural problems. Percent correct for total emotion recognition was calculated by taking the mean score of happy, sad, fear, anger and neutral recognition and percent correct for negative emotions was calculated by taking the mean score of sad, fear and anger recognition. Given the debate regarding the specific nature of emotion recognition impairments in antisocial populations (section 1.6.1), emotion recognition scores for happy and neutral expressions were examined in addition to the total and negative scores. MANCOVAs were used to determine any between group differences for scores on the SPPC and emotion recognition (total, negative, happy and neutral scores). Bonferroni corrections were used to adjust for multiple comparisons. Effect sizes were calculated as partial eta squared (n_p^2; small ~.03, medium ~.06, ≥.14; Cohen, 1992). Analyses were carried out using SPSS 23 (SPSS Inc., Chicago, Illinois).

3.3.4.1 Covariates

The SPCC and FER are both verbal tasks and prior research has shown an association between verbal ability and self-esteem/self-perception (Simon & Simon, 1975), on the one hand, and emotional intelligence on the other (Hogan et al., 2010). Therefore, VIQ was included as a covariate in the categorical analyses for both tasks. FSIQ, age and SES were not included as covariates in the analyses. SES was not significantly correlated with performance on either the SPCC or FER ($p < .05$). Age was significantly correlated with performance on the SPCC but not with performance on the FER. A hierarchical regression analysis showed that while SPCC score significantly predicted behavioural problems age did not. FSIQ was significantly correlated with performance on the FER, but not with performance on the SPCC. A hierarchical regression analysis showed FER significantly predicted behavioural problems even when controlling for FSIQ. As FER and Frith-Happé animations predicted behavioural problems even when controlling for FSIQ and age respectively these demographic variables were not included as covariates in the analyses. (See Appendix B for the relationships between demographic and outcome variables and Appendix C for full details of hierarchical regression analyses).

3.4 Results

3.4.1   Demographic and behavioural data

Participants in the TD group were significantly older, had a higher SES, FSIQ and VIQ than the BP group (see Table 3.1). Verbal IQ was included as a covariate in the analyses, but FSIQ, age and SES were not. SES was not significantly correlated with performance on either the FER or SPPC ($p < .05$), age was only significantly correlated with SPPC scores, $r(130) = .216$, $p = .013$, and IQ, $r(130) = .352$, $p < .001$, and VIQ, $r(130) = .298$, $p = .001$ were only significantly correlated with performance on the FER. The groups were matched on gender and there was no difference in emotion recognition accuracy by gender, $t(131) = -.001$, $p = 1$, nor was there an effect of gender of performance on the SPPC, $t(131) = -.416$, $p = .678$. Participants in the TD group had a significantly lower total SDQ score, showed

significantly fewer conduct and peer problems than the BP group and significantly more

prosocial behaviour.

Table 3.1 Demographic and behavioural characteristics of TD and BP participants

	TD (n = 54)	BP (n = 78)	*p*-value
Age (years)	9.74 (1.01)	9.12 (.88)	<.001
FSIQ	102.94 (18.66)	92.22 (13.68)	<.001
VIQ	53.25 (10.95)	45.37 (10.94)	<.001
Gender			.729
% Male	75.9	78.5	
% Female	24.1	21.5	
SES			.001
% Low	0	6.3	
% Medium	21.7	51.6	
% High	78.3	42.2	
SDQ score			
Total	7.84 (3.14)	17.40 (6.05)	<.001
Conduct Problems	1.22 (1.05)	4.00 (2.69)	<.001
Peer Problems	1.88 (1.51)	3.71 (2.25)	<.001
Prosocial Behaviour	6.88 (3.53)	4.63 (2.84)	<.001

Notes: Means are presented with standard deviations in brackets. FSIQ = full scale intelligence quotient (two-subtest WASI), VIQ = verbal IQ (WASI vocabulary subtest), SES = socioeconomic status, SDQ = Strengths and Difficulties Questionnaire, TD = typically developing group, BP = behavioural problem group

3.4.2 Self-esteem

BP participants scored significantly lower than TD participants for the behavioural

conduct, $F(1, 123) = 20.653$, $p < .001$, $n_p^2 = .144$, 95% CI [-4.38, -1.72], and global, $F(1,123)$

$= 11.164$, $p = .001$, $n_p^2 = .083$, 95% CI [-3.94, -1.01], subscales of SPPC. There was no

difference between BP and TD participants on the social competence subscale, $F(1,123) =$

1.064, $p = .304$, $n_p^2 = .009$, 95% CI [-1.37, .431] (see Figure 3.1).
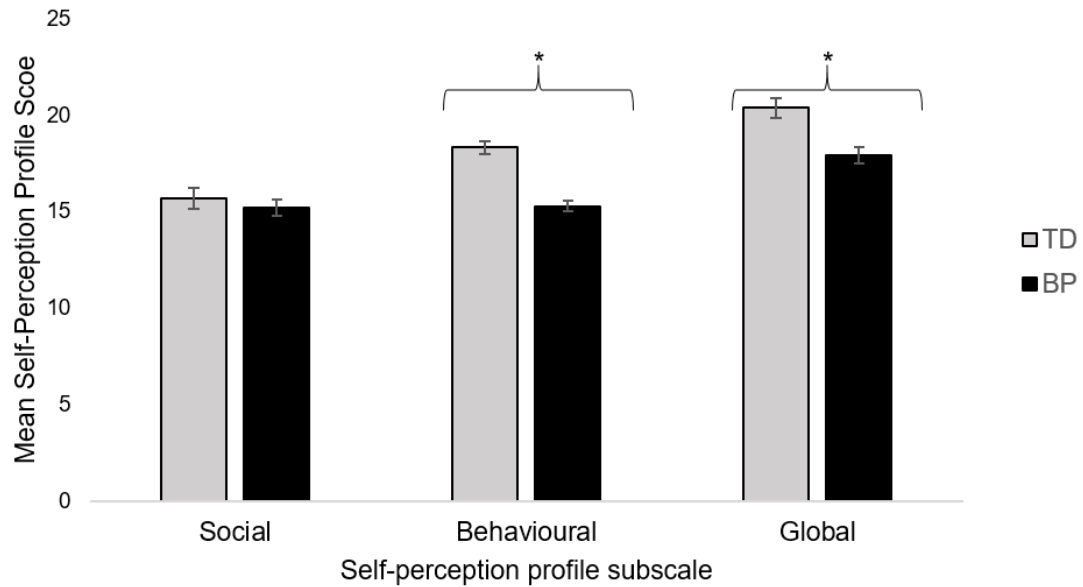
Figure 3.1 Estimated marginal means of social, behavioural and global self-perception profile scores. Error bars are set at ± 1 standard error. * = p < .05. TD = typically developing group, BP = behavioural problems group.

3.4.3   Emotion Recognition

BP participants scored significantly lower than TD participants for total, $F(1,123) = 9.17$, $p = .003$, $n_p^2 = .069$, 95% CI [-9.43,-1.98], negative, $F(1,123) = 4.66$, $p = .033$, $n_p^2 = .037$, 95% CI [-10.39,-.451] and neutral recognition, $F(1,123) = 5.19$, $p = .024$, $n_p^2 = .041$, 95% CI [-15.33,-1.08]. There was no difference between BP and TD participants for happy recognition, $F(1,123) = 3.92$, $p = .050$, $n_p^2 = .031$, 95% CI [-8.11,-4.85] (see Figure 3.2).
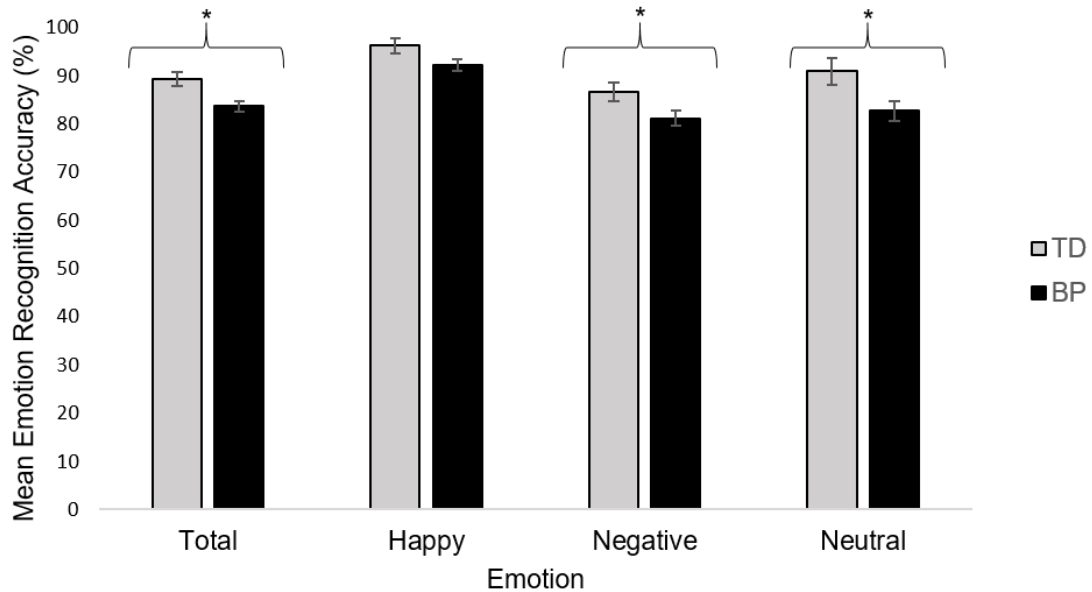
Figure 3.2 Estimated marginal means of total, happy, negative and neutral emotion recognition scores. Error bars are set at ± 1 standard error. * = p < .05. TD = typically developing group, BP = behavioural problems group.

3.4 The relationship between behavioural problems, emotion recognition and self-esteem

The behavioural, global and total scores on the SPPC were positively correlated with emotion recognition ability. Total SDQ score was significantly, inversely correlated with both emotion recognition ability, and behavioural, global and total scores on the SPPC[1], the conduct problems subscale of the SDQ was inversely correlated with behavioural, global and total scores of the SPPC and the peer problems subscale of the SDQ was negatively correlated with social, behavioural and total scores of the SPPC (see Table 3.2).

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[1] A higher score on the SDQ is reflective of more problem behaviours and difficulties whereas a higher score in the SPPC is reflective of higher self-esteem.

Table 3.2 Relationship between behavioural problems, emotion recognition and self-esteem

	SDQ				FER		SPPC		
	1.Total	2.Conduct	3.Peer	4.Pro-social	5.Total	6.Total SPPC	7.Social	8.Behav-ioural	9.Global
1	-								
2	.694**	-							
3	.610**	.193*	-						
4	-.401**	-.461**	-.303**	-					
5	-.326**	-.168	-.194*	-.011	-				
6	-.459**	-.471**	-.239**	.167	.224**	-			
7	-.169	-.131	-.212*	-.052	.123	.428**	-		
8	-.500**	-.528**	-.220*	.193*	.223**	.798**	.073	-	
9	-.300**	-.261**	-.151	.137	.183*	.807**	.178*	.466**	-

Notes: Values represent Spearman's rho. Correlations n = 133. * = correlation is significant at the 0.05 level, ** = correlations is significant at the 0.01 level. SDQ = Strengths and Difficulties Questionnaire, FER = facial emotion recognition, SPP = Self-Perception Profile

Multiple regression analysis was used to determine whether emotion recognition and self-esteem predicted behavioural problems (as indicated by total SDQ score). The multiple regression model significantly predicted total SDQ score, $F(2, 125) = 23.725$, $p < .001$, adjusted $R^2 = .264$. Both emotion recognition and self-esteem significantly added to the prediction, $p < .05$ (see Table 3.3).

Table 3.3 Summary of Multiple Regression Analysis

	B	**SE$_B$**	**β**	***p*-value**
Intercept	45.301	5.096		
Emotion Recognition	-.127	.055	-.185	.022
Self-esteem	-.410	.075	-.438	<.001

Notes: B = unstandardized regression coefficient, SE$_B$ = standard error of the coefficient, β = standardized coefficient

3.5 Discussion

The first aim of the current study was to assess and compare self-esteem and emotion recognition in children with behavioural problems and typically developing controls. Our results confirm previous findings of low global self-esteem, low self-perceptions of behavioural conduct and impaired emotion recognition in children with behavioural problems and supports the idea that self-enhancing bias for self-perceived social competence exists for those with behavioural problems. The second aim of the study was to explore the relationships between self-esteem, emotion recognition and behavioural characteristics. For

the first time our results indicate that self-esteem and emotion recognition are positively related and both inversely associated with severity of behavioural problems. Moreover, we found that self-esteem and emotion recognition, independently of each other, predicted behavioural problems.

The results of the current study are in line with previous work that has found self-esteem to be lower in children and adolescents with behavioural and conduct problems compared to typically developing controls (Barry et al., 2003; Glass et al., 2011). In addition, the current study demonstrates that low self-esteem predicted behavioural problems independently of an impairment in emotion recognition, a neuropsychological correlate of, and risk factor for, ASB (van Goozen, 2015). While both global self-esteem and self-perceived behavioural conduct were lower in children with behavioural problems than in typically developing controls, there was no difference between the two groups in self-perceptions of their social competence. This is in contrast to results on the SDQ which showed that both parents and teachers reported that children with behavioural problems displayed a significantly higher number of peer problems than the typically developing control children. This is in line with previous research that suggests that children with behavioural problems view their own social competence overly optimistically, resulting in a 'self-enhancing bias' (Hughes et al., 1997).

The current study found that children with behavioural problems had lower self-esteem and impaired negative emotion recognition compared to typically developing controls. Moreover, this is the first study to show that self-esteem and emotion recognition are positively related, significantly expanding on previous work that has suggested such a relationship might exist. The RDoC is part of a recent attempt to create new ways of classifying mental illness, advocating studying the processes underlying mental health problems (Insel et al., 2010). The RDoC identified six primary domains of behavioural functioning, one of which was the 'systems for social processes'. This dimension encompasses processes, behaviour and mechanisms which mediate responses in

interpersonal settings (https://www.nimh.nih.gov/research-priorities/rdoc/definitions-of-the-rdoc-domains-and-constructs.shtml). Both emotion recognition and self-perception were identified as core constructs in this domain and research shows that both self-esteem/self-perception and emotion recognition are essential for successful social interaction (Hunnikin & van Goozen; Mann et al., 2004). This study is the first to show that these two processes, both necessary for successful functioning in interpersonal settings, are related to one another.

Although the current study shows that self-esteem and emotion recognition are related, a hierarchical regression analysis found that self-esteem and emotion recognition predicted behavioural problems independently of one another. This suggests that while they are related processes, they are distinct risk factors for ASB. This has important implications when formulating interventions and treatment strategies for individuals displaying behavioural problems and these two risk factors for, and correlates of, ASB need to be considered separately.

The current study found inverse associations between both global self-esteem and self-perceived behavioural conduct, on the one hand, and conduct problem severity and total SDQ score, an indicator of mental health and wellbeing, on the other. This is in line with previous research that has found that lower levels of self-esteem in adolescence are associated with higher levels of criminal activity and mental health problems in adulthood (Trzesniewski et al., 2006). Like self-esteem, emotion recognition was found to be inversely associated with total SDQ score and in addition, an inverse association was also found between peer problems and emotion recognition. This finding is in line with previous research that has found that an impairment in emotion recognition is associated with interpersonal problems (e.g., Hubble et al., 2015).

Although the current findings offer promising new avenues for research it is important to acknowledge the limitations of this study. There were differences between the BP and TD

groups in terms of demographic characteristics (SES, IQ, age) and as such we cannot rule out their contribution to our findings. SES was not associated with either self-perception or emotion recognition ability while age was significantly related to performance on the SPPC, but not to performance on the FER, and IQ was significantly related to performance on the FER, but not to performance on the SPPC. However, hierarchical regression analyses showed that self-perception and emotion recognition both significantly predicted behavioural problems even when controlling for age and IQ respectively (see Appendix B). It therefore seems unlikely that differences in demographic characteristics are responsible for the difference between BP and TD groups in self-perception and emotion recognition. However, future research should ensure participant groups are matched to confirm that any differences in these processes are attributable to behavioural problems and not due to differences in demographic characteristics.

The current study compared self-esteem and emotion-recognition in children who were identified by their teachers as having behavioural problems to a group of typically developing controls, and examined the relationship between self-esteem, emotion recognition and severity of behavioural problems. Our results indicate that children with behavioural problems have lower global self-esteem, poorer perceptions of their behaviour and display an impairment in emotion recognition compared to typically developing children. There was no difference, however, in self-perceived social competence between the two groups which may be indicative of a self-enhancing bias in children with behavioural problems. Self-esteem and emotion recognition were positively related and both were inversely associated with severity of behavioural problems. Moreover, they both predicted behavioural problems independently of one another. Our findings indicate that the well-documented impairments in self-esteem and emotion recognition in those with behavioural problems may be related. The impairments in these related, but distinct processes, should be taken into account when considering the development of intervention and prevention programmes for children exhibiting ASB.

4. First evidence that improving emotion recognition increases mental health and wellbeing in children with behaviour problems

This Chapter is based on:

Wells, Hunnikin, Ash & Van Goozen (*under revision)*. First evidence that improving emotion recognition increases mental health and wellbeing in children with behavioural problems

4.1 Abstract

Impaired emotion recognition is a risk factor for behavioural problems and ASB. It has been argued that improving emotion recognition leads to improvements in behavior and wellbeing, but long-term follow-up studies are missing. This study examined the immediate and longer-term effects of a brief targeted emotion recognition training on behavior and wellbeing in children taking part in an early intervention program. Participants were 7- to 11-year-old children with behavioral problems ($n = 62$, mean age: 8.61, 83.9% male). Those impaired in emotion recognition ($n = 40$) received the emotion training; all children continued to receive their usual interventions. Teachers, who were blind to interventions received, rated participants' behaviour before and 6 months after the emotion training. Only children who received the emotion training showed a significant reduction in behavioral problems at the 6-month follow-up; post-test emotion recognition predicted children's behaviour and wellbeing at the 6-month follow-up independently of their initial emotion recognition ability and behavioral problems. This study is the first to show that targeting emotion recognition improves longer term behavior and social functioning in children with severe behavioral problems. Improving emotion recognition should be a consideration when developing cost-effective interventions to improve mental health and wellbeing.

4.2 Introduction

The ability to accurately recognise the emotions of others is crucial for interpersonal interactions and social functioning (Herba & Phillips, 2004). Emotion recognition is positively associated with the initiation and maintenance of healthy social relationships (Izard et al., 2001), it provides insight into the mental states of others, enabling the understanding of their behaviour (Hunnikin & van Goozen, 2018) and we know that young children who are good at recognising the emotions of others are more socially skilled and popular (Edwards et al., 1984).

The degree to which emotion skills develop in childhood has significant implications for children's later social competence (Cicchetti, 2016). Difficulties with emotion recognition are

well documented in children and adolescents with a range of mental health, neurodevelopmental and behavioural difficulties (Bons, Broek, & Scheepers, 2013). In a systematic review, Collin, Bindra, Raju, Gillberg and Minnis (2013) found emotion recognition impairments in a wide range of child psychiatric disorders, including CD, indicating that impaired emotion recognition is a transdiagnostic risk factor. Across these disorders the impairments in emotion recognition were likely to negatively affect peer relationships (Collin et al., 2013). Interventions that successfully target and improve emotion recognition could improve behaviour and social functioning and reduce the likelihood of a range of psychopathology, relieving pressure on statutory services (Hubble et al., 2015)

Although an impairment in emotion recognition is a risk factor for many neurodevelopmental disorders the nature of this impairment varies. In individuals displaying ASB, conduct and behavioural problems, the impairment appears to be specific to the recognition of negative emotions, especially fear (Marsh & Blair, 2008) but impairments in sadness and anger are also reported (Fairchild et al., 2009). In addition, some research indicates that antisocial individuals display a HAB, misinterpreting ambiguous, neutral faces as angry (Dadds et al., 2006). While the majority of research finds antisocial individuals to show an impairment in emotion recognition, it is important to note that a great deal of individual variation in emotion recognition ability exists (Eugène et al., 2003) and some research has found emotion recognition to be intact in antisocial individuals (Glass & Newman, 2006). Therefore, not all individuals with behavioural problems are likely to be impaired in emotion recognition.

ASB describes a persistent pattern of negative behaviours, including an inability to conform to, and a violation of, social norms and a disregard for the rights of others (APA, 2014). ASB displayed during childhood and adolescence is associated with numerous negative outcomes during adulthood. It predicts future ASB, psychiatric illness, poor physical health, substance abuse (Bardone et al., 1998; Fombonne et al., 1983), erratic employment patterns and violent relationships (Scott et al., 2001). In addition to the negative outcomes

for the individual, childhood ASB is hugely costly to society (Odgers et al., 2007). Reducing and preventing the development of ASB is therefore crucial, both for the individuals displaying the behaviour and for society at large.

A few studies have attempted to correct emotion recognition impairments and improve subsequent behaviour and wellbeing. Penton-Voak et al. (2013) demonstrated that modifying hostility biases in youth offenders was associated with fewer self and staff reported aggressive incidents up to two weeks after training. Similarly, Rawdon et al. (2018) found that increasing the perception of happiness over disgust in ambiguous expressions in socially anxious adolescents led to fewer self-reported depressive symptoms two weeks later compared to those who received a sham intervention. However, these improvements in mood and behaviour were only assessed in the short term. The only study to date in which the longer term effects of emotion recognition training on objectively recorded behaviour were examined found that improving negative emotion recognition in youth offenders led to a significant reduction in the severity of crimes committed up to 6 months later (Hubble et al., 2015).

While expanding on the work by Penton-Voak et al. (2013), the work conducted by Hubble et al. (2015) did have its limitations. The training was not tailored. Instead, group allocation (emotion recognition training versus treatment as usual) was determined by individuals' availability to attend the training sessions, regardless of whether or not they showed an initial impairment in emotion recognition ability. Previous research has shown that not all individuals displaying ASB will show an impairment in emotion recognition ability (Glass & Newman, 2006) and considerable individual variability exists (Eugène et al., 2003). As such, not all individuals would benefit from an emotion recognition training programme.

The previous studies by Penton-Voak et al. (2013) and Hubble et al. (2015) were conducted in adolescents. No studies to date have been conducted in children who have experienced severe adversity and display disruptive behaviour as part of an early prevention

initiative; early intervention is the most (cost-)effective way to prevent and reduce mental health problems (US Department of Health and Human Services, 2007). Antisocial individuals often start showing conduct problems early in life (Moffitt, 1993) and once established ASB is maintained. Research has shown that the majority of crime is committed by a relatively small group of chronic offenders who display ASB during childhood (Sainsbury Centre for Mental Health, 2009). Thus, interventions need to be delivered early to stand a greater chance of being effective (van Goozen, 2015) and research has consistently shown that intervening early in children displaying behavioural problems leads to better outcomes (Hektner et al., 2014; Skeem et al., 2014) than late intervention. Emotion recognition skills continue to develop through the primary school years (Rodger et al., 2015), providing an ideal time to intervene. Dadds et al. (2012) found that an emotion recognition training improved conduct problems in 6-16 year olds with CU traits 6 months after receiving the training, despite there being no improvement in emotion recognition. Because parents were involved in both the training and reporting on behaviour, no independent assessments were available to verify these improvements.

Previous studies examining the effect of emotion recognition training on behaviour have not assessed participants' baseline emotion recognition ability before receiving emotion recognition training. Some research has found antisocial populations to show intact emotion recognition (Del Gaizo & Falkenbach, 2008; Glass & Newman; 2006) and others have shown that some children with behavioural problems are actually better at recognising fear (Woodworth & Waschbusch, 2008). A targeted treatment approach is likely to be more effective as well as representing a more efficient use of time and resources (van Goozen & Fairchild, 2008; White et al., 2013; Wilkinson et al., 2015); only those individuals displaying behavioural problems *and* an impairment in emotion recognition should receive emotion recognition training.

In the UK, the Early Intervention Partnership Hub brings together police and social care and works with children from families known to police or social services and who have been

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exposed to multiple ACEs. The Hub aims to intervene early to prevent the escalation of behavioural and emotional problems. A key feature of the Hub is the holistic approach employed by PCSOs who work with children, families and schools enabling children to access help they may previously not have received (Doran, 2018). PCSOs deliver targeted group and one-to-one sessions focusing on a number of issues faced by children, including witnessing domestic abuse (Doran, 2018).

The Research Domain Criteria (RDoC) approach (Insel et al., 2010) advocates the study of the underlying and transdiagnostic processes involved in mental health problems and recommends the development of personalised interventions that target those with clear problems, rather than assuming that impaired processes are present in all those sharing a diagnosis or exhibiting similar behavioural problems. In line with this approach, it has been established that emotion recognition can be rapidly improved in children with behavioural problems (Hunnikin, Wells, Ash & van Goozen, *under review*). Building on this work, in the current study we aimed to examine the longer-term effects of emotion recognition training on behaviour and social functioning 6 months later, as rated by teachers who were unaware that the children had received emotion training.

In the current study the behaviour and wellbeing of children with behavioural problems were assessed at pre-test and at 6-month follow up through independent teacher reports, using the SDQ (Goodman, 1997). The SDQ is frequently used in epidemiological (Maughan et al., 2008), longitudinal (St Clair et al., 2011) and intervention (Hutchings et al., 2013) research. All participating children were part of the Early Intervention Partnership Hub and therefore received support in various ways. In line with RDoC guidelines (Inset et al., 2010), only children with emotion recognition impairments, compared to a sample of typically developing children, received the emotion training.

4.3 Method

4.3.1 Ethical Statement

All aspects of the research were approve by the Cardiff University School of Psychology Research Ethics Committee. Informed written consent was provided by the participant's parents/guardians and informed written assent was obtained for the participants.

4.3.2 Participants

Only children with behavioural problems were included in this chapter. As with Chapters 2 and 3, BP participants referred to the research team by either their teacher, FSW or PCSO and/or because they were part of the Early Intervention Partnership Hub. This study was part of a larger project that aimed to identify socio-emotional impairments in children displaying behavioural problems (BP). Ninety-eight children completed the pre- and post-test emotion recognition task. The behaviour of 62 of these children (52 male) aged 7-10 ($M = 8.61$, $SD = 1.06$) was followed up six months later. Attrition is an almost inevitable feature of longitudinal research, especially when dealing with highly problematic families. In the current study three schools (19 participants) did not provide information at the 6-month follow-up. Follow-up behavioural information was not obtained for a further 17 participants because they moved schools during the course of the study. Children who dropped out did not differ from those who remained in the study in demographic or emotional or behavioural data, suggesting no systematic bias in the data (see Appendix D).

Children in the Early Intervention Partnership Hub come from families who have been identified through a multi-agency process and have been subjected to multiple ACEs, including mental health issues within the home, poverty and domestic abuse. Children in the Hub do not have a formal mental health diagnosis but show behavioural and emotional problems and are close to the threshold for clinical help, as outlined in the interim evaluation of the Hub (Doran, 2018).

After referral, the child's teacher completed the SDQ to confirm mental wellbeing and behaviour status of the child over the last 6 months. Children scoring in the 'slightly raised' or 'above' range for key subscales were eligible to take part (see section 1.13.1 on p.37 for a full description of the sample and eligibility criteria). All BP participants completed a facial emotion recognition (Hunnikin et al., 2019) test. Based on their performance, participants were assigned to either the behavioural problems with emotion training (BP+) group ($n = 40$) or the behavioural problems without training (BP-) group ($n = 22$).

The FER measure was developed for this research. As such, a preliminary study was conducted to assess its suitability. 20 participants (16 male) with a mean age of 8.58 were recruited from schools in England and South Wales to confirm the intensity differences in the FER measure and provide information regarding children's normative emotion recognition ability (see Hunnikin, 2019, doctoral thesis for further information on this study). Participants in the BP+ group were deemed to have an impairment in emotion recognition, and would therefore expect to benefit from the emotion training, because they performed equal to or less than 66.67% for fear, sadness and/or anger expression recognition and these emotions play an important role in ASB (Bowen et al., 2014; Hunnikin & van Goozen, 2018). This threshold represents 1.5 standard deviations below the average based on the preliminary study (Hunnikin, 2019). Based on the RDoC recommendation that interventions should be tailored to those individuals displaying an impairment (Insel et al., 2010), only participants in the BP+ went on to receive the emotion training. The behaviour of all participants (BP+ and BP-) was followed up 6 months later.

All participants (BP+ and BP-) continued to receive their usual interventions and support. This support was provided by either a FSW or PCSO. Participants' usual interventions varied depending on the children's individual needs and included a mix of targeted individual and group work and as well as more universal interventions delivered in a classroom setting (see section 1.13 p.41 for further information on usual interventions).

4.3.3 Materials

4.3.3.1 Demographics and IQ

The Wechsler Abbreviated Scale of Intelligence, first edition (WASI; (Wechsler, 1999) was used to provide an estimated IQ score. Socioeconomic status (SES) was estimated using the National Statistics estimates of average household total weekly income based on each participant's postcode (Low = £0-£520; Middle = £571-£670; High = £671+; (Hubble et al, 2015).

4.3.3.2 Strengths and Difficulties Questionnaire

The SDQ is a 25-item questionnaire made up of five subscales measuring behavioural, emotional and social difficulties and strengths (Goodman, 1997). Summing the emotional symptoms, conduct problems, peer problems and hyperactivity subscales together gives a 'total difficulties' score that ranges from 0-40. The total score does not include the prosocial subscale. The total difficulties score measures mental health and wellbeing in children and is used as *the* measure of mental health and wellbeing in reports conducted by the Office for National Statistics (ONS; Beardsmore, 2015). The SDQ has been shown to be a good screener for psychiatric disorders in both clinical and community-based populations (Warnick, Bracken & Kasl, 2008) and predicts consistent behavioural problems (Wilson et al., 2012). As well as a screening tool, the SDQ has been used to monitor the effectiveness of interventions and as a measure of health and wellbeing in community settings such as schools (Goodman & Goodman, 2009). It has been shown to be an effective outcome measure in numerous samples including in children at risk for developing conduct problems (Hutchings et al., 2013). Goodman and Goodman (2009) showed that the *total* difficulties score can be used as a dimensional measure of child mental health for comparing scores over time or after an intervention. The total difficulties score can also be analysed categorically. A total score of 12 or above is considered to be above average and only 10% of the UK population is classified as above average (Goodman & Goodman, 2011).

Teacher report SDQ was used because teachers are familiar with a broad range of children, they have expertise regarding normative child development (Viding, Blair, Moffitt & Plomin, 2005) and teacher ratings have greater internal consistency and stability than parent ratings (Gomez, Harvey, Quick, Scharer & Harris, 1999). Importantly, in the current study, teachers were unaware which participants had and had not received the emotion training therefore removing bias. In the current study, Cronbach's α for the total SDQ score was 0.71 at pre-test and 0.84 at 6 months post-test indicating good internal consistency.

4.3.3.3 Facial Emotion Recognition

See Section 2.3.3.2 (p.49) for a full description of the FER test.

4.3.4 Cardiff Emotion Recognition Training (CERT)

Participants in the BP+ group were eligible to receive the CERT due to the emotion recognition impairments they showed. The CERT is a computerised emotion recognition training intervention developed at Cardiff University to improve the identification of facial expressions of happiness, sadness, fear and anger by directing attention to key facial features and providing assistance with the interpretation of these features (Hunnikin et al., *under review*; https://emotionrecognition.cardiff.ac.uk/index.php). In addition to improving emotion recognition ability, the CERT also aims to (a) improve the ability to understand when and why certain emotions are shown; (b) improve the ability to understand that people can show different emotions in the same situation and (c) provide guidance on the appropriate response to someone displaying a certain emotion.

The CERT consists of three 20-30 minute sessions that were delivered once a week over three consecutive weeks. It was delivered on a one-to-one basis by a FSW or PCSO in a quiet room at the child's school. The sessions were designed to get progressively harder because there is a reduction in the intensity of the facial expressions across the sessions. In session one, faces are of approximately 100% intensity; this drops to approximately 75% for session two and reduces further to approximately 50% for session three. Similarly, there is a

reduction in both written and pictorial hints, encouraging the participant to recognise the facial expression without the help of the hints. Different models are included in the different sessions in order to expose participants to as many different faces and varying emotional displays as possible. See Figure 4.1 for an example activity from the CERT.

Several learning strategies are adopted in the CERT. The programme consists of repetition of activities across sessions; seven out of thirteen activities are repeated. The purpose of the repetition is to (1) encourage the learning of the key facial features for each emotion, and (2) to assess participants' learning from the previous session. In order to aid learning, participants are given instant feedback as to whether their answer is correct or incorrect. They must achieve a correct answer to proceed and regardless of whether an answer is correct or incorrect, they are provided with hints displaying the common facial features for that emotion.

4.3.4.1   *Activities within the CERT*

The layout of each session of CERT is similar. It consists of an introduction, the different activities, a review and then a quiz. See Table 4.1 for a description of all the CERT activities.

Table 4.1 Description of activities within CERT

Activity Name	Description of Activity	Session activity is completed in
Introduction	Participants are told the purpose of the training, provided with a description of what emotions are and introduced to a description of the key facial features that are important for each emotional expression.	Sessions one, two and three
How do they feel?	Participants are asked to choose which emotion they think a model is showing (see Figure 4.1)	Sessions one, two and three
When have you felt this way?	Participants are required to first identify the correct emotion the model is displaying and then think of a situation when they experienced this emotion.	Session one
Choose the emotion	Participants are presented with four different photos and they are required to identify which model is displaying the target emotion.	Sessions one and two
Emotion videos	Participants view a video of a face morphing from a neutral expression to an emotional display (100% intensity). Participants pause the video when they can identify an emotional display and name the emotion.	Session one, two and three

Parts of the face	Participants are told to consider the separate facial features (eyes, eyebrows and mouth) and choose the correct description for each facial feature for each emotion out of three forced-choice options.	Sessions one and two
Emotion stories	Participants view emotional vignettes and they choose which emotion they would show if they were in this situation.	Session three
Copy the face	Participants first identify the emotion the model is showing and then imitate the expression.	Session two
Make a face	Participants view photos of two different emotional expressions from the same person that are split in half. The participant is required to drag and drop the top half and the bottom half to create a specified emotional expression.	Session two
Talking to your friend	Participants view a photo of a model displaying an emotion and are asked to provide an open-ended response of what they think is an appropriate response to the emotional display. They then view three-forced choice options and select which response they believe is the most appropriate one.	Session three
Review	At the end of each session, a review activity summarises the key facial features of each emotion and there is the opportunity to discuss the session.	Sessions one, two and three
Quiz	Participants view photos and they are required to say what emotion the model is showing. No feedback is provided and a 'no emotion' option is included	Sessions one, two and three
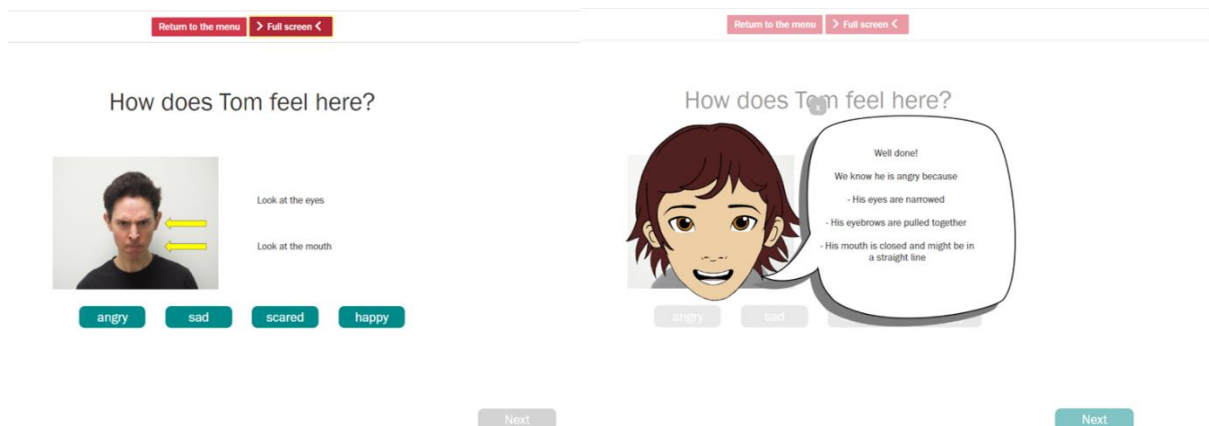
Figure 4.1. Pictures of the 'How do they feel' activity from session 1 of the CERT. The expression displays anger at 100% intensity.

4.3.5 Procedure

All elements of the study were completed at the child's school. Participants completed

the FER at pre-test and 8 weeks post-test. The BP+ group completed the CERT in between,

while the BP- group continued to receive their standard interventions. Follow up teacher SDQ ratings were collected 6 months later.

4.3.6 Statistical Analyses

Possible demographic differences between the two groups were analysed using independent samples t-tests for continuous variables and X^2 tests for binary variables. Spearman's correlations were used to determine the relationship between emotion recognition and behaviour at pre-test.

Percent correct for negative emotion recognition was calculated by taking the mean score of sad, fear and anger recognition. Given the debate regarding the specific nature of emotion recognition impairments in antisocial populations (section 1.6.1), emotion recognition scores for happy and neutral expressions were also examined. A difference in emotion recognition at pre-test between the two groups was confirmed using an ANOVA. Given the significant differences between the BP+ and BP- groups for FER and total SDQ score at pre-test, separate paired samples t-tests within each group were used to determine whether emotion recognition ability differed between pre-test and post-test and whether SDQ score differed between pre-test and 6-month follow-up. Effect sizes were calculated as Cohen's d (small ~ 0.2, medium ~ 0.5, large ~ 0.8; Cohen, 1988). McNemar's tests were used to determine whether there was a significant change in the percentage of participants with an above average SDQ score.

Hierarchical regression was used to determine whether changes in emotion recognition were associated with changes in problematic behaviour and wellbeing. Where there was a significant difference in SDQ score between pre-test and 6 month follow-up hierarchical regression analyses were used to determine whether emotion recognition at post-test predicted behaviour at the 6-month follow-up independently of pre-test FER, pre-test SDQ and IQ. Analyses were carried out using SPSS 23 (SPSS Inc., Chicago, Illinois).

4.4 Results

4.4.1 Demographics

The BP+ and BP- groups did not differ in age, IQ, gender socioeconomic status, conduct problems and prosocial behaviour at pre-test. However, as well as having a significantly lower total and negative FER score, the BP+ group had a significantly higher total SDQ score and more peer problems at pre-test (see Table 4.2). Emotion recognition ability at pre-test was negatively correlated with total SDQ score, $r_s(60) = -.321$, $p = .011$, and peer problems, $r_s(60) = -.257$, $p = .044$, at pre-test.

Table 4.2 Demographic and behavioural characteristics for BP+ and BP- participants at pre- and post-test

	BP+ (*n* = 40)	BP- (*n* = 22)	*p*-value
Age (years)	8.50 (1.11)	8.82 (.96)	.262
IQ	82.58 (30.59)	95.36 (13.50)	.07
Gender			.264
% Male	80	90.9	
% Female	20	9.1	
SES			.695
% Low	8.3	13.6	
% Medium	55.6	59.1	
% High	36.1	27.3	
FER score (pre-test)			
Total	77.09 (12.09)	89.06 (8.51)	<.001
Negative	70.76 (16.19)	90.78 (3.96)	<.001
Neutral	76.67 (23.59)	85.23 (20.72)	.145
Happy	93.75 (10.63	95.46 (9.17)	.512
SDQ score (pre-test)			
Total	18.79 (5.16)	15.04 (6.03)	.013
Conduct problems	4.20 (2.95)	3.64 (2.95)	.457
Peer problems	3.77 (2.51)	2.45 (1.26)	.013
Prosocial	4.71 (2.26)	4.27 (3.33)	.571
FER score (post-test)			
Total	89.29 (8.47)	90.30 (6.74)	.609
Negative	87.15 (11.76)	89.27 (8.71)	.425
Neutral	90.42 (12.45)	89.39 (22.15)	.843
Happy	94.58 (10.43)	94.32 (9.05)	.917
SDQ score (post-test)			
Total	15.38 (6.29)	12.68 (6.93)	.138
Conduct problems	3.50 (2.83)	2.50 (2.48)	.155
Peer problems	2.73 (2.08)	2.00 (1.95)	.178
Prosocial	5.18 (2.59)	6.00 (2.58)	.236

Notes: Means are presented with standard deviations in brackets. IQ = intelligence quotient (two-subtest WASI), SES = socioeconomic status, FER = Facial Emotional Recognition, SDQ = Strengths and Difficulties Questionnaire.

Table 4.3 shows the change in FER and SDQ scores between pre- and post-test for BP+ and BP- participants.

Table 4.3. FER and SDQ change scores for BP+ and BP- participants		
	BP+	**BP-**
FER change score		
Total	12.20	1.24
Negative	16.39	-1.51
Neutral	13.75	4.16
Happy	0.83	-1.14
SDQ change score		
Total	3.41	2.36
Conduct problems	0.70	1.14
Peer problems	1.04	0.45
Prosocial	0.47	1.73

Notes: FER = Facial Emotional Recognition, SDQ = Strengths and Difficulties Questionnaire. A positive FER change score reflects an improvement in emotion recognition ability and a positive SDQ change reflects an improvement in behaviour

4.4.2 Emotion Recognition

At pre-test, participants in the BP+ and BP- group differed significantly in their total emotion recognition score, Welch's $F(1,60) = 42.180$, $p < .001$, $n^2 = .305$, and their recognition of negative emotions, Welch's $F(1, 60) = 55.788$, $p < .001$, $n^2 = .353$, but not in the recognition of neutral, $F(1,60) = 2.032$, $p = .159$, $n^2 = .033$, or happy, $F(1,60) = .401$, $p = .529$, $n^2 = .007$, expressions.

Comparing pre- and post-test scores, participants in the BP+ group showed a significant increase in the recognition of both negative, $t(39) = -6.581$, $p < .001$, $d = 1.041$, 95% CI [-21.42, -11.34], and neutral expressions, $t(39) = -3.230$, $p = .003$, $d = 0.511$, 95% CI [-5.14, 3.47], at post-test compared to pre-test. They showed no difference in their ability to recognise facial expressions of happiness, $t(39) = -.392$, $p = .697$, $d = 0.062$, 95% CI [-5.14, 3.47]. In contrast, participants in the BP- group showed no significant difference in their ability to recognise happy, $t(21) = .420$, $p = .678$, $d = 0.090$, 95% CI [-4.48, 6.76], negative, $t(21) = .772$, $p = .449$, $d = 0.164$, 95% CI [-2.57, 5.61], or neutral expressions, $t(21) = -2.409$, $p = 0.053$, $d = 0.436$, 95% CI [-8.39, .06] (see Figure 4.2).
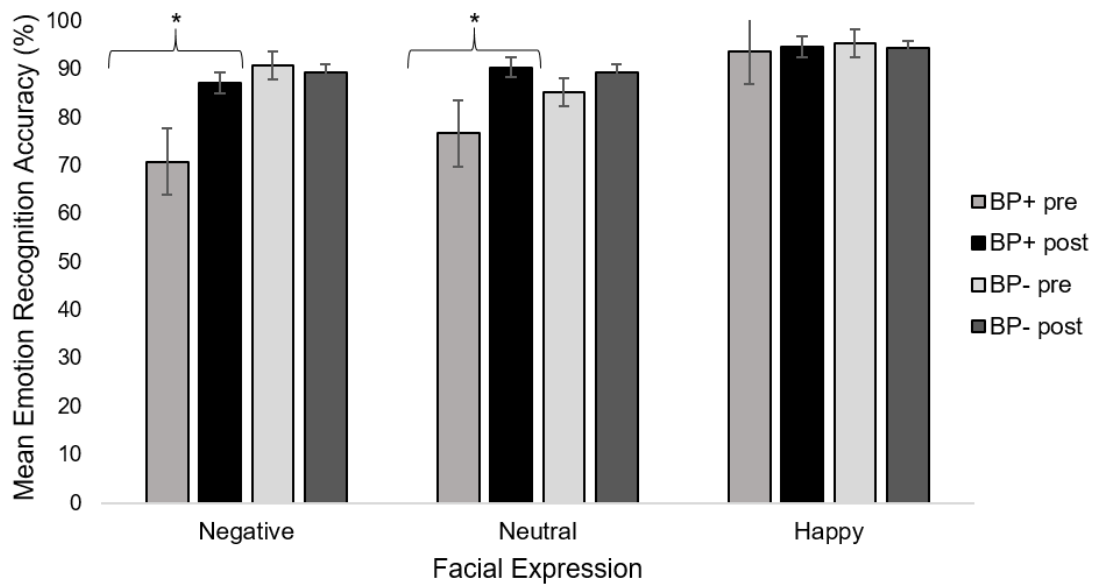
Figure 4.2 Mean recognition scores for negative, neutral and happy expressions at pre- and post-test. Error bars are set at ± 1 standard error. * = $p < .01$.

4.4.3 Links between emotion training and change in behavioural problems and wellbeing

After correcting for multiple comparisons (Bonferroni), participants in the BP+ group had significantly lower total SDQ scores, $t(39) = 2.866$, $p = .007$, $d = .450$, 95% CI [1.00, 5.82], and significantly less peer problems, $t(39) = 2.865$, $p = .007$, $d = .450$, 95% CI [.31, 1.78], at 6 months follow-up, compared to pre-test. Furthermore, there was a significant reduction in the percentage of participants in the BP+ group with an above average total SDQ score falling from 93% at pre-test to 64% at 6 months post-test compared to pre-test, $x^2(1) = 7.692$, $p = .003$. There was no change, however, in BP+ participants number of conduct problems, $t(39) = 1.506$, $p = .140$, $d = .238$, 95% CI [-.24, 1.64] , or prosocial behaviour, $t(39) = -1.052$, $p = .299$, $d = .169$, 95% CI [-1.35, .43].

By contrast, after correcting for multiple comparisons, participants in the BP- showed no change in total SDQ score, $t(21) = 1.448$, $p = .162$, $d = .309$, 95% CI [-1.03, 5.76], number of conduct problems, $t(21) = 1.838$, $p = .080$, $d = .394$, 95% CI [-.15, 2.42], peer problems, $t(21)$ = 1.200, $p = .244$, $d = .258$, 95% CI [-.40, 1.50], or prosocial behaviour, $t(21) = -2.597$, $p = $

.017, d = .554, 95% CI [-3.11, -.34], at 6 months post-test. There was also no change in the percentage of participants in the BP- between pre- and post-test, this stayed at 64%, $x^2(1)$ = .000, p = 1. See Figures 4.3 and 4.4.
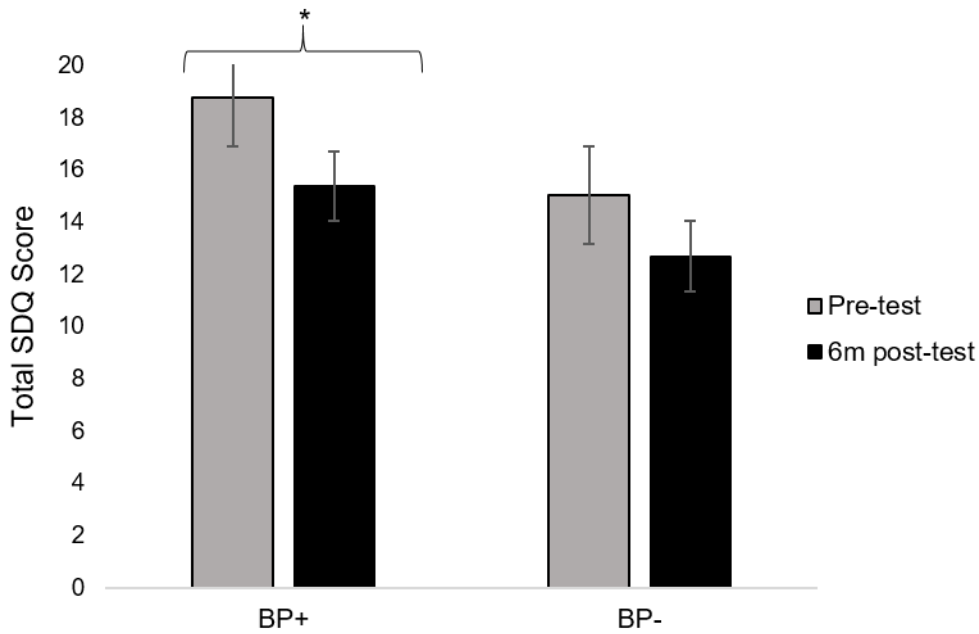
Figure 4.3 Mean total SDQ score at pre- and 6 months post-test for BP+ and BP- participants. Error bars are set at ± 1 standard error. * = p < .01
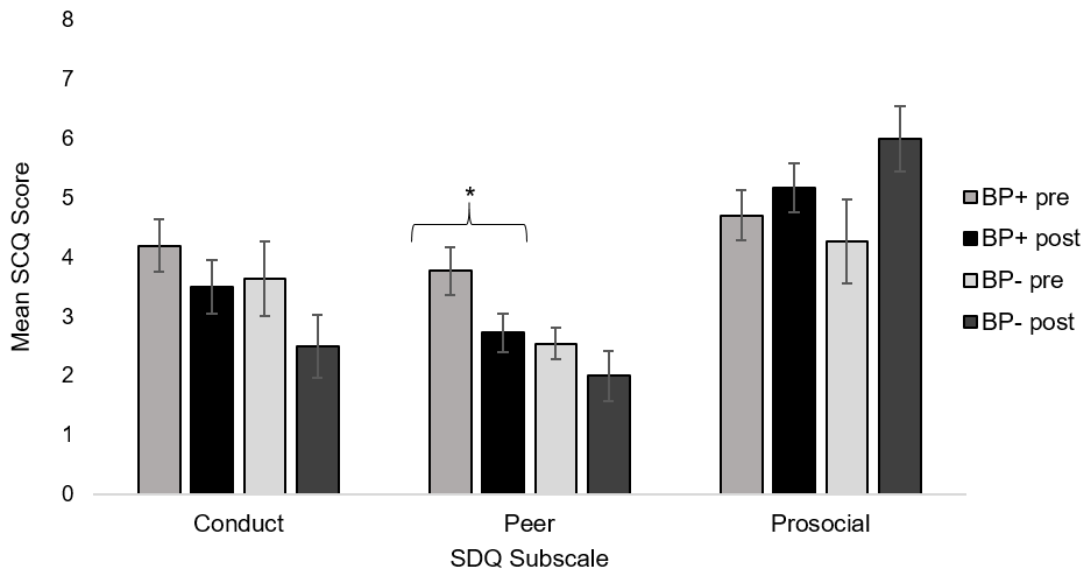
Figure 4.4 Mean conduct problems, peer problems, and prosocial scores at pre- and 6 months post-test for BP+ and BP- participants. Error bars are set at ± 1 standard error. * = p < .0125

4.4.4   Were changes in emotion recognition associated with changes in problematic behaviour and wellbeing?

The extent to which SDQ scores at 6-month follow up were predicted by improvements in emotion recognition was analysed by hierarchical regression analysis involving the whole sample of 62 children. At step 1, we regressed 6-month follow up total SDQ scores on pre-test total SDQ scores, pre-test total FER scores and IQ. The resulting regression equation did not exceed conventional significance threshold, $F(3,58) = 2.59$, $p = .061$. The only significant predictor was pre-test total SDQ, $\beta = .270$, $p = .038$. At step 2, we added post-test FER scores as a predictor. Now the overall regression equation was significant, $F(4,57) = 3.51$, $p = .013$, and the increase in predictive power was also significant, $F(1,57) = 5.63$, $p = .021$. In addition to pre-test total SDQ score, $\beta = .313$, $p = .014$, post-test FER score was a significant predictor, $\beta = -.305$, $p = .021$. Thus, post-test FER score added significantly to the prediction of 6-month total SDQ, after controlling for pre-test total SDQ score, pre-test total FER score and IQ (see table 4.4). A similar pattern of results was found when the same analysis was conducted on the BP+ sample of 40 children, where once again the addition of post-test total FER score added significantly, $\beta = -.385$, $p = .031$, to the prediction of 6-month follow-up total SDQ score, after controlling for pre-test total SDQ score, pre-test total FER score, and IQ.

A hierarchical analysis was also used to examine the extent to which peer problems at 6-month follow up were predicted by improvements in emotion recognition. As before, at step 1 we regressed 6-month follow up peer problems scores on pre-test peer problems scores, pre-test total FER scores and IQ. The resulting regression equation was statistically significant, $F(3,58) = 5.026$, $p = .004$ but the only significant predictor was pre-test peer problems score, $\beta = .410$, $p = .001$. At step 2, we added post-test FER scores as a predictor. The overall regression equation remained significant, $F(4,57) = 4.251$, $p = .004$, however, the increase in predictive power was not statistically significant, $F(1,57) = 1.74$, $p = .193$. The only significant predictor was pre-test peer problems score, $\beta = .418$, $p < .001$ (see table 4.5)

Table 4.4. Summary of regression analysis – total post-test SDQ

Variable	Total post-test SDQ			
	Model 1		Model 2	
	B	*β*	*B*	*β*
Constant	11.52		28.21	
Total pre-test SDQ	.31	.27*	.36	.31*
Total pre-test FER	.30	.06	.09	.17
IQ	-.05	-.23	-.05	-.22
Total post-test FER			-.26	-.31*

Notes: B = unstandardized regression coefficient, β = standardized coefficient. * p < .05

Table 4.5. Summary of regression analysis – post-test peer problems

Variable	Total post-test peer problems			
	Model 1		Model 2	
	B	*β*	*B*	*β*
Constant	2.04		5.00	
Pre-test peer problems	.41	3.66**	.42	.45**
Total pre-test FER	-.01	-.43	0	.01
IQ	0	-.27	0	-.03
Total post-test FER			-.04	-.16

Notes: B = unstandardized regression coefficient, β = standardized coefficient. **p < .01

4.5 Discussion

The present study aimed to show that a relatively brief intervention that improves emotion recognition in children with ACEs and behavioural problems is linked to longer-term improved behaviour and wellbeing. Impairments in emotion recognition have been implicated in a range of psychiatric disorders, (Collin et al., 2013), and a specific impairment in negative emotion recognition has been widely reported in antisocial and violent samples (Hunnikin & van Goozen, 2018). The CERT was delivered in a targeted manner, i.e., to those children with behavioural problems and impaired emotion recognition (BP+). Their changes in emotion recognition ability following the CERT and in behaviour and wellbeing 6 months later were compared to a group of children who exhibited behavioural problems but without impaired emotion recognition (BP-), who also continued to receive their usual help and support. Only those children who received the CERT showed a significant increase in emotion recognition ability and – more importantly – a significant decrease in number of peer

problems and total SDQ score as reported by teachers who were unaware that these children had received the CERT. The percentage of children in the BP+ group whose total SDQ score was above average dropped from 93% at pre-test to 64% at the 6-month follow-up. Finally, the results of the hierarchical regression analysis show that emotion recognition scores after the emotion training added significantly to the explanation of SDQ scores at the 6-month follow-up, after taking account of individual differences in pre-test SDQ score, pre-test emotion recognition and IQ. Thus, it seems reasonable to conclude that the significant improvement in emotion recognition induced by the emotion training intervention helped to predict individual differences in problematic behaviour 6 months after the emotion training, supporting the view that the emotion training not only improved emotion recognition but also led to a reduction in problematic behaviour.

The present study significantly expands on previous evidence that has found emotion recognition training to be associated with an improvement in longer term criminal behaviour in youth offenders (Hubble et al., 2015) by demonstrating that emotion recognition training can be used as an early intervention in younger children exhibiting problem behaviour and that it improves their longer-term social relationships, mental health and wellbeing. Previous work in children and young people conducted by Penton-Voak et al. (2013) and Dadds et al. (2012) found that emotion recognition training was associated with a subsequent improvement in behaviour two weeks and six months after the training respectively. While the current study successfully targeted and improved the recognition of all negative emotions that are hypothesised to be casually involved in the development of ASB the work conducted by Penton-Voak et al. (2013) only targeted the modification of hostility biases. However, recent studies have found no evidence of a hostility bias in at risk children (van Zonneveld et al., 2019) or in adolescents with CD (Airdrie et al., 2018) and work by Jusyte and Schönenberg (2017) found that while violent offenders displayed an impairment in the recognition of negative emotions they did not display a hostility bias.

Dadds et al. (2012) found that their emotion recognition training was limited in effectiveness to children with CU traits. However, this effect was not confirmed by independent reports and the fact that emotion recognition did not improve makes it unclear what caused the reported change in behaviour. Indeed, Dadds et al. (2012) thought it likely that any positive effects on behaviour were due to parent-child empathic exercises that were part of the training rather than the computerised programme itself. By contrast, the present study clearly shows that children who received the CERT exhibited an improvement in both emotion recognition *and* longer-term behaviour and wellbeing. The improvement in behaviour was assessed from ratings made 6 months after the intervention by teachers who were unaware which children had received the CERT. Furthermore, behaviour and wellbeing at the 6-month follow-up was significantly predicted by post-test emotion recognition ability. This suggests that that it is possible not only to target a key process linked to mental health and wellbeing, but also to alter antisocial behaviour developmental trajectories.

Many existing interventions aiming to reduce behaviour problems in children focus on improving the child-parent relationship. The effectiveness of some parenting programmes has been demonstrated and they are recommended by NICE (Scott, 2010). However, research has shown that some parents cannot or will not participate in these interventions (Losel & Beelmann, 2003), and this was also the case with the current sample. The interim evaluation of the Early Intervention Partnership Hub (Doran, 2018) found that many parents were unable to engage with services due to mental health issues or alcohol/drug misuse. Schools therefore provide an ideal setting to deliver interventions, especially to children from adverse backgrounds (Department of Health & Department for Education, 2017). At a time when funding services for children and young people are being cut (Butler, 2018), with an estimated 1.6 million children being "invisible" to social support (Children's Commissioner for England, 2018), easily delivered, computerised interventions like the CERT are key to increasing the reach of treatments and preventing the escalation of problems in at-risk groups.

Following the CERT, participants in the BP+ group showed a significant reduction in their total number of difficulties and number of peer problems as indicated by the SDQ. There was, however, no reduction in conduct problems, nor any increase in prosocial behaviour at the 6 month follow up. This may be because initially an individual's improvement in emotion recognition leads to them being better able to understand the emotions of their peers and consequently to a reduction in their peer problems, and a reduction in conduct problems and increase in prosocial behaviour will follow the initial improvement in interpersonal relationships. Emotion recognition is predictive of positive social adjustment (Belachhi & Farina, 2012) and social adjustment is a protective factor in preventing further behavioural problems (Hodges et al, 1999). Thus, it seems reasonable that the reduction in peer problems may subsequently lead to a reduction in conduct problems and an increase in prosocial behaviour. However, further research with longer term behavioural follow ups is needed to determine this. Similarly, further work is needed to explore the reduction in peer problems following the CERT. Although BP+ participants displayed a significant reduction in the number of peer problems following the CERT, a hierarchical regression analysis found that post-test emotion recognition ability did not significantly predict 6 months follow up peer problem score. Research using more robust evaluation methods (e.g., randomised control trials) and more sources of behavioural information (e.g., administrative school data) are needed to explore this further.

It is important to acknowledge that the present study had some limitations. Although all children referred into the study were at high risk for future criminal behaviour, after the children had been assessed for emotion recognition problems and assigned to their intervention condition, the groups were found to differ in the severity of their peer problems and total SDQ score. Although this poses analytic challenges, it is consistent with the view that emotion recognition is a key factor in behavioural problems. A further limitation is that participants were not randomly allocated to one of the intervention conditions. Our objective was to deliver the intervention according to objectively assessed need (Insel et al., 2010).

Training those who are known *not* to have a problem is a waste of scarce resources. Nevertheless, future studies examining the effectiveness of the CERT could randomise group allocation and include a closely matched control intervention. A final limitation to acknowledge is that although there was a significant reduction in the number of children in the BP+ group who were rated as being at high risk for psychopathology 6 months after receiving the CERT, two-thirds of these children were still considered as high risk, showing that further work with these children is needed.

Researchers have challenged the notion that high-risk children inevitably become adult offenders (Odgers et al., 2007; Skeem et al., 2014), arguing that well-targeted interventions could create a turning point in antisocial behaviour for high-risk juveniles. The period between childhood and early adolescence is a time when children are particularly adept at social and emotional learning. This creates a window of opportunity for interventions such as the one we have developed and provides a natural opportunity to promote prosocial development in high-risk children.

5. General Discussion

"Supporting vulnerable children is the biggest social justice challenge of our time"

Children's Commissioner for England (2018)

Central to this thesis was the examination of emotion recognition, ToM, self-esteem and self-perception in children with behavioural problems who were deemed to be at risk for future antisocial and criminal behaviour due to exposure to adversity. ASB that is established during childhood is often maintained and continues into adulthood (Loeber et al., 2002). Emotion recognition, ToM and self-esteem are all essential for social interaction and as such, impairments in these processes are likely to play a role in the development of ASB (Fonagy & Luyten, 2018).

A body of research indicates that an impairment in emotion recognition plays a causal role in the development and maintenance of ASB (Blair, 2005; Marsh & Blair, 2008; van Goozen, 2015). Similarly, low levels of ToM and self-esteem have been implicated in the development of ASB (Sharp, 2008; Trzesniewski et al., 2006). The development of ASB is thought to be dependent on the interactions and relationships between different risk factors (Farrington, 1995). Although research suggests that emotion recognition and ToM are related processes (Mier et al., 2010) and that emotional intelligence is positively related to self-esteem (Rey et al., 2011), research has not yet explored the interrelations between emotion recognition and both ToM and self-esteem and behavioural problem severity.

Although antisocial and criminal behaviour are extremely costly on both an individual and societal level, existing interventions and treatments are limited in their effectiveness (Hunnikin & van Goozen, 2018). Research suggests that to be most effective, intervention and treatment should be tailored to the social, emotional and cognitive characteristics of the individual (Wilkinson et al., 2015). An impairment in emotion recognition, particularly in the recognition of negative emotions, is consistently found in antisocial populations (Bowen et al., 2014; Marsh & Blair, 2008) and recent research suggests that emotion recognition training can be used to improve behaviour in antisocial adolescents (Hubble et al., 2015;

Penton-Voak et al., 2013). However, research has not yet explored whether an early, tailored emotion recognition training can improve behaviour and wellbeing in children with behavioural problems.

5.1   Overview and aims

The aims of this thesis were to examine emotion recognition, ToM and self-esteem in children with behavioural problems and to explore the interrelations between these three processes and behaviour problem severity. In addition, it aimed to determine whether an emotion recognition training could improve behaviour and wellbeing in children with behavioural problems.

Participants in the behavioural problems (BP) group were children recruited from primary schools in Northamptonshire. They were referred to the research team by either their teacher, PCSO or FSW and/or because they were part of the Early Intervention Partnership Hub. Teacher report SDQ was used to confirm the severity of their behavioural problems. Typically developing (TD) participants were recruited from primary schools and did not show behavioural/emotional problems. All participants completed an initial research session that consisted of a battery of tests, including an IQ assessment, a questionnaire measure of self-esteem and computer-based tests measuring facial emotion recognition (FER) and ToM. Participants in the BP group who showed an impairment on the FER test (as compared to a sample of typically developing children) received an emotion recognition training (the CERT). BP participants completed a post-test research session which included a repeat FER test and their behaviour was followed up six months later via teacher-report SDQ; the teachers were unaware which participants had, and had not, received the CERT in addition to their usual support and interventions.

Chapter 2 examined emotion recognition and ToM in children with behavioural problems compared to TD controls and explored the relationship between these two processes as well as their relationships with behaviour problem severity. Impairments in emotion recognition

ability have been consistently found in antisocial populations (e.g., Bowen et al., 2014; Hubble et al., 2015). However, research evidence regarding ToM impairments in antisocial individuals is more mixed with some research finding that ToM is intact (Blair, 2008; O'Nions et al., 2014) while other research suggests that, like emotion recognition, levels of ToM are lower in antisocial individuals (Hughes et al., 1998; Sharp, 2008). While some research has found emotion recognition and ToM to be related (Corden et al., 2006; Mier et al., 2010), to our knowledge no study has explored this relationship in children with behavioural problems. The goal of Chapter 2 was to identify whether the impairment in emotion recognition that is consistently found in antisocial populations extends to an impairment in ToM and to examine whether these two processes are related, both to one another, and to behaviour problem severity.

Chapter 3 examined emotion recognition, self-esteem and self-perception in children with behavioural problems compared to TD controls, and examined the relationship between emotion recognition and self-esteem and perception, on the one hand, and their relationships with behaviour problem severity, on the other. Like emotion recognition ability, a large body of literature has found self-esteem and self-perception to be lower in antisocial populations compared to typically developing controls (Henricsson & Rydell, 2004; Matsuura et al., 2010). While previous work suggests that self-esteem emanates from processes related to social cognition, including emotion recognition (McCauley et al., 2017) and is positively related to emotional intelligence (Rey et al., 2011), to our knowledge the relationship between self-esteem/perception and emotion recognition has not been explored. The goal of Chapter 3 was to identify whether children with behavioural problems who are at at-risk of future criminal behaviour would show lower self-esteem than TD controls and to determine whether emotion recognition and self-esteem were related to one another and to behavioural problem severity.

Chapter 4 examined whether an improvement in emotion recognition, following an emotion recognition training, was associated with a subsequent improvement in behaviour

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and wellbeing six months later. Previous research has shown that youth offenders who received an emotion recognition training showed a significant reduction in the severity of crime committed in the six month follow up period, while those who received the statutory treatment as usual (TAU) did not (Hubble et al., 2015). However, the work conducted by Hubble et al. (2015) was reactive in nature, intervening in individuals who were already engaged in the criminal justice system. Research suggests that to be more effective, interventions should happen early (Odgers et al., 2007; Skeem et al., 2014). In the only study to examine the effect of an emotion recognition training in children with conduct problems, Dadds et al. (2012) found that children with conduct problems and high CU traits, who received emotion recognition training, showed a significant reduction in the number of conduct problems six months later. However, there was no improvement in emotion recognition following the training so the mechanism underlying the improvement in behaviour was unclear. The goal of Chapter 4 was to compare the behaviour and wellbeing of BP participants six months after they had received the CERT with the behaviour and wellbeing of BP participants who had not received an emotion recognition training and to establish whether improved emotion recognition was the mechanism underlying any improvement in behaviour or wellbeing.

5.2 What is the evidence for impairments in emotion recognition, ToM and self-esteem in children with behavioural problems?

Emotion recognition, ToM and self-esteem are all processes essential for successful social interaction (Fonagy & Luyten, 2018) and although low levels of all three have been implicated in the development of ASB, less is known about how these processes relate to one another and to behavioural problem severity. The findings of this thesis confirm that emotion recognition is a risk factor for ASB with children with behavioural problems showing an impairment in emotion recognition compared to TD controls. Moreover, low levels of ToM and self-esteem were both also identified as risk factors for ASB (Chapters 2 and 3 respectively).

The ability to understand the intentions of others is a key component of ToM (Mohammadzadeh et al., 2016) and the results of the analyses in Chapter 2 demonstrate that children with behavioural problems displayed a specific impairment in ascribing intentions to animated shapes when the interactions between characters involved mental states. Meanwhile, the results of the analyses in Chapter 3 show that children with behavioural problems had lower self-esteem and lower self-perceptions of their behaviour compared to TD controls. There was, however, no differences between BP and TD participants in self-perceptions of their social competence which may be indicative of a 'self-enhancing bias' (Hughes et al., 1997).

The ability to understand the intentions of others is *one* component of ToM and it has been suggested the misrecognition and misinterpretation of the intentions of others may lead to displays of ASB (Mohammadzadeh et al., 2016). The results of Chapter 2 indicate that children in the BP group ascribed significantly fewer intentions to animated shapes than participants in the TD group did but the ability of BP participants to understand the clip did not differ from TD participants. This supports Coricelli's (2005) model of ToM (section 1.7.4) which suggests that emotion recognition is a prerequisite for ToM and is line with research conducted by Skuse (2003) that found that the same neural circuits are required for both emotion recognition and ToM. However, determining why BP participants showed significantly lower scores than TD participants on one dimension of the task and one component of ToM, but not another is something that further work should explore. Similarly, given the relationship between emotion and intention recognition and previous work that has distinguished between cognitive and affective ToM (Mier et al., 2010), future work should also aim to explore whether the impairment in intention recognition in children with behavioural problems is specific to an impairment in the ability to recognise emotional intentions.

Emotion recognition and ToM are essential for understanding others and for successful social interaction. Perception and understanding of the self are similarly important for social

interaction as they guide behaviour (Mann et al., 2004) and low self-esteem and self-perception have been implicated in behavioural problems (Leary et al., 1995) and the development of ASB (Donnellan et al., 2005). The results of Chapter 3 expand on this, demonstrating that both global self-esteem and self-perceptions of behaviour are lower in children with behavioural problems compared to TD participants. Interestingly, there was no difference between BP and TD participants in their self-perceptions of social competence despite teacher and parent reports indicating that BP participants exhibited significantly more peer problems than did TD participants. This is in line with previous research that has found that children with behavioural problems perceive their social competence overly optimistically (Hughes et al., 2001) which has been coined a 'self-enhancing bias'. Different theories have attempted to account for this bias. Some suggest that the bias exists due to a hyposensitivity to negative feedback from peers (Zakriski & Coie, 1996), while Hughes et al. (1997) suggest that it acts as a defence mechanism, designed to protect a sense of self-worth.

Our findings are consistent with a large body of research that suggests that impairments in negative emotion recognition play a role in the development and maintenance of ASB and provide further evidence to suggest that low levels of ToM and self-esteem are also risk factors for the development of ASB. However, the *specificity* of the impairments that children with behavioural problems show is of note and has implications for the development of prevention and intervention programmes. This thesis found evidence of impairments in the recognition of negative and neutral expressions, but there was no difference between BP and TD participants in their ability to recognise facial displays of happiness. Similarly, BP participants showed lower intentionality scores on a ToM task and lower levels of global self-esteem and self-perceptions of behavioural conduct, but there was no difference in appropriateness scores on the ToM task and no difference in self-perceptions of social competence. Instead of targeting these constructs and processes as a whole, future

intervention and prevention programmes should be tailored to address these specific impairments.

5.3   Does variation in emotion recognition, ToM and self-esteem explain variation in behaviour problem severity?

Individuals displaying ASB represent a heterogeneous group. In an attempt to reduce some of this heterogeneity researchers have used a categorical approach to differentiate between different subtypes of ASB, comparing, for example, early onset versus late onset ASB, ASB with low CU traits versus high CU traits, and between those displaying instrumental versus reactive aggression. However, categorical approaches are problematic as they do not always take into account differences in ASB severity (Hudziak et al., 2007) and extensive heterogeneity remains within categorical classifications (Krueger et al., 2005). Accordingly, dimensional ways of studying psychopathology and ASB are on the rise (Fairchild et al., 2009; Marsee et al., 2005; Passamonti et al., 2010). This is in line with the RDoC approach; instead of treating mental illnesses and disorders based on labels and diagnoses, the RDoC framework advocates studying the processes and mechanisms underlying mental health problems (Insel et al., 2010).

This thesis initially took a categorical approach; categorising participants as either children with behavioural problems (BP group) or without (TD group) and used categorical analyses (MANCOVAs) to determine whether there was a difference between these two groups in emotion recognition, ToM and self-esteem. However, based on the increasing need to look at ASB dimensionally, not only to increase understanding of the processes underlying ASB and explain variation in severity but also to improve treatment options (Hudziak et al., 2007), we examined behavioural problems, emotion recognition, ToM and self-esteem dimensionally. The need to use a dimensional approach is further demonstrated by previous research that has shown considerable individual variation in emotion recognition ability with some antisocial populations showing intact emotion recognition (Glass & Newman, 2006). Chapter 4 of this thesis found that while approximately 60% of BP

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participants showed an impairment in emotion recognition, 40% did not. This is line with the results of Hunnikin et al. (2019) who, using a cross-sectional design, investigated emotion recognition in a larger sample of children at-risk for future criminal behaviour again finding that approximately 40% of participants did not show an impairment in emotion recognition. This demonstrates that while an impairment in emotion recognition is a neuro-correlate of ASB in some individuals it is not in all. This is important to consider when developing intervention strategies.

According to the RDoC approach, it is essential to study "the full range of variation from normal to abnormal" (Cuthbert & Insel, 2015, p.5). As such, the whole sample (BP and TD groups) was included in dimensional (correlational and regression) analyses. Our analyses in Chapter 2 showed that emotion recognition and ToM were related processes and that they both, independently of one another, explained behavioural problem severity. Similarly, our analyses in Chapter 3 showed that emotion recognition and self-esteem were positively related and, again, both explained behavioural problem severity independently of one another.

We found that the total SDQ score, reflective of a child's total number of difficulties and overall mental health and wellbeing (Beardsmore, 2015), was inversely correlated with emotion recognition ability, ToM, self-perception of behaviour and global self-esteem. This is in line with previous work that has shown that an impairment in emotion recognition is a transdiagnostic risk factor for a number of neurodevelopmental disorders (Collin et al., 2013) while low levels of ToM and self-esteem have also been found in individuals with different mental health problems (Gumley, 2011; Keane & Loades, 2016). In addition, there were inverse relationships between the severity of conduct problems specifically and emotion recognition, ToM, self-perception of behavioural conduct and global self-esteem. Previous research has found that emotion recognition, ToM and self-perception are all associated with ASB and predict future behavioural problems (Donnellan et al., 2006; Hubble et al., 2015; Sharp & Vanwoerden, 2014). We also found that the severity of peer problems was inversely

correlated with emotion recognition ability, although it was not related to either ToM or global self-esteem. A body of research has found that emotion recognition is necessary for good interpersonal relationships (Hunnikin & van Goozen, 2018) and individuals with good emotion recognition are more popular (Edwards, Manstead & MacDonald, 1984). The findings presented in this thesis indicate that the reverse is also true. Interestingly, there was no relationship between emotion recognition, ToM or self-esteem, on the one hand, and the prosocial subscale of the SDQ, on the other. In the research presented in this thesis the prosocial subscale was used as an indirect measure of CU traits given previous work that has found significant correlations between the prosocial subscale of the SDQ and CU traits (Kimonis et al., 2016). Future research, however, should explore whether a non-significant result is also found if a direct measure of CU traits is used.

Previous research has found that impairments in emotion recognition and self-esteem predict ASB in adolescents (e.g., Bennett et al., 2005; Trzesniewski et al., 2006). The findings of this thesis extend this to demonstrate that impairments in emotion recognition, ToM and lower levels of self-esteem and self-perception are associated with behavioural problems in children. The majority of previous work that has investigated socio-emotional functioning in children with behavioural problems has investigated *either* emotion recognition *or* ToM or self-esteem and the work that has looked at more than one aspect of socio-emotional functioning (e.g., Jones et al., 2010; Schwenck et al., 2012) has taken a categorical approach. The dimensional approach in this thesis, however, allowed for an understanding of the processes and mechanisms underlying ASB and behavioural problems in children; we found that although emotion recognition significantly predicted behavioural problems, ToM and self-esteem both significantly added to this prediction. This indicates that the well documented impairment in emotion recognition in antisocial populations (e.g., Bowen et al., 2014; Marsh & Blair, 2008) extends to other areas of socio-emotional functioning and this knowledge can help inform the development of personalised, targeted intervention and treatment options (Cuthbert & Insel, 2013).

The knowledge that ToM and self-esteem, two processes we have shown to be related to emotion recognition, predict behaviour problem severity independently of emotion recognition can be incorporated into the development of prevention and intervention techniques. Although beyond the scope of this thesis, future research should aim to explore the interrelations between ToM and self-esteem as well as their relationships with emotion recognition and to determine which of the three is the strongest predictor of behavioural problems. This would help to further inform treatment options.

5.4   Is an improvement in facial emotion recognition associated with an improvement in behaviour and wellbeing in children with behavioural problems?

This thesis, along with a wider body of research, has demonstrated that antisocial individuals and children with behavioural problems show impairments in emotion recognition. We know that emotion recognition training can improve behaviour in antisocial adolescents (Hubble et al., 2015, Penton-Voak et al., 2015). Chapter 4 examined whether a targeted emotion recognition training could improve emotion recognition ability in children with behavioural problems (who also displayed an initial impairment in emotion recognition) and whether this improvement was associated with a subsequent improvement in behaviour and wellbeing six months later. It should be noted that *all* children continued to receive their usual school based support.

We demonstrated that the CERT had a positive effect on the recognition of negative and neutral facial expressions. Moreover, we found that only the subgroup of children who received the CERT (BP+) showed a significant reduction in their total number of difficulties and in the severity of their peer problems six months after the intervention, whereas those children who did not receive the CERT intervention (BP-) showed no significant change in SDQ scores. We also found that post-test emotion recognition scores predicted SDQ scores at the six months follow up after taking baseline emotion recognition and SDQ scores, as well as IQ, into account.

Emotion recognition is positively related to social skills (Chapters 2 & 3 of this thesis; Vachon, Lynam & Johnson, 2014). At pre-test, the BP+ group had significantly more peer problems compared to the BP- group, consistent with the view that emotion recognition is crucial for interpersonal relationships (Hunnikin & van Goozen, 2018). While children with behavioural problems who received the CERT showed a significant reduction in total problem behaviours and the severity of peer problems, interestingly there was no change in the severity of conduct problems after receiving the CERT. When looking at the SDQ on an item by item basis, the behaviours that changed after receiving the CERT were those related to interpersonal relationships (e.g., fighting with other children, being liked by other children) whereas those relating to rule breaking behaviours did not (e.g., lies/cheats, steals from home), again reinforcing the argument that emotion recognition is especially important for successful interpersonal interaction. This is in line with the rationale Hubble et al. (2015) put forward to explain why young offenders who received an emotion recognition training displayed a reduction in the *severity* of crimes committed in the six months follow up period. They suggested that high severity crimes generally involve physical aggression and interpersonal violence. Thus, a reduction in crime severity following an improvement in emotion recognition may be because an improvement in emotion recognition leads to a better understanding of the emotions of potential victims.

In the results presented in Chapter 4, it is therefore possible that, in those children who received the CERT, improvements in the recognition of negative emotions led to a better understanding of the emotions of their peers and therefore a reduction in the number of peer problems. This is in line with research that suggests that emotion recognition is predictive of positive social adjustment (Belacchi & Farina, 2012). Social adjustment is a protective factor in preventing further behavioural problems and criminal behaviour (Hodges et al., 1999). In addition to the significant change in SDQ scores six months after receiving the CERT, qualitative feedback from school staff illustrates the positive impact the CERT had on

children's social relationships. The Lead Behavioural Professional at one primary school said:

"*being able to recognise expressions has enabled some of the children to develop secure friendships*".

Meanwhile, a Family Support Worker at another school observed that the CERT:

"*had benefits with improving low grade behaviour"*.

This feedback indicates that the statistically significant changes in total SDQ score and the reduction in peer problems six months after completion of the CERT had real world implications for the social relationships of some of these children. Further work is still needed to confirm the impact[2] the improvement in emotion recognition and reduction in peer problems had. Similarly, work is also needed to determine whether this extends to an improvement in familial relationships and to a reduction in conduct problems and/or an increase in prosocial behaviour.

Our results suggest that by taking an RDoC approach and tailoring interventions to target the underlying mechanisms and neuropsychological processes associated with developmental psychopathology it is possible, not only to improve these processes but to also potentially alter antisocial trajectories into a prosocial direction. It may be that the improvement in peer relationships (indicative of social adjustment, a protective factor of ASB) observed in those children who received the CERT will, in time, extend to a reduction in conduct problems. Although it was beyond the scope of this thesis, future research could benefit from a subsequent follow up 12 months after receiving the CERT to determine this. In addition, given that ToM and self-esteem are both essential for social interaction and are related to both emotion recognition and severity of behavioural problems, future research

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[2] The impact supplement of the SDQ was completed by teachers and subsequently analysed but we found no significant change in impact scores following completion of the CERT. The peer problems subscale on the SDQ is comprised of multiple items that measure interpersonal difficulties. The impact supplement, however, is comprised of much fewer items, only one of which relates to peer relationships. Further work, using other sources of information, is needed to fully explore the impact that the CERT has on children's interpersonal relationships.

could explore whether an improvement in emotion recognition has a positive knock-on effect on ToM and/or self-esteem and whether any subsequent reductions in conduct problems are mediated by improvements in either one or both of these processes.

5.5   Strengths, limitations and future directions

5.5.1   Strengths

A key strength of this thesis is its focus on the identification of risk factors for the development of ASB. It confirms that an impairment in negative emotion recognition is a risk factor for ASB and predicts behavioural problem severity. In addition, it extends and contributes to the literature by identifying low levels of both ToM and self-esteem as risk factors for ASB; both were significantly lower in the BP group than in the TD group and explained behavioural problem severity independently of emotion recognition ability. As well as being associated with the severity of behaviour problems, this thesis demonstrated that ToM and self-esteem were also both positively related to emotion recognition ability.

Another strength of this thesis is the use of an intervention that is tailored to the mechanisms and processes underlying behavioural problems, an approach recommended by the RDoC research framework (Insel et al., 2010). A large body of literature shows that emotion recognition is impaired in antisocial populations. While some studies have attempted to reduce this impairment (Dadds et al., 2012; Hubble et al., 2015; Penton-Voak et al., 2013) to our knowledge no previous study has utilised a targeted, tailored approach like the one used in this thesis. This thesis adds to the field by showing that it is possible to teach children with severe behavioural problems and who display an impairment in emotion recognition how to recognise emotions. Moreover, achievement of this skill was associated with an improvement in behaviour and peer relationships six months later. Fongay and Luyten (2018) took an RDoC approach to conduct problems in children and identified some limitations with the RDoC approach, arguing that in some cases the domain a construct was encompassed by was arbitrary. They give the example that emotion recognition,

encompassed by the system for social processes domain, could just as easily be encompassed by the negative valence system. However, the relationship between emotion recognition and peer problems and the reduction in peer problems that was found following an improvement in emotion recognition demonstrates the important social role that emotion recognition plays.

Thus far, the studies that have improved emotion recognition ability via emotion recognition training in antisocial populations have adopted a more reactive approach by intervening in those who have already entered the criminal justice system (Hubble et al., 2015; Penton-Voak et al., 2013). Research suggests, however, that intervening early is more effective than intervening late (Skeem et al., 2014). This thesis utilised emotion recognition training as a school based, early intervention that could be delivered by non-specialist staff (e.g., FSWs and PCSOs). It is hoped that by intervening early in children deemed to be at risk of future criminal behaviour their antisocial trajectory may be altered.

The school setting of the intervention is another strength of this thesis. Research has shown that some parents of children with behavioural problems cannot or will not participate in treatment (Losel & Beelman, 2003) and this was indeed the case for many parents of the children in the Early Intervention Partnership Hub (Doran, 2018); alcohol/drug misuse and mental health issues prevented parents from engaging with social services. The amount of time children spend in school makes it an important location for prevention and intervention efforts (Domitrovich, Durlak, Staley & Weissberg, 2017). This sentiment was echoed by a recent joint report of the Departments of Health and Education (2017) which concluded that schools provide an ideal setting to deliver interventions. Indeed, research has shown that interventions that are delivered in school and by school staff, achieve similar or better outcomes than those delivered outside school (Barnes, Smith, & Miller, 2014; Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011) and that they are cost effective (Domitrovich et al., 2017).

Finally, a key strength of this thesis is the dimensional approach employed throughout. ASB is extremely heterogeneous and categorical attempts to differentiate between different subtypes have limited effectiveness (Hudziak et al., 2007). In contrast to a categorical approach, RDoC advocates the use of a dimensional approach to study the processes underlying psychopathology (Insel et al., 2010). The dimensional analytical approach using correlation and regression analyses has allowed for an understanding of the interrelations between emotion recognition, ToM, self-esteem and behavioural problem severity, demonstrating that these risk factors all add to the explanation of behavioural problems. Understanding the mechanisms and processes underlying ASB and psychopathology more generally is essential for the development of effective intervention and treatment options like the CERT.

5.5.2 Limitations

There are a number of limitations of this thesis that need to be discussed, the majority of these pertain to issues surrounding the six months follow up reported in Chapter 4. Although the behaviour of BP participants was followed up six months after taking part in the research project via teacher-report, this follow up did not include a child research session meaning there were no repeat measures of emotion recognition, ToM or self-esteem. It may be that emotion recognition improved further once the children had more time to consolidate their emotion recognition skills. Emotion recognition is positively associated with peer relationships (Hunnikin & van Goozen, 2018; Chapter 4 of this thesis) and following the CERT, participants showed an improvement in both emotion recognition and peer relationships. It may be that a reciprocal relationship exists whereby an improvement in emotion recognition improves children's ability to interact with peers which provides them with more opportunities to practice and refine their emotion recognition skills. Similarly, ToM and self-esteem are two processes necessary for successful social interaction and both were found to be positively related to emotion recognition. It is possible that the CERT also improves ToM and/or self-esteem, and that this may have contributed to the subsequent

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reduction in the severity of peer problems. It was not possible to examine this in the current research but it is a potential and important avenue for future work.

Going forward it would also be beneficial to have more sources of behavioural data, including information provided by parents, and other objective measures or assessments of behaviour, such as the number of unauthorised absences and school exclusions, and indicators of positive engagement with the school and its activities. Although the SDQ is a commonly used, valid measure of problem behaviours and teachers were unaware of which BP participants received the CERT, including school records as another measure of behaviour would have removed any remaining bias or subjectivity that comes from questionnaire measures. The research presented in this thesis can only speak to the impact that the CERT had on emotion recognition in a school setting. It would, however, be useful to know whether the improvement in peer relationships extends to familial relationships as well. Parental reports of behaviour would be useful to have although the unwillingness of some parents to engage in interventions and research is something that needs to be considered.

The difference in sample size between BP and TD groups in Chapters 2 and 3 and also between the BP+ and BP- groups in Chapter 4 is a limitation of the work presented in this thesis and should be noted. Unequal sample sizes result in a general loss in statistical power. Although the difference in sample size was accounted for in statistical analyses wherever possible, future research should ensure that groups are of an equal size to maximise statistical power.

Although the same sample was used throughout this thesis, not all participants were able to complete all tasks and the sample sizes varied consequently which prevented some additional comparisons across chapters and may limit the generalisability of the findings (see Appendix D for a summary of attrition between chapters). This was due to a combination of logistical issues, the fact that the self-esteem task was only suitable for children aged 8 years or above and attrition rates that come with longitudinal research. For example, 15% of

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the total sample were younger than 8 years old and so did not complete the self-esteem

task. In addition, for the longitudinal research presented in Chapter 4, three schools (19

participants) did not provide follow up information and this information was not obtained for a

further 17 participants as they moved schools during the course of the study. Despite this

attrition, there does not appear to be systematic bias in the data (Appendix D). Future work

should attempt to measure emotion recognition, ToM and self-esteem in the *same* sample of

participants and try to reduce attrition rates in longitudinal work to increase the

generalisability of the findings.

One limitation throughout this thesis was that the BP and TD groups significantly differed

on some other potentially confounding variables, particularly socioeconomic status (SES), IQ

and age. Differences in demographic variables come with the nature of the research.

Children who display disruptive behaviour and who have been exposed to ACEs often come

from chaotic families of lower SES (Sprague & Walker, 2000) and the quality of their home

environment means they often have lower IQ, especially verbal IQ, compared to children

without behavioural problems who have not been exposed to ACEs (Moffitt, Gabrielli &

Mednick, 1981).

Despite these differences, it was deemed inappropriate to include these demographic

variables as covariates in categorical analyses. Although ASB and disruptive behavioural

problems are more common in those of lower SES (Piotrowska, Stride, Croft & Rowe, 2015),

Martin-Key et al. (2018) have convincingly argued that matching groups on SES reduces the

representativeness of the groups and therefore the generalisability of the findings. Similarly,

there is a convincing argument that including IQ as a covariate in cognitive studies of

neurodevelopmental disorders is inappropriate as IQ does not meet the requirements for a

covariate and using it as a covariate has produced overcorrected findings about

neurocognitive function (Dennis et al., 2009). Dennis et al. (2009) convincingly argue that

when a 'covariate' is intrinsic to the condition being investigated, it becomes meaningless to

adjust for it. For example, children with behavioural problems consistently show lower IQ

compared to TD children (Moffitt et al., 1981). Thus, the difference in IQ between BP and TD participants in the current research is reflective of pre-existing, non-random differences that are a result of representative sampling (Dennis et al., 2009).

Where correlational analyses showed that SES, IQ or age were significantly related to outcome measures (emotion recognition, ToM, self-esteem) hierarchical regression analyses were used to confirm that the outcome measure significantly predicted behavioural problems *independently* of these demographic variables (see Appendix B). However, while SES, IQ and age were not controlled for in categorical analyses, given the verbal nature of the FER, ToM and self-esteem tasks and the fact that BP participants displayed significantly lower verbal ability compared to those in the TD group, verbal IQ was included as a covariate. Although unlikely to have contributed to the findings of the research presented in this thesis, future research should ensure that participant groups are matched on key demographic variables, particularly age, to confirm that any differences in emotion recognition and processes related to social cognition are attributable to behavioural problems and not due to differences in demographic variables.

Similarly, gender and sex differences were not considered in this thesis. ASB is more prevalent in boys (Nock et al., 2006) and research demonstrates a gender difference in emotion recognition ability (Wingenbach, Ashwin & Brosnan, 2018) with females outperforming males (Baron-Cohen & Wheelwright, 2004). However, although there is research that suggests that ASB and CD present differently in males and female (Euler et al., 2015), girls and boys with CD have been found to have similar impairments in emotion recognition ability (Fairchild, Stobbe, van Goozen, Calder & Goodyer, 2010). In this thesis participant groups were matched on gender and we found no evidence of gender differences in emotion recognition, ToM or self-esteem. Indeed, the higher percentage of males in our sample is representative of the increased prevalence of disruptive behaviour and CD in males compared to females (Nock et al., 2006) as well as the higher number of males involved in the criminal justice system (Ford, Goodman & Meltzer, 2013).

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5.5.3 Future Directions

The novel nature of the work presented in this thesis means there is a wealth of potential future research to be done. The cross-sectional work presented in both Chapters 2 and 3 has interesting theoretical implications and raises a lot of important questions. As discussed in section 5.2, future work could aim to explore the specificity of impairments children with behavioural problems appear to display in processes necessary for social interaction.

While the intervention work presented in Chapter 4 provides *preliminary* evidence that improving emotion recognition in children with behaviour problems improves problem behaviour, a lot more work is needed. As noted in the General Introduction (section 1.12) the funding landscape for early intervention is bleak and it is estimated that investment in early intervention will have declined by 72% between 2010-2020 (Action for Children, National Children's Bureau and The Children's Society, 2017). It is therefore essential, now more than ever, that money is invested in interventions and programmes that are *evidence based* and that this evidence comes from rigorous evaluations. While the work presented in this thesis presents initial, preliminary evidence that the CERT has a positive effect on children's behaviour further research must utilise more rigorous, robust evaluation designs (e.g., quasi-experimental designs and ultimately a randomised controlled trial) to be able to determine causal impact before the roll out of such an intervention can even be discussed. The Early Intervention Foundation's (EIF) '10 Steps for Evaluation Success' (see Figure 5.1) provides an example of the many steps an intervention must go through before it can begin to be 'scaled' up and implemented. On this framework, the work presented in Chapter 4 would fit on step 5; 'pilot for outcomes'. Figure 5.1 demonstrates the extent to which further work is necessary.

Figure 5.1. Diagram depicting EIF's 10 Steps for Evaluation Success
https://www.eif.org.uk/resource/10-steps-for-evaluation-success

Another potential avenue for future research is to explore whether the improvement in emotion recognition observed in children with behavioural problems following emotion recognition training (Chapter 4) is also associated with any change in neural activity. For example, in the ASD literature, changes in neural activity have been observed in those with ASD alongside improved recognition and interpretation of emotional faces (Bölte et al., 2006). Numerous theories that account for the relationship between an impairment in emotion recognition and the development of ASB indicate that dysfunction of the amygdala plays a key role (i.e., somatic marker hypothesis, fearlessness theory, IES theory; section 1.6.4). Utilising brain imaging techniques in future research exploring emotion recognition and the effect of an emotion recognition training in children with behavioural problems may provide further insight on the role of the amygdala.

Children displaying behavioural problems represent an extremely heterogeneous group (see section 1.2.2) and this is reflected in the sample of participants included in the research presented in this thesis. Although eligibility criteria for inclusion in the BP group was implemented (i.e., score in the 'slightly raised' or 'above' range for conduct or peer problems and/or 'slightly lowered' or 'below' range for prosocial behaviour), heterogeneity remained

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with some participants scoring in this range for just one subscale while others scored in this range for all three (Appendix A). In addition, participants may also have showed raised scores on the hyperactivity and/or emotional symptoms subscales which may have had an impact on the findings. Future research could aim to tease apart the information provided by the SDQ, looking at the different subscales as well as the externalising and internalising scores, and explore whether different subscales/scores are differentially related to emotion recognition, ToM and self-esteem. This will in turn help inform the development and level of targeting of future interventions. It may also be possible to look at the individual items of the SDQ to further reduce the heterogeneous nature of the sample, although how this may affect the psychometrics of the measure would need to be determined and taken into account.

5.6 Implications and conclusions

This thesis has shown that children with behavioural problems show similar emotion recognition impairments to those observed in other antisocial populations and these impairments extend to other processes crucial for successful social interaction: ToM and self-esteem. Moreover, this thesis has shown that an emotion recognition training delivered in a targeted manner not only improves emotion recognition ability in children with behavioural problems but that this improvement is associated with a subsequent reduction in problem behaviours six months later.

ASB that starts in childhood is often persistent and maintained into adulthood (Loeber et al., 2002). Most existing interventions aim to reduce ASB and alter its developmental trajectory by targeting the parent-child relationship. Family focused therapy views ASB as a result of a dysfunctional family and aims to improve behaviour by improving family functioning. However, there is increasing evidence that it is interventions that target underlying (neuro-) psychological processes that represent a real opportunity to affect change (Hunnikin & van Goozen, 2018). In addition, not all parents are able or willing to participate in treatment (Webster-Stratton et al., 2001), highlighting the need for effective, evidence-based interventions that work directly with children and are tailored to their needs.

We have shown that delivering an early emotion recognition training intervention in a school setting improves both emotion recognition ability and subsequent behaviour. The intervention was only delivered to children who displayed both behavioural problems *and* had an impairment in emotion recognition. This is line with the RDoC approach that recommends that interventions should target the specific processes and mechanisms underlying behaviour. Given the financial cuts schools, mental health services and local authorities in the UK are currently facing (Butler, 2019), tailored interventions represent an efficient use of the limited time and resources available.

Although encouraging, the results regarding the effect of the CERT on child behaviour should be seen as preliminary. A randomised control trial is necessary to confirm that the CERT, and an improvement in emotion recognition, are responsible for subsequent improvements in behaviour and peer relationships. In addition, further research is needed to explore *how* an improvement in emotion recognition leads to an improvement in behaviour and peer relationships, and longer term follow up studies are needed to explore whether improvements in relationships lead to reductions in conduct problems and/or other improvements in prosocial behaviour. Similarly, because we have shown that ToM and self-esteem are both processes involved in disruptive behaviour and positively related to emotion recognition (Chapters 2 and 3), further work is needed to determine whether improving emotion recognition improves either ToM or self-esteem, or both, and whether these processes play a mediating role in any improvements in behaviour.

To conclude, we have demonstrated that in addition to an impairment in emotion recognition, children with behavioural problems have impaired ToM and lower self-esteem than typically developing controls. We have also shown that emotion recognition, ToM and self-esteem are related and predict severity of behavioural problems. Finally, we have shown that a short, computerised emotion recognition training program (the CERT) can improve the ability to recognise negative and neutral facial expressions and this improvement predicts a reduction in severity of problem behaviours up to six months later. This suggests that

emotion recognition is a crucial mechanism to target in order to achieve behavioural change. Emotion recognition training represents an efficient, practical early intervention strategy for those individuals who are displaying behavioural problems and/or are at risk of future antisocial and criminal behaviour.

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Appendix

Appendix A: Sample breakdown for the behavioural problems (BP) group

Range of SDQ scores for each subscale and total difficulties score				
	Conduct problems	**Peer problems**	**Prosocial behaviour**	**Total difficulties score**
Range	0-10	0-10	0-10	5-32

Proportion of BP participants in different severity groupings				
	Conduct problems (0-10)	**Peer problems (0-10)**	**Prosocial behaviour (0-10)**	**Total difficulties score (5-32)**
Close to average	30%	30%	32%	18%
Slightly raised/lowered	10%	41%	15%	16%
High/low	15%	8%	16%	20%
Very high/low	45%	21%	37%	46%

Proportion of BP participants who reached the inclusion criteria for 1, 2 or 3 subscales			
	1 subscale	**2 subscales**	**3 subscales**
Proportion of participants	21%	50%	29%

Appendix B: Correlations between demographic variables and outcome variables

Correlations between demographic variables, emotion recognition and AST		
	FER	AST
SES	.151	.071
IQ	.326**	.063
VIQ	.278**	.148
Age	.146	.308**

Notes: Values represent Spearman's rho correlations. n = 137. ** = correlation is significant at the 0.01 level.

Correlations between demographic variables, emotion recognition and SPPC		
	FER	SPPC
SES	.127	.121
IQ	.352**	.149
VIQ	.298**	.153
Age	.040	.216*

Notes: Values represent Spearman's rho correlations. n = 110. ** = correlation is significant at the 0.01 level.

Appendix C: Hierarchical regression analyses to determine inclusion of covariates

IQ

Correlation analyses found that while there was no association between IQ and performance on either the AST or the SPCC, there was a positive relationship between IQ and performance on the FER. Given the difference in sample size between chapters two and three, two hierarchical regression analyses were run. In both instance, the full model of FER and IQ was significant and FER significantly predicted behavioural problems even when controlling for IQ.

Chapter 2: R^2 = .221, F(2, 124) = 17.54, p < .001.

Chapter 2 coefficients				
Variable	Total SDQ			
	Model 1		Model 2	
	B	*β*	*B*	*β*
Constant	35.570		52.378	
FER	-.248**	-.411	-.209**	-.346
IQ			-.113**	-.237
R²	.169		.221	
F	25.37**		17.54**	

Chapter 3: R^2 = .164, F(2, 121) = 11.91, p < .001.

Chapter 3 coefficients				
Variable	Total SDQ			
	Model 1		Model 2	
	B	*β*	*B*	*β*
Constant	32.939		38.561	
FER	-.225**	-.336	-.181**	-.270
IQ			-.098**	-.236
R²	.113		.164	
F	15.55**		11.91**	

Age

Correlation analyses found that while there was no association between age and performance on the FER, there was significant associations between age and performance on both the AST and SPCC. A hierarchical regression analysis showed that the full model of AST and age was significant, R^2 = .057, F(2, 128) = 5.822, p = .004, but the addition of age to the prediction of SDQ did not lead to a significant change in R^2 = .027, F(1, 128) = 3.710, p = .056. Similarly, hierarchical regression showed that the full model of SPCC and age was significant, R^2 = .251, F(2, 124) = 20.734, p < .001, but the addition of age to the prediction of SDQ did not lead to a significant change in R^2 = .004, F(1, 124) = .664, p = .417

Appendix D: Attrition throughout chapters

Number of participants in the studies presented in Chapters 2, 3 and 4 of this thesis			
	Total sample	BP group	TD group
Chapter 2	137	93	44
Chapter 3	133	79	54
Chapter 4	60	60	n/a

Although the same sample was used in all chapters of this thesis as is demonstrated by the above table not all participants completed all tasks. For example, not all TD participants were able to complete the Frith-Happé animations task due to logistical issues. Meanwhile, the Self-Perception Profile for Children was only suitable for children aged 8 years and above. This meant that this task was unsuitable for completion by 15% of the total sample as they were aged 7. In addition, attrition is an almost unavoidable aspect of the longitudinal nature of the research presented in Chapter 4; more information on the attrition rates can be found in Appendix E. The slight variation in in sample meant that additional comparisons and analyses between chapters was no possible and does limit the generalisability of the findings of this work.

Appendix E: Comparison between those BP participants for whom follow up SDQ scores were available and for those for whom this was not the case on key demographic variables

There was no difference between BP participants for whom follow up SDQ scores were available and for whom this was not the case. Please see the table below.

Demographic information for BP participants for whom follow up SDQ scores were and were not available			
	Whole sample 6m follow-up available (*n* = 62)	Whole sample 6m follow-up not available (*n* = 36)	*p*
Age	8.61 (1.06)	9 (1.22)	.103
IQ	92.53 (13.63)	91.71 (12.41)	.770
Gender			.772
% male	83.9	81.1	
% female	16.1	18.9	
SES			.138
% low	10.3	0	
% medium	56.9	50	
% high	32.8	50	
Pre-test total SDQ	17.25 (5.79)	19.43 (6.73)	.097
Notes: Means are presented with standard deviations in brackets			

In addition, when considering the BP+ and BP- groups separately, there were no differences in pre-test emotion recognition ability (the variable on which the group allocation was based) between those included at the 6-month follow-up and those who dropped out. Please see the two following tables.

Pre-test emotion recognition ability for BP+ participants for whom follow up SDQ scores were and were not available			
	BP+ 6m follow-up available (*n* = 40)	BP+ 6m follow-up not available (*n* = 20)	*p*
Pre-test total FER	76.54 (12.43)	77.58 (15.07)	.893
Pre-test neg FER	71.22 (16.02)	73.75 (15.00)	.568
Notes: Means are presented with standard deviations in brackets. FER = facial emotion recognition. Neg = negative.			

Pre-test emotion recognition ability for BP- participants for whom follow up SDQ scores were and were not available			
	BP- 6m follow-up available (*n* = 22)	BP- 6m follow-up not available (*n* = 16)	*p*
Pre-test total FER	90.61 (4.26)	91.08 (5.23)	.394
Pre-test neg FER	89.13 (8.82)	92.65 (4.27)	.138
Notes: Means are presented with standard deviations in brackets. FER = facial emotion recognition. Neg = negative.			