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Humour and Intention Understanding in 18- to 36-Month-Old Toddlers

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Summary

This thesis investigated whether 18-36 month olds understand humour and humorous intentions. Also investigated was whether parents use vocal acoustic and verbal cues to indicate that a joke was intended.

1. Unambiguous physical jokes and mistakes accompanied by intentional cues (laughter, Woops!) were demonstrated to 19-36 month olds. Toddlers of all ages distinguished unambiguous jokes and mistakes by copying jokes and correcting mistakes.

Ambiguous physical actions interpretable either as jokes or mistakes were demonstrated. Toddlers saw half of these actions with a humorous intentional marker (laughter), and the other half with an accidental marker (Woops!). Only 25-30 and 31-36 month olds differentiated humorous intentions and mistakes by copying actions marked with laughter and correcting actions marked with Woops!

2. In a two-part study, parents read storybooks with humorous, sweet, and neutral pages to their 18-26 month olds. Target book sentences were measured for speech rate, intonation contours, and mean, standard deviation, and range of both fundamental frequency and amplitude. Humorous sentences displayed unique vocal acoustic patterns (versus neutral and sweet sentences).

3. Parents read a book containing humorous and non-humorous pages to their 19-26 month olds. Parents used significantly more high abstraction extra-textual utterances (ETUs) and significantly less low abstraction ETUs when reading the humorous pages.

Parents read either a humorous or non-humorous book to their 18-24 month olds. Parents reading the funny book made significantly more ETUs encouraging disbelief of prior utterances.

These findings indicate that toddlers understand humour by at least 19 months, and humorous intentions by 25 months. This is the earliest known age at which children understand that other can intend to do the wrong thing (versus pretense, lying, metaphor, etc.)

The acoustic and verbal cues given by parents could help toddlers, (1) notice *that* a joke was said, and (2) understand *what* the joke was.

Chapter 1: General Introduction

Humour is a complex mental state that emerges as early as eight months (Reddy, 2001). It is a primarily social and uniquely human phenomenon that involves expressing incorrect information, and relies on the audience's ability to understand the intention that the information is not a fact, lie or mistake, but instead is a problem to be solved and enjoyed. However little, if any, experimental research has examined how babies and toddlers come to understand humour.

My thesis involves looking at the relationship between humour and the understanding of intentions in the 18 to 36 month period. This should yield fascinating information about how humans develop socially, the purpose of humour and when and how it develops, and what triggers infants' conception of others' minds. I have conducted three studies to find out which cues are available to toddlers to let them understand that something is intended to be humorous, as well as to find out the age at which children understand humorous intentions.

Chapter 2: Literature Review

2.1. Humour Theories

2.1.1. Humour and Incongruity

Cognitive psychologists who study humour generally agree that incongruity is necessary for humour (Deckers & Kizer, 1975; Wicker, Thorelli, Barron, and Ponder, 1981; Forabosco, 1992; Attardo, 1997; Nerhardt, 1976; Shultz, 1976, 1974; McGhee, 1979; Hillson & Martin, 1994), where incongruity, at its most basic, is a discrepancy between what is expected and what actually occurs. Several studies have shown incongruity to have an important impact on humour appreciation. For example, Deckers and Kizer (1975) tested whether incongruity would predict humour appreciation in a weight-based paradigm. Participants were initially given zero, 11, or 22 trials in which they compared a weight weighing 90 grams to weights ranging between 80 and 100 grams. Participants were then asked to compare the 90 gram weight to a 90, 270, or 630 gram weight. Coders blind to the hypothesis coded participants' facial expression for humour, which minimally consisted of a smile and a change in the shape of the mouth. They found that the more judgments made prior to test trial, the more humorous the participants found the comparison. Furthermore, the heavier the weight, or more distant from the expected weight, the more humorous the participants found the comparison. They suggest that an increase in incongruity increases humour response, and that this only occurs if an expectation has been created.

A further study by Deckers and Devine (1981) replicated these findings in a slightly different context. They handed books to participants under the pretense that the subjects should judge whether they liked the covers of the books and whether they would like to study from the books. Half of the subjects received six normal weight books, including a normal weight control statistics textbook, whereas the other half received five normal weight books, and one heavy statistics textbook that had the inner pages cut out and filled with lead shot. Coders blind to the hypothesis rated the subjects' facial expressions as (0) no smile, (1) smile with teeth not visible, (2) smile with teeth visible, or (3) exhalation of air or laughter. After holding and rating the six books, the subjects were asked to rate how humorous they found the statistics book, both in the experimental and control conditions. Deckers and Devine found that participants in the experimental condition displayed significantly more mirth, and rated the statistics book as significantly more humorous, indicating that incongruity can be sufficient to induce humour.

Testing verbal humour in a controlled, albeit not very naturalistic scenario, Hillson and Martin (1994) investigated how incongruity affects humour appreciation. They compiled a list of artificial jokes to test the effect of between-domain incongruity on humour appreciation. Forty participants gave semantic differential ratings for 26 nouns and the six domains to which those nouns belonged. The domains included actors, world leaders, birds, cars, foods, and newspapers and magazines. Examples of nouns in each domain included John Candy, Mikhail Gorbachev, Falcon, Rolls-Royce, Fast food hamburger, and The Globe and Mail. Participants then rated jokes in the form, "A is the B of Domain

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of A", e.g., "John Candy is the fast food hamburger of actors" on a nine-point humour scale. While the overall humour ratings of the jokes were low, they found that jokes were rated as more humorous if there existed greater incongruity, or semantic distance, between the domains.

The previous studies suggest that incongruity is important in both physical and verbal humour domains. Indeed, it is difficult to imagine what would account for a joke if it were not incongruous in some respect.

2.1.2 Incongruity and Resolution

While some cognitive psychologists suggest that humour can arise from incongruity alone (Forabosco, 1992; Attardo, 1997; Nerhardt, 1976; Hillson & Martin, 1994), others posit that humour is based on both incongruity and resolution, where incongruity occurs by overlapping two items that are seemingly unrelated, but actually related in another sense, such that the incongruity can be resolved (O'Quin & Derks, 1999; Shultz, 1976, 1974; McGhee, 1979). Staley and Derks (1995) investigated appreciation of nonsense and incongruity-resolution jokes. They had participants rate a series of incongruity-only or incongruity plus resolution cartoons. Participants were found to rate incongruity plus resolution cartoons funnier than incongruity only cartoons. However the cartoons based on incongruity alone were also rated as very funny by participants.

Ruch, McGhee, and Hehl (1990) completed a large investigation on over 4000 14- to 66-year-olds. They found that the older subjects were, the more they

preferred incongruity-resolution jokes to incongruity only jokes. However, again, incongruity only jokes were still considered funny.

Finally, Hillson and Martin (1994) (discussed earlier) found that whilst higher incongruity in jokes of the form, "A is the B of domain A" predicted higher humour ratings, better resolution did not predict humour ratings on its own. However, an interaction effect occurred such that jokes with higher incongruity and better resolution were found to be funniest. Thus the driving force in whether something is perceived as humorous is the initial incongruity.

Whilst resolution can make an already incongruous joke funnier, it is not necessary for humour appreciation. These studies together demonstrate that it is the incongruity itself which determines whether or not something is humorous.

2.1.3. Other Humour Theories

Wicker et al. (1981) note that psychologists have defined humour in many ways. Some, such as Freud, have defined humour according to its affective components, such as release of tension, laughing at topics that arouse negative affect, and humour's ability to free people from their concerns.

Sroufe and Waters (1977) focused on the tension-release hypothesis for their model of infant laughter. In a previous study, Waters, Matas, and Sroufe (1975) found that if a mother called her infant's name, put on a mask, and then moved close to the infant, the infant would laugh, whereas if a stranger did the same thing, the infant would cry. In their explanation, the infant must release

tension resulting from an aversive action. If the mother, or a positive context, is present, the heart rate of the baby may decelerate enough to result in laughter, whereas in the case of a stranger, or negative context, the heart rate continues to accelerate, leading to crying.

Other humour theories focus on themes. For example, Pinderhughes and Zigler (1985) compared five- and eight-year-olds' appreciation of humour involving aggression and dependency (toilet humour) as themes, and found that children preferred aggression jokes to dependency jokes.

However Wicker et al. (1981) found better support for a cognitive based theory of humour. They had 125 participants rate 74 jokes on 13 scales, including both affective (e.g. emotional involvement; anxiety) and cognitive (e.g. surprise; make sense) dimensions. They found that the cognitive dimensions of humour were more clearly correlated to funniness ratings of the jokes than the affective dimensions. Furthermore, the cognitive dimensions of humour mediated the affective dimensions of humour's effect on funniness ratings.

2.2. What Children Find Funny

2.2.1. Incongruity and Resolution in Children's Humour

Most research in humour development has focused on children from three years and over, when children have well developed verbal skills. Following Shultz' theory that humour involves both incongruity and resolution, Shultz (1974) showed three forms of a pun-based joke to six-, eight-, 10-, and 12-year-olds. The first form allowed one to notice incongruity as well as resolve the

answer to the joke. The second form allowed one to notice incongruity, but did not give anything to resolve the joke. Finally, the third contained no incongruity, but did allow one to resolve the joke. An example is given as follows.

Why did the cookie cry?
A. Because its mother was a wafer so long.
B. Because its mother was a wafer.
C. Because he was left in the oven too long.

Schultz found that while children eight years and above found version A, containing both incongruity and resolution, to be much funnier than versions B, containing incongruity only, and C, containing resolution only, six-year-olds found versions A and B equally funny, and both funnier than version C. What he suggests is that six-year-olds do not understand that an utterance can have two meanings, and so are only finding the absurdness, or incongruity, of the joke funny, and hence are incapable of actually resolving a joke. He maintains that in order to have adult-like humour, one must be able to contain two ideas in one's head at the same time: one that makes a joke incongruous, and one that resolves it.

Pien and Rothbart (1976) presented cartoons to four- and five-year-olds. These cartoons either contained incongruity and resolution, or were altered to contain incongruity alone. Half of the children saw both versions of the cartoon and were asked which one they found funnier. The other half of the children were shown cartoons individually and asked if they found them funny, and if so, whether they were a little funny or very funny. Children's faces were also scored for mirth in both conditions. They found that when children saw the two cartoon types paired, they found the cartoon that contained both incongruity and resolution

as funnier than the cartoon that contained incongruity only. However children who saw only one cartoon at a time found incongruity and resolution cartoons equally funny to cartoons based on incongruity alone. They suggest that children from a young age appreciate resolution in humour, and that this is not necessarily a later step in humour development. Indeed, they suggest that the resolution aspect of humour could be much simpler than Shultz (1974) implies, for example, if a mother was to fail to reappear from behind a barrier in a game of peek-a-boo, and a child then finds the mother after a search, finding the mother could be considered resolution. Thus figuring out what a discrepancy is in a single element rather than two overlap schemas could be considered resolution. They suggest that theoretically, even infants could resolve incongruity along these lines.

Sinnott and Ross (1976) tested 230 children aged three to eight on a forced choice task. Children were each shown six pairs of puppet-acted scenarios and asked to choose which would make children laugh more. Scenarios were paired as neutral and aggressive, aggressive and incongruous, or neutral and incongruous. Examples included: a puppet running around the stage waving hello three times (neutral); a puppet walking across, tripping, and falling on its face (aggressive); a puppet walking across the stage by bouncing on its head (incongruous). Children of all ages chose the incongruous and aggressive scenarios significantly more than the neutral scenarios as most humorous, however no difference was found between the aggressive and incongruous scenarios. They suggest that both incongruity and aggression are factors in children's humour appreciation. However it is appropriate to note that aggression

could be seen as socially incongruous in these scenarios. For example tripping and falling on one's face is something unexpected and unintended by the puppet.

These studies demonstrate that children as young as three years of age find incongruity humorous. These studies also demonstrate that as one simplifies humorous stimuli, it is more accessible at a younger age. This suggests that while no research of this kind has been carried out on children younger than three years, with the right stimuli, the potential for toddlers to understand incongruity as humorous exists.

2.2.2. Level of Cognitive Difficulty of Humour Affects Children's Humour Appreciation

Another aspect that can affect whether and how much children appreciate a joke is how cognitively difficult the humour is in comparison with the child's own cognitive development. Whilst a child might understand jokes and humour in general, if a joke is cognitively too difficult or too easy, s/he might not appreciate that particular joke. Zigler, Levine, and Gould (1967) found that a moderate difficulty level evoked the most humorous responses from children. Children in a past study were tested for joke comprehension. Jokes that were easily explained by children were considered easy. Jokes that were partially explained by children were considered moderately difficult. Jokes that children did not explain very well were considered difficult. Based on the children's comprehension in a past study, easy, moderately difficult, and difficult jokes were selected to test children's humour appreciation in a new study. They tested eight-, 10- and 12-year-old children on a set of 16 cartoons. They recorded children's

mirth expression, and asked children to choose the funniest three cartoons. They found that cartoons of medium difficulty produced significantly more mirth than cartoons with low or high difficulty. They also found that cartoons chosen as the funniest showed a similar pattern. They suggest that children find humour closely linked to their cognitive capacities to be the funniest.

Pinderhughes and Zigler (1985) add further evidence that a joke's difficulty can affect a child's joke comprehension. They investigated five and eight-year-olds' humour appreciation across some cognitive variables. Children were shown cartoons at three levels of difficulty (easy, moderately difficult, and difficult). Children's facial responses were coded for mirth, and children rated how funny they found each cartoon on a five point scale. Children's comprehension of the cartoons was also scored by the experimenters. They found that children showed higher mirth scores for easier cartoons. They also found a correlation between comprehension and children's IQ scores. They suggest that cognitive factors are important in humour comprehension.

The fact that difficulty level plays a part in children's humour comprehension could reveal why children seem to understand different types of jokes at different ages. Shultz' (1974) study relied on a high level of language ability for children to get the jokes. Pien and Rothbart (1976) found humour comprehension at a younger age by making the jokes image based. Making incongruities simpler still could facilitate infants' and toddlers' ability to appreciate humour.

2.3. Laughter in Infants

Studies on the cognitive development of humour in infants and toddlers are limited. One of the only experimental studies to investigate this is by Sroufe and Wunsch (1972). They conducted a study in which they looked at the types of stimuli that made infants laugh. Mothers presented auditory stimuli (e.g. mother using a squeaky voice), tactile stimuli (e.g. bouncing baby on knee), social stimuli (e.g. cloth in mother's mouth), and visual stimuli (e.g. mother crawling on the floor) to their infants. They recorded when four- through 12-month-olds laughed at each type of stimulus. They found that four- to six-month-olds laughed 10% of the time overall, while seven- to nine-month-olds laughed 37% of the time, and 10- to 12-month-olds laughed 43% of the time. Looking at the types of stimuli which elicited laughter, they found that seven- to nine-month-olds laughed more than 10- to 12-month-olds at auditory and tactile stimuli, while 10- to 12-month-olds laughed more than seven- to nine-month-olds at social and visual stimuli. They suggest that what makes infants laugh is in line with their cognitive development, as infants' vision and social interactions develop later than their tactile and auditory abilities.

However McGhee (1979) posits that it is unclear as to whether this is humour appreciation. One possibility is that these children are laughing because they are engaging in play with their mothers, and not because they appreciate humour. Another possibility follows the theory that an incongruity can lead to arousal, which in turn can lead to laughing or crying, depending on the context of the incongruity (Sroufe & Waters, 1976). If a mother is the person causing the incongruity, and she is happy doing so, a child could then release their tension in a

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positive manner (laughter) without appreciating humour. Thus whilst it is possible that laughter could be an indication of humour appreciation, it is also possible that laughter indicates other mental states, such as relief. Thus other methods are needed to decide whether infants and toddlers appreciate humour. In adults and older children, simply asking whether they find stimuli funny could be sufficient. However this method would not work with pre-verbal children, thus other methods are needed.

2.4. Stages of Infant and Toddler Humour Development: Theories and Evidence

There are three main theories, or lines of thought, on how humour develops in infants and toddlers. Piaget (1962) posits that jokes and puns are not symbolic, and are outside the realm of play. McGhee (1979) maintains that humour is based on symbolism. Finally, Reddy (1991) theorises that teasing and humour could be the basis for symbolic thought.

2.4.1. Piaget: Humour and Pretend Play as Separate Entities

Piaget (1962) has little to say about jokes. However, much of his theory on play, and more specifically, stages leading to pretend play, could be interpreted as reflective of, or related to, humour development. One set of attributes that he does specify about jokes and puns is that they involve thought and are not symbolic. Second, he maintains that jokes and puns are not a form of play as their purpose is to evoke laughter, rather than for play itself.

Two stages of play, according to Piaget (1962), that are precursors and the basis for pretense could be considered in some situations as humorous as they involve incongruity. Stage 4 involves the application of known schemas to new situations, for example, Piaget would block an object from the view of his seven-month-old, either using his hand or a piece of cardboard. His son would then push aside the hand or cardboard and burst into laughter. Whilst this example is not labelled as humorous by Piaget, it is very much in line with Pien and Rothbart's (1976) example of resolution of incongruity resulting from a game of peek-a-boo. Thus Stage 4 play could come in the form of humour.

Stage 5 play involves an infant combining unrelated gestures by chance, and then making a game of them by repeating, or ritualising, them. For example, Piaget's daughter at 10 months pressed her nose against her mother's cheek, forcing her to breathe more loudly. She repeated this with variations, and laughed heartily. Again, Piaget does not classify this as humour. However, combining unrelated gestures is incongruous, and could fall in line with humour production. Thus Stage 5 play could come in the form of humour.

2.4.2. McGhee: Pretend Play as the Foundation for Humour

According to McGhee's (1979) theory of humour development, incongruity is the foundation of humour. McGhee also claims that infants cannot comprehend humour until they are able to engage in pretend play, as it is at this point that infants can perceive incongruity. Early in the second year, once pretend play has been achieved, McGhee maintains that infants embark on the first phase of humour which involves assimilating objects into schemas that don't fit, for

example, sucking on a towel. Further advanced stages of humour, according to McGhee, depend on language. McGhee stipulates that the second stage of humour development occurs at the end of the second year, and involves incongruous labelling of objects and events, for example, calling a banana an apple. McGhee's third stage of humour development occurs at three years, and involves conceptual incongruity, for example, finding a bike with square wheels funny. Finally, Stage 4 humour involves jokes with multiple meanings, for example puns, and does not occur until seven years of age. According to McGhee, this is the stage at which children's humour starts to resemble adult humour.

Whilst backed by a good amount of theory on humour and pretend play, McGhee has little in the way of empirical evidence to support his theory. All of his examples of children conforming to his stages of humour are based on Piaget's observations of his two children, as well as Chukovsky's observations of his child, totalling only a three-child sample. Furthermore, the examples which McGhee uses from Piaget's research, e.g. Piaget's daughter sucking on a towel, are deemed humorous because they are accompanied by laughter.

The first problem arises from McGhee's own critique of Sroufe and Wunsch's (1972) study that laughter does not necessarily indicate humour appreciation. Indeed, these children could be laughing because they are playing. Furthermore, as the examples of Stages 4 and 5 play noted by Piaget above, these pre-pretense forms of play are also accompanied by laughter, however McGhee does not consider them to be humour. Finally, Piaget himself never actually categorizes these instances as humorous. Indeed, as explained earlier, Piaget sees

humour as non-symbolic. Given that McGhee's premise is that humour is symbolic, and Piaget disagrees, it is questionable whether these examples from Piaget's work can for certain be counted as evidence for humour in children. It is even more questionable as to whether these observations should form the basis for a theory of humour development.

One case study that might lend McGhee support is a study by Dubois, Farmer, and Farmer (1984). They conducted a longitudinal case study from 24 to 36 months on a girl, B, in which they recorded instances of B's laughter and humour production. They found that B was not receptive to verbal humour until 30 months when B laughed at a word that was unfamiliar to her: Beddy-bye. However they found that B was receptive to physical humour at two years, for example, she saw a boy attempt to kick a football, and then miss, at which she laughed. This gives some support to McGhee's theory, placing incongruous action-based humour before verbal humour, however, in this case, it occurred later than the ages hypothesized by McGhee, and is only supported by laughter, which is not on its own a reliable indication of humour.

Johnson and Mervis (1997) put McGhee's theory to the test in a longitudinal study of one boy, Ari, from 12 to 24 months. They were interested in looking at McGhee's second, third, and fourth stages of humour development, as well as when they occurred in relation to the development of symbolic play and mastery of words. They found that Ari's first episode of symbolic play occurred at 14 months. The first instance of humour production occurred at 15 months and involved incongruent labelling in which he called a hummingbird a duck. This

corresponds to the second stage of humour development. At 18 months, he deliberately produced the wrong animal sound (e.g. Baa for a horse). This is consistent with the third stage of humour. Finally, at 22 months he showed instances of word play, for example, making primitive puns, which corresponds to the fourth phase of humour. Overall it was found that Ari's pretend play curve preceded his joking curve and that the words he used in his jokes had been mastered shortly before the jokes were made.

This study gives some support to McGhee's theory. As McGhee proposes, the humour in this study appeared after pretend play. Stage 2 humour occurred in the second year before the third stage, and the third stage before the fourth. However McGhee's timing of Stages 3 and 4 appear to be too late given Ari's behaviour in Johnson and Mervis' (1997) study. Rather than producing Stage 3 humour during the third year, Ari produced this type of humour by 18 months. Furthermore, McGhee stipulates that Stage 4 humour does not occur until seven years of age, but some simple puns occurred as early as 22 months. In addition, since physical humour was not recorded in this study, one cannot be certain that Ari did not create instances of physical humour before pretend play.

2.4.3. Reddy: Humour as the Foundation for Pretend Play

Reddy (1991, 2001) and Reddy, Williams, and Vaughan (2002) bring into focus a strong component of humour that other theories of humour development lack. That is, humour is fundamentally related to affect, socio-cognition, and cultural practices (Reddy et al., 2002). Reddy et al. compared humour development in children with autism, a disorder characterised by lack of affective

engagement and social relations, with humour development in children with Down's syndrome (DS), a disorder that does not affect affective engagement or social relations. They found that whilst children with autism laughed at tactile and slapstick humour as much as children with DS, they showed a distinct deficiency in responding to funny faces or socially inappropriate acts, laughing with others, or clowning, but an increase in unshared laughter. This suggests that a major component of humour is affective and social.

Reddy (2001) has developed a measure of humour production for pre-verbal children. Reddy found that 87% of eight- and 11-month-olds and 100% of 14-month-olds "clowned", that is, they deliberately repeated actions in order to re-elicit laughter from others. Such actions included screwing up the face, wobbling of the head, squeaks, splashing, teasing and copying others' actions (such as grandma snoring). At its least, this study reveals that infants understand that repeating incongruous actions can elicit an affective response from other people, giving infants a basic understanding of incongruity and others' mental states.

Reddy (1991) also found through parent reports that nine- to 12-month-olds teased their parents by offering objects, and retracting them when the parents tried to take them. Reddy suggests that teasing could provide a basis for toddlers' later pretending abilities. According to Reddy, by offering an object, but then taking it away, infants engage in abstracting from a serious to a playful gesture. Thus violating others' expectations, or creating incongruity through teasing and repeating incongruous actions, may in fact be the basis for infants to understand

that they themselves can intentionally do the wrong thing, which in turn could provide a basis for pretend play.

Indeed, this theory opposes the causal direction of McGhee's (1979) theory, placing humour as a precursor to, rather than a product of, pretend play. This is also in line with Piaget's (1962) stance that jokes and puns need not be symbolic. However unlike Piaget, Reddy suggests that teasing could be an early form of symbolism upon which pretend play is built, suggesting that the social component of humour is an important factor in developing pretense.

If Piaget's (1962) theory allowed play to have another purpose than play itself, and that social factors could be involved, then the humour displayed in teasing and clowning in Reddy's (1991, 2001) studies could fall under Piaget's Stages 4 and 5 of play. As Piaget sees these stages as important precursors to pretense, Reddy and Piaget might both agree that these types of behaviour build a foundation for pretense. Singh, Morgan, and Best (2002) found that infants attend longer to positive versus negative vocalisations, and Fernald (1993) found that infants smile significantly more at positive versus negative vocalisations. If positive affect increases infants' own positive affect as well as attention, it would be fitting that others' positive affective responses (i.e. laughter) to Piaget's Stages 4 and 5 of play could increase their desire or motivation to engage in such play.

2.4.4. Summary: Stages of Infant and Humour Development

These theories thus place the development of humour in infants and toddlers at different ages and with different relationships to pretend play. At its

earliest, humour appears at eight months, and is a precursor for pretend play (Reddy, 1991, 2001). At its latest humour occurs at 18 months, with pretend play a precursor for humour (McGhee 1979). On another view, humour does not develop in any way alongside pretend play (Piaget, 1967).

2.5. Summary

The data on humour appreciation in children place a strong emphasis on the need for incongruity as a basis for humour (Shultz, 1974; Pien & Rothbart, 1976). Humour appreciation is also dependent on whether the cognitive difficulty is a match to the cognitive level of the child. However studies by Reddy (1991, 2001), and Reddy et al. (2002) suggest that affect and social-cognition are also important factors in humour.

The data on infant and toddler humour development is limited. Whilst Sroufe and Wunsch (1972) provide experimental evidence as to the stimuli at which infants laugh, it is not clear that this indicates humour appreciation. Whilst McGhee's (1979) theory offers the most cohesive theory of infant and toddler humour development, little empirical evidence exists to support it. Reddy (1991, 2001) provides data on humour production in normally developing infants, however these studies do not focus on humour appreciation. Overall, experimental evidence is needed in this field.

Chapter 3: The Missing Link: Humour and Intentions

The previous data has some major gaps. Several questions remain. One question is how early children appreciate others' incongruous actions or utterances as humorous. McGhee's (1979) theory is an estimate, but lacks empirical evidence. Case studies by Johnson and Mervis (1997) and Dubois et al. (1984) provide empirical evidence, but lack generalisability. Sroufe and Wunsch's (1972) study provides empirical evidence for the kind of stimuli at which infants laugh, however laughter does not necessarily equate with humour appreciation. Thus one task of this thesis is to test toddlers' ability to appreciate externally created humour.

A more interesting question remains to be answered, that is, the role of intention in joke creation and appreciation. Most jokes are intentional (Leekam, 1991), and socio-cognition is an important part of joking (Reddy et al., 2002). However cognitive studies and theories to date have mostly ignored this important aspect of joke expression and appreciation. A joke is something incongruous that was intended to be incongruous for the purpose of humour alone. For an infant or toddler to appreciate a joke, s/he must first realise that it is incongruous, and second that it was intended to be so. For a joker to tell a joke s/he should offer enough cues to the audience to appreciate that it is incongruous, and that it is intended to be incongruous for the purposes of a joke.

Thus this thesis will cover four areas of interest pertaining to the development of humour in toddlers. First, it will investigate whether toddlers can

appreciate others' incongruity as humorous. Second, it will investigate whether toddlers understand that others intend to create incongruity in order to be humorous. Third, it will investigate the non-verbal acoustic cues that parents use to express that a joke is incongruous and intended to be funny. Finally, this thesis will investigate the verbal cues given by parents to express that a joke is incongruous and intended to be funny.

3.1. Intention Understanding in Humour

Reddy (2001) found that parents reported that their eight-, 11-, and 14-month-old infants deliberately repeated incongruous actions in order to re-elicit laughter. Reddy (1991) also found that parents reported that nine- to 12-month-olds teased their parents, for example, by offering objects, and retracting them when the parents tried to take them. These studies show that infants as young as eight months intentionally create incongruity for humorous purposes. The question then remains as to whether and when infants or toddlers understand that others can intend to be humorous.

Understanding that something is intended as a joke is a difficult task. First, in order to understand that someone else can intend to do something wrong, they must understand that others' have intentions at all. Second, as infants and toddlers are at a key stage of learning about the world, they might not know that an incongruity even exists in an action or utterance, thus knowing that an incongruity exists is a key ability to appreciating a joke. Finally, if an infant or toddler were to know that an incongruity existed, several other possibilities are at hand to explain why someone would do something wrong.

Sroufe and Waters (1977) touch on the idea that context is important in infants' interpretation of humour, but do not consider the context created by intentions. Leekam (1991) points out that jokes differ from mistakes in that jokes are intentional and mistakes are not. She goes on to point out that jokes also differ from lies in that while both are intentional, the second order intentions involved in these differ such that jokes are not intended to be believed, whilst lies are. Other difficulties ensue as we realise that jokes and lies are not the only forms of intentional incongruity. Indeed, Andrews, Rosenblatt, Malkus, Gardner, and Winner (1986) illustrate that metaphors and irony are intentionally incongruous, and need to be differentiated from lies and mistakes.

3.1.1. Theories of Intention Understanding

Many researchers agree that from nine months infants have some awareness of others' intentions, and that by 12 to 14 months, infants understand others' intentions. For example, Gergely, Nadasdy, Csibra, & Biro (1995) tested whether 12-month-olds understand goals by habituating them to an image of one ball "jumping" over an obstacle to get to another ball. In the test phase the obstacle was removed and infants either saw the ball once again jumping to the other ball (same physical action, different goal) or roll directly to the other ball (same goal, different physical action). Infants looked longer when the ball did the same action than when the ball achieved the same goal, thus demonstrating that infants encoded the action as goal-directed and so intentional.

Behne, Carpenter, Call, and Tomasello (2005) found that nine-, 12-, and 18-month-olds displayed significantly more impatience (reaching and banging more, looking less) when an experimenter was unwilling (teasing or refusing) to give a toy to the infant than when they were unable (mistakenly dropped it, could not reach it, or distracted by a phone or person). However this result did not hold for six-month-olds. This suggests that toddlers were frustrated by the unwilling intention of the experimenter in the unwilling condition.

Finally, Phillips, Wellman, and Spelke (2002) conducted a series of looking-time tasks on eight-, 12- and 14-month-olds. In the first task, the experimenter emoted positively and grasped one of two kitties during habituation, and then either displayed a consistent event (grasping the kitty that had received positive emoting) or inconsistent event (grasping the kitty that did not receive positive emoting). Twelve-month-olds, but not eight-month-olds, looked longer at the inconsistent event. In another task, the experimenter only emoted positively to one of two kitties during habituation, and then either displayed a consistent event (grasping the kitty that had received positive emoting) or inconsistent event (grasping the kitty that did not receive positive emoting). Fourteen-month-olds, but not 12-month-olds, looked longer at the inconsistent event. Thus it appears that by 12 months, infants take into account a combination of physical and emotional behaviours in predicting others' actions, and that by 14 months, infants understand that positive emoting on its own indicates the intention to grasp a specific object.

Tomasello and Rakoczy (2003) posit that infants come to understand other as intentional at one year, which in turn allows infants to be aware of others' attention directed to objects. This, they theorise, is a developmental "leap", which enables infants to learn from others, including learning language. Indeed, this is the age at which infants start to imitate and learn words. It is at this point, they posit, that infants develop self-other equivalence. This point develops from a culmination of skills between nine and 12 months including joint-attention, pointing, and gaze-following, which all indicate some basic awareness of others' goals.

Baldwin and Baird (2001), and Baldwin, Baird, Saylor, and Clark (2001) agree that intention understanding develops around nine-12 months, culminating at one year, and offer an explanation of how infants might come to do this. Baldwin, et al. found that 10- to 11-month-olds parse intentional actions appropriately such that they look longer at actions that are paused mid-intention as compared to actions that are paused between intentions. Baldwin et al. interpreted the findings to mean that infants have a low-level ability to parse physical and temporal regularities, which happen to coincide with intentions. Baldwin and Baird posit that it is this low-level detection coupled with increasing knowledge about the world that allows infants to finally detect intentions.

However some researchers would argue that social awareness before nine months is important in the development of intention understanding at 12 months. For example, Legerstee, Barna, and DiAdamo (2000) habituated six-month-olds to an experimenter either talking to or swiping at something occluded behind a

barrier. In the test phase, the experimenter was occluded and the infant saw either another person or a person-shaped object. Infants looked longer when the experimenter had been talking at what was revealed to be an object, or had been swiping what was revealed to be another person, than when the experimenter had been talking to another person or swiping an object. Thus six-month-olds have expectations of social actions and are thus somewhat sensitive to others' intentions.

Woodward (1998) ran several experiments in which five-, six- and nine-month-olds were habituated to either a hand grasping or a hand-like stick touching or grasping one of two objects (a ball or a bear). The objects were then switched and the hand or stick either grasped or touched the original object (same goal, different physical action), or the other object (new goal, same physical action). They found that when a hand grasped a new object, six- and nine-month-olds looked significantly longer than when the hand grasped the same object in a new location, however five-month-olds did not differentiate the two. When a hand-like object touched or even grasped the objects, no difference was found for any of the age groups. Thus infants from at least six-months are sensitive to the goals of other people.

Reddy and Morris (2004) argue that a developmental leap, as proprosed by Tomasello and Rakoczy (2003), infers that infants under nine months are "mind blind", and that such a theory requires a dualistic interpretation of mind and behaviour. Indeed, even Baldwin and Baird's (2001) theory does not really clarify how extra knowledge could make infants interpret actions in a mentalistic rather

than behavioral way. Furthermore, in constrast to Tomasello and Rakoczy's

(2003) claims, other researchers argue that very young infants are indeed sensitive

to others' attention (Reddy, 2003) and recognise self-other equivalence (Meltzoff,

2007).

Reddy (2003) proposed that infants come to understand others' intentions

through affective-engagement. She argues that by two months, infants are already

reacting to others' attention to themselves as, for example, when adults make eye

contact with infants, infants smile more. Four-month-olds elicit others' attention,

for example, by making calling vocalisations when they are not receiving

attention. By six months, infants are sensitive to the fact that others' attention can

be directed to specific aspects of the infant, rather than to the whole. For example,

they exaggerate unusual actions to gain attention. Finally, this leads to aspects of

infant behaviour noted by Tomasello and Rakoczy (2003) such as gaze and point-

following, which reveal that between nine to 12 months, infants are sensitive to

others' attention towards other objects. It is this chain of sensitivity to others'

attention, argues Reddy, that leads to the ability of representing others' minds, i.e.

that others are intentional agents, at 12 months. This theoretical stance eliminates

the need for infants to develop dualistically- first reacting to behaviour, and later

magically to minds as well. Instead, social interactions between the infant and

another person, with infants sensitive to that other person's attention, and thus to a

primitive form of mental understanding, could drive infants to more complex

understanding of others' minds, including intention understanding.

Finally, Meltzoff (2007) takes the position that very young infants understand others as "like me" which leads them to understand others as intentional agents. He argues that infants first experience behaviours themselves, after which, if they see the same behaviours in others, they can relate those people's behaviours to their own experiences. Thus an infant who has experience making facial expressions and manual gestures can imitate others' facial expressions and manual gestures because they are able to see others as "like me" in those contexts. An infant who has turned his or her own head to gaze in order to look at an object can interpret that when another person turns his or her head, it is also to look at an object, as s/he is "like me". And so infants come to it understand that others have intentions because 12-month-olds understand that they themselves have intentions, and that others are "like me". Thus, according to Meltzoff, it is the recognition of self-other equivalence that drives intention-understanding, and not vice versa as Tomasello and Rakoczy (2003) propose.

3.1.2 Intention Understanding and Imitation

Studies on imitation in infants and toddlers have revealed that toddlers understand that others have intentions. In a study by Meltzoff (1995), 18-month-olds were shown a failed, and hence incomplete, action on a novel object by either an adult or a mechanical device. For example, the adult or mechanical device might attempt, but fail, to pull apart a dumbbell shaped object. While no linguistic or facial cues were provided, effortful actions were repeatedly produced on an object, which they suggest shows intent to other adults. They found that the toddlers completed the action when an adult had demonstrated it, but did not when the action was shown by the mechanical device. This showed that 18-month-olds attribute intentions to humans that they do not attribute to mechanical devices.

A study by Carpenter, Call, and Tomasello (2002) looked at whether two-year-olds were more likely to copy a demonstrator's intended action if they already knew what the intention was before they saw the action. The target action was to pull a pin out of a birdhouse (box) in order to open it. Prior to this, some children were given access to the demonstrator's intentions, whilst others were not. The demonstrator's intentions were demonstrated to other children in three ways prior to the demonstrated action: (1) toddlers saw the end state, that is, the open box, (2) toddlers saw the demonstrator trying, but failing, to open the box, and (3) toddlers saw the demonstrator open other boxes. Children who were not given access to the demonstrator's intentions prior to the demonstration were either shown no action, or an unrelated action on the object. Finally, one group of children saw no initial demonstration whatsoever. Carpenter et al. found that toddlers in all three prior intention conditions performed significantly better than children in the two conditions that did not show prior intention as well as the condition that showed no demonstrations whatsoever. Indeed, toddlers who saw a demonstration without knowledge of prior intentions did just as poorly as toddlers who did not even see a demonstration. These results again suggest that toddlers understand others' intentions, and act accordingly.

Carpenter, Akhtar, and Tomasello (1998) modelled two novel actions on an object for 14- to 18-month-olds, accompanied by the demonstrator marking the action as intentional, "There!", or accidental, "Woops!" After the two actions, an interesting result would occur, such as a light turning on. They then asked the child to try. They found that toddlers copied significantly more actions that were

marked as intentional versus those marked as accidental, again showing that toddlers have an understanding of others' intentions, and that they use these to guide their own actions to obtain the same results.

What all of these studies show is that toddlers understand that some actions performed by adults are intended, and others are not. All of these studies showed actions on novel objects, so in each of these studies, the child has no prior knowledge of what constitutes a correct action in these scenarios. It may be presumed that the child is learning what is correct based on the intentions of the adult demonstrator. If it was not intended, it is not correct. While yielding fascinating information about when toddlers understand that what others meant to do is correct, this does not tell us much about whether toddlers understand that others can intend to do an action that they know to be incorrect.

3.1.3 Differentiating Intentions to Create Incongruity

To tease apart children's understanding of several concepts that rely on the intention to create incongruity, several studies have been conducted. Lee, Xu, Fu, Cameron, and Chen (2001) tested seven-, nine-, and 11-year-old Taiwanese, Chinese, and Canadian children's abilities to distinguish lies from truth-telling. Children read stories following the format that a person did something either good or bad, and either admitted to or denied doing it. Children of all ages reliably differentiated lies from the truth.

Further studies by Siegal and Peterson (1996, 1998) tested three- to five-year-olds on their ability to distinguish lies from mistakes. In both studies,

children saw that a bear either saw or did not see that a food item was contaminated (by mold or a fly). The bear then told a friend in both conditions that the food was okay to eat. Children as young as three in both studies identified the bear who knew about the contaminant as a liar, and the bear who did not know as mistaken.

Pretend play is another area in which toddlers understand that others can intend to do the wrong thing. In pretend play, a toddler must understand that another person has purposely done the wrong thing by substituting one action for another. Furthermore, the child must understand that the substituting action represents the real action in a possible world (Nichols & Stich., 2003). Thus two cognitive abilities are required for understanding the intention to pretend. Rakoczy, Tomasello and Striano (2004) showed 26- and 36-month-old toddlers an ambiguous incomplete action that was either marked as a mistake or as pretense. They then asked the toddlers to try. They found that 36-month-olds, but not 26-month-olds, copied the actions marked as pretending, and completed those marked as mistakes. This suggests that by 36 months, toddlers can both understand that others intend to do the wrong thing, as well as understand that others can intend to substitute one action for another, represented as normal in a possible world.

More in the realm of humour, studies by Andrews et al. (1986) and Winner and Leekam (1991) found that children could distinguish irony from lies or deception. In the study by Andrews et al. (1986), six- and eight-year-old children each read sixteen stories. These stories were either false, but intended literally (lies and mistakes), or false, but intended as nonliteral (irony and metaphor).

Eight-year-olds did well at identifying all types of falsehoods, however six-year-olds did less well, wrongly identifying metaphors and ironic utterances as mistakes and lies. Winner and Leekam (1991) tested seven-year-olds on their ability to distinguish irony from deception. They found that children's ability to do so was contingent on their ability to distinguish second order intentions, that is, that the liar intended for the audience to believe the falsehood, whereas the ironist did not.

Looking specifically at humour, Sullivan, Winner, and Hopfield (1995) read two stories to five- to eight and a half-year-old children. In one story, a child lies, as the child does not know that the person to whom he is lying knows the truth. In the other story, a child jokes, as the child knows that the person to whom he is joking knows the truth. They found that children's understanding of second-order beliefs (understanding what the lying/joking character knows about the other character's beliefs) was imperative to understanding whether the child was lying or joking.

Understanding metaphors, irony, pretending, and lying all require a child to understand that others intend to do the wrong thing. However each of these behaviours requires more complex understanding, either requiring the child to understand that others can have beliefs that do not match the child's, can represent objects as other objects, or that people have knowledge of what other people know.

One form of understanding that others could intend to do the wrong thing without understanding anything else is humour. As humour, according to incongruity theorists, and basic humour, according to incongruity and resolution theorists, requires only noticing an incongruity, understanding that a joke is intended should only require a child to understand that someone intended to create an incongruity, or do the wrong thing.

If toddlers are able to understand that others can intend to do the wrong thing, they should be able to understand that others can joke as compared to tell the truth or make a mistake. They should be able to make this distinction regardless of whether toddlers understand that others can represent wrong actions on objects as real in a possible world. They should also be able to make this distinction regardless of whether they understand that others can intend to deceive. Finally, they should be able to make this distinction regardless of whether they understand that others can mean the opposite of what they say, or can allude to a quality exemplified by metaphor,

3.2. A Case for Parents' Use of Acoustic and Verbal Features to Indicate Humorous Intentions

As outlined above, without understanding the intentions behind it, a joke could be misunderstood to be the truth, a mistake, a lie, pretending, a metaphor, or irony. Indeed, as studies above described (Zigler et. al., 1967; Pinderhughes & Zigler, 1985), children appreciate jokes less if they are cognitively difficult. In the case of verbal humour for children who are not yet proficient with language, the

child may find verbal jokes difficult to understand, and thus will not appreciate them as humorous.

If a parent were to tell a joke to a child with limited world knowledge and verbal skills, it would seem appropriate for the parent to indicate somehow that s/he intends for the joke to be understood as a joke, and not as any of the above mentioned alternatives (e.g. new information, lie). One hypothesis explored in my dissertation is that parents might express that what they are saying or doing is meant to be funny, and not normal or serious, by using vocal acoustic characteristics of their speech to indicate their intentions. A second hypothesis is that parents may give verbal cues, either highlighting the humorous tone, or explaining parts of the joke.

3.2.1. Parents' Use of Vocal Cues to Indicate Humorous Intentions

Vocal acoustic characteristics comprise several features including mean fundamental frequency (F_0), which is what we hear as the pitch of the voice. It also includes the F_0 range, that is, what we hear as the difference between the highest and lowest pitch in an utterance. Another measure is F_0 standard deviation, which reflects what we hear as the amount of variation of pitch in an utterance. Aside from pitch variables, we can also measure what we perceive as loudness, known as mean amplitude. We can also measure amplitude range, the difference between what we perceive as loudest and quietest expressed points of an utterances. Furthermore, we can measure amplitude standard deviation, which reflects what we hear as the amount of variation of loudness in an utterance. A final acoustic feature to consider is speech rate, that is, how fast one speaks.

These features have been studied extensively by emotion researchers to distinguish how people express different emotions. For example, people are louder when they are angry than when they are sad (Scherer, 1986; Banse and Scherer, 1996). However, these global features of speech have also been found to express different intentions, for example, Gussenhoven (2004) maintains that people vary pitch register for communicative purposes, for example, they use a higher pitch to express indignation, and a lower pitch to suggest confidentiality.

Another important vocal cue to consider when looking at different mental states is the intonation contour. An intonation contours is the shape created as the F_0 increases, decreases, or stays flat, across a sentence. Gussenhoven (2004) illustrates how different contours can yield different meanings for sentences. For example, the sentence, "I don't think she meant to say that." will fall in pitch across the sentence with a final pitch lowering on the last syllable (that) to indicate that it is a declarative, whereas the same sentence with a final pitch rise on the last syllable indicates the intention of the speaker to remind the listener of shared knowledge.

Adults use different vocal acoustic characteristics to indicate different intentions with other adults. One example of this involves the difference between a statement and a question. van Heuven and Haan (2000) had participants say the content of a Dutch sentence in four ways: (1) as a statement, (2) as a Wh-question (who, what, where, when, why), (3) as a yes/no question, and (4) as a statement in question form. They found that when participants uttered a question, they raised

their F_0 at the end of the sentence. However, when uttering a statement, they did not. Furthermore, the degree to which they raised the F_0 at the end of the sentence varied depending on the question type, with statement-like questions rising the most, followed by yes-no questions, and then Wh-questions. Thus in order to differentiate whether one intends for a listener to respond or not to a sentence, adults use intonation cues as a guide.

Another example much closer to humour is the use of intonation in expressing irony, in which the speaker means the opposite of what s/he says, so contextual cues other than the words are necessary to distinguish an ironic from a non-ironic sentence. Anolli, Ciceri and Infantino (2000) reported that vocal acoustic features distinguished two types of irony from neutral speech and from each other. Fifty adults said four standard phrases: one that expressed kind irony, one expressing sarcastic irony, and two corresponding normal controls. They found that when subjects expressed both types of ironic phrases, they used a higher mean F_0, as well as higher range and standard deviation of F_0, higher mean energy (similar to amplitude) and higher energy range, and faster speech rate. Furthermore, when expressing sarcastic irony versus kind irony, sarcastic irony had a higher mean F_0, F_0 range, F_0 standard deviation, and a higher energy range. Thus adults give vocal acoustic cues to other adults when expressing irony, a concept similar to humour.

It is already known that parents use different intonation contours to indicate different intentions. Katz, Cohn, and Moore (1996) asked mothers to get their four-month-olds' attention, show approval, and provide comfort by using

their voices. Katz et al. classified each of the mothers' utterances by classifying them into one of five intonation categories: rising, falling, bell, wave, and flat. They found that mothers differentiated intentions using different intonation contours. Specifically, mothers used a rise-fall contour in order to elicit attention, and bell and wave shapes to express comfort.

Parents also manipulate vocal acoustic characteristics to express intentions to their toddlers. Reissland and Snow (1996) had mothers interact with their infants during a pretend play setting (e.g. feeding a doll) and a normal setting (e.g. feeding the infant) when their toddler was 11 months, and again at 15 months. They found that mothers increased their mean pitch during the pretend play context at both 11 and 15 months. Furthermore, mothers increased their pitch range during pretend play when their infants were 11, but not 15 months of age. This shows that mothers use vocal acoustic characteristics of their voices to indicate that they intend actions to be interpreted in different ways, i.e. real and pretend, and that this varies depending on what they believe is their child's level of comprehension.

Given the findings of past research, if parents intend to communicate humour differently to normal speech it would make sense for them to do so vocally. During toddlerhood, children's vocabularies are limited, but develop rapidly, so extra vocal acoustic cues would certainly help toddlers understand that an utterance was intended as a joke. Indeed, parents speak to infants and toddlers in an exaggerated way, known as Infant-Directed Speech (IDS) (Fernald, 1989, 1993). This form of speech uses an increased mean F_0 (Fernald & Simon, 1984),

more varied intensity of amplitude (Fernald & Kuhl, 1987; Weppelman, Bostow, Schiffer, Elbert-Perez & Newman, 2003), and a slower speech rate (Papousek, Papousek & Haekel, 1987). Thus using one's vocal acoustic characteristics of speech to better communicate with toddlers is not a foreign concept.

Given that humour involves expressing an incongruity, parents might use their voices to indicate this to their toddlers. Since adults use vocal acoustic patterns to express irony, a form of humour, to other adults, and since parents exaggerate vocal features in general speech to infants and toddlers, it would make sense that they would use their vocal features to express the incongruity inherent to humour. Furthermore, parents have already been found to use vocal acoustic features to indicate the intention to do the wrong thing, that is, the intention to pretend (Reissland & Snow, 1996), thus it would make sense that parents would change their voices to indicate the intention to do the wrong thing in another context.

3.2.2. Parents' Use of Language to Indicate Humorous Intentions

Parents adjust language to their child's level of comprehension. However, they also scaffold new linguistic concepts. A study by Danis, Bernard, and Leproux (2000) found, using the Bayesian analysis of directional association models (Bernard, 1997), that adults adjust their level of abstract language during a book reading task to that of the three-year-old child to whom they are reading. Furthermore, they also found that adults raise the level of abstraction in speech more so than children, indicating that parents bootstrap abstract language with children.

Mothers speak differently to their children depending on whether they are in a pretend or real situation. Lillard and Witherington (2004) asked mothers to either eat Cheerios and drink juice with their 18-month-old toddler, or pretend to eat Cheerios and drink juice. They found that mothers in the pretend condition spoke significantly more than those in the real condition. Furthermore, mothers in the pretend condition made significantly more references to concrete objects (cup, plate), as well as behaviours (eating, drinking) than mothers in the real condition. Thus mothers offer verbal cues to their toddlers to indicate that a situation is pretend rather than real.

If parents were to try to convey to their children that they intended to be funny, using language could play an important role. First, humour is an abstract concept requiring abstract thought. In order to get a joke, it is important to first notice an incongruity. Torreano, Cacciari and Glucksberg (2005) found that if adults were given sentences with verbs that were more abstract, they were more likely to judge the sentence as metaphorical. It is thus plausible that parents could use more abstract language to highlight incongruity in humorous utterances.

Attardo (1997) discusses the semantic script theory of humour in which the text of a joke is fully or partially compatible with two different scripts, and the two scripts oppose each. Attardo posits that one possible definition for opposition is negation, that is, the second script can be anything that is not part of the first script. Given this definition of text humour, parents may want to highlight that the two parts of a scripted joke do not actually fit together in a normal sense. Thus

after reading scripted jokes, parents may make statements that request the child to disbelieve the joking statement, which would cue the child to the joking nature of the sentences.

3.3. Experimental Paradigms in this Thesis

This thesis will examine first, when toddlers understand general incongruity-based and intended incongruity-based humour. It will add to the current literature on infant and toddler humour development, and will reveal when toddlers develop the cognitive abilities of noticing incongruity and understanding that others can intend to create incongruities. In order to test toddlers' abilities to do these tasks, we will use an imitation paradigm.

In order to establish whether toddlers understand that incongruity can be humorous, 19-24, 25-30, and 31- to 36-month-olds will view unambiguous humorous actions on objects that are very incongruous, for example, an experimenter putting a boot on her hand and laughing, and unambiguous mistakes on objects that are only slightly incongruous, for example, an experimenter putting a ring over a ring stacker, but letting it drop next to the ring stacker, effectively missing, along with the experimenter saying, "Woops!" If the toddlers copy joke actions significantly more than mistakes, and correct mistakes significantly more than jokes, this will demonstrate that they can recognize that very incongruous actions are funny.

Second, in order to ascertain whether toddlers understand that jokes are intended, the experimenter will demonstrate ambiguous actions on objects that are

moderately incongruous, for example, putting a hat on her head such that it covers her eyes. Toddlers will either hear laughter as an accompaniment, or they will hear the experimenter say, "Woops!". If the toddlers copy the ambiguous actions marked by laughter significantly more than those marked by, "Woops!" and correct actions marked by, "Woops!" significantly more than actions marked by laughter, this will demonstrate that toddlers understand that jokes rely on others' intention to be humorous.

Third, this thesis will examine the cues available to infants and toddlers for them to come to understand that materials are meant to be humorous. These include non-verbal vocal cues, including global acoustic features of speech and intonation contours. In a first study, parents will read a book containing both humorous pages without a specific joke structure, and non-humorous pages. In a second study, parents will read either a book full of incongruity-based jokes, or a matched book with normal, non-incongruous sentences. The sentences contained in the books will be analysed for mean F_0, F_0 range, F_0 standard deviation, mean amplitude, amplitude range, and amplitude standard deviation, as well as speech rate and intonation contours. If parents use significantly different vocal acoustic characteristics when expressing humour or jokes as compared to non-humorous speech, then it is possible that vocal acoustic cues could be used by toddlers to understand humorous intentions. Furthermore, the nature of the humorous vocal acoustic features could reveal what it is about the jokes or humorous material parents are expressing to their toddler, for example, if they are expressing that the jokes are exhilarating, or if they are expressing that the jokes are incongruous.

Finally, this thesis will examine the cues available to infants and toddlers for them to come to understand that materials are meant to be humorous in the form of verbal cues. Specifically, we will look at the use of abstract utterances and disbelief statements by parents reading humorous and non-humorous materials.

In a first study, parents will read a book containing both humorous and non-humorous pages. We will then examine parents' use of high and low abstract language. As humour is an abstract concept, an increased use of abstract language could cue a child to think in an abstract way, and thus to expect utterances as humorous.

Second, this thesis will examine parents' use of disbelief statements, that is, statements that encourage children to disbelieve past utterances shared in a book reading setting. Parents will read either a book containing jokes or a matched book that does not contain jokes. If parents use more disbelief statements when reading a humorous book as compared to a non-humorous book, toddlers might be getting a cue that incongruity existed in past utterances, which in itself would be a cue for jokes. Parents' use of these cues could effectively bootstrap toddlers' understanding of humour as intended incongruity.

3.4. Summary

More research is needed in the area of humour development to examine the effect of intentions on humour. This is important because intentions form a key aspect of joking. Without understanding the intention to joke, an audience

could mistake humour for a mistake, pretense, lying, or a metaphor. The current thesis will examine the role of intention in humour development. First, this thesis will examine whether toddlers understand that incongruity can be humorous, and that others can intend to do the wrong thing in order to be humorous as compared to making a mistake. Second, this thesis will look at how parents express that they intend to say the wrong thing in order to create humour by examining parental vocal acoustic and verbal cues specific to humour as compared to normal utterances.

Chapter 4: Do the Wrong Thing:

How Toddlers Tell a Joke from a Mistake

4.1. Introduction

An important step in children's understanding of others' actions is identifying when and why a person does the wrong thing. The most familiar example of this is false belief, that is, identifying that someone can have a belief that is not in line with physical or social realities existing in the world. The fact that we do not understand false beliefs until four years (Gopnik & Astington, 1988) illustrates that understanding why others do the wrong thing is quite complex. Other less cognitively demanding possibilities exist, however, to explain why a person does the wrong thing. These simpler possibilities could be important steps towards more complex forms of understanding why others do the wrong thing. In this study, the aim was to find out when toddlers understand that others can intend to do the wrong thing with the purpose of making a joke.

One simpler possibility to explain why someone did something wrong is by considering a wrong action to be a mistake. Meltzoff (1995) found that when 18-month-olds were shown an incomplete action as a result of the demonstrator trying but failing to complete an action, they completed the actions, whereas when an inanimate object demonstrated the same action as the demonstrator, the toddlers did not. Carpenter et al. (1998) demonstrated two actions on novel objects, one marked as intentional (There!), and the other as accidental, (Woops!), after which an interesting result would occur. They found that 14- to 18-month-olds copied the actions marked as intentional significantly more than those marked as accidental.

Sakkalou and Gattis (2006) found the same results in 14- to 18-month-old toddlers even when the only cue to intention was intonation. In their study, the demonstrator used the intonation patterns of "Woops!" and, "There!", but spoke in Greek. These studies together show that 14- to 18-month-olds understand that others sometimes do the wrong thing because they have made a mistake.

As many parents can attest, however, development is not just about learning to do the right thing, but also learning to do the wrong thing. Learning to do the wrong thing is particularly complex. Normally a child carries out an action (physical or verbal) that s/he already knows to be correct, or learns that a new action is correct and subsequently carries it out. To learn to do the wrong thing, the child learns that a new action is incorrect, but still carries it out. As we normally avoid wrong actions, doing the wrong thing is a counter-intuitive process.

To some extent, it can be said that pretend play is one form of doing the wrong thing. In pretend play, rather than using an object in the way it is normally used, one must use it as if it were another object altogether. The way in which the object is used is thus, in a literal sense, wrong. Toddlers pretend by making object substitutions from 18 months (Elder & Pederson, 1978; Ungerer, Zelazo, Kearsley, & O'Leary, 1981). Rakoczy et al. (2004) found that when 26- and 36-month-old toddlers were shown the same wrong action either marked as pretense or trying, 36-month-olds, but not 26-month-olds, could differentiate the actions. They did this by completing the action when trying was intended, and doing the wrong action when pretending was intended. This suggests that 36-month-olds understand that others can intentionally do the wrong thing in order to pretend.

A less ambiguous form of doing the wrong thing is lying. Children differentiate lying from mistakes as early as three years (Siegal & Peterson, 1996; 1998). Lying involves saying the wrong thing with the purpose of deceiving another person. Thus understanding that someone else intends to lie requires a child to understand that the liar intends to say the wrong thing, and intends for the listener to believe the falsehood.

A third form of doing the wrong thing is joking. Joking involves saying or doing the wrong thing with the purpose of a listener or viewer recognising that it is the wrong thing. Thus understanding that someone else intends to joke requires a child to (1) have knowledge that what has been said or done is wrong, (2) understand that the joker intended to say or do the wrong thing, and (3) understand that the joker intended for the listener not to believe the falsehood. Sullivan, et al. (1995) read two stories to five- to eight and a half-year-old children. In one story, a child lies, as the child does not know that the person to whom he is lying knows the truth. In the other story, a child jokes, as the child knows that the person to whom he is joking knows the truth. They found that children's understanding of second-order beliefs (understanding what the lying/joking character knows about the other character's beliefs) was imperative to understanding whether the child was lying or joking.

However jokes can be represented at a much simpler level than was displayed in this study. A simpler comparison would be to discover if toddlers can distinguish humorous intentions from mistakes. Jokes and mistakes both require the audience to know that the information displayed is incorrect. However, jokes and mistakes differ

in their intentions. When one makes a mistake, the audience must understand that the demonstrator intends to do the right thing, but fails, whereas when one makes a joke, the audience must understand that the demonstrator intends to do the wrong thing (Leekam, 1991).

Indeed, humour is less complex than all the other aforementioned forms of doing the wrong thing. Humour is less complex than pretend play in that it does not necessarily require one to make "as-if" construals, that is, it is not necessary to compare the wrong action to a similar situation in the child's knowledge of the world in which the action could be perceived as right. The child only needs to know that it is wrong, and thus does not need to match it to other aspects of his/her knowledge of the world. Humour is also less complex than understanding lying, which would require the child to understand second-order beliefs. Thus it is possible that learning that others intend to do the wrong thing in order to joke could be a precursor to learning that others intend to do the wrong thing in order to pretend or lie. The relationship and requirements between these different types of intention understanding are displayed in Figure 4.1.
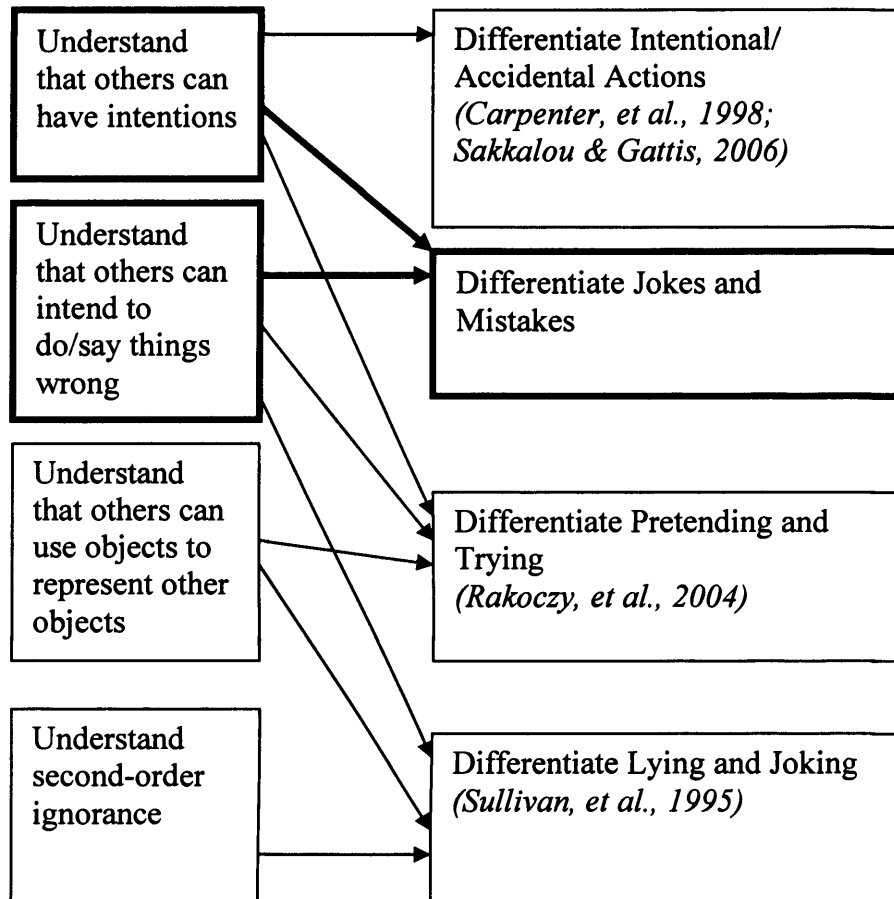
Figure 4.1. Cognitive abilities needed to differentiate reasons for doing the wrong thing in different experiments. Boxes and arrows in bold are specific to the current study.

The current study measured whether toddlers can, (1) tell the difference between a mistake and a joke, and (2) tell whether they understand intentions as humorous. In the current study, a joke was defined as an action on an object that is dissimilar from actions normally applied to such an object (e.g. putting a boot on one's hand). A mistake was defined as an incomplete action that is similar to an action normally applied to such an object (e.g. writing with the wrong end of a marker).

Three sets of unconventional actions were demonstrated to 19-24, 25-30, and

31- to 36-month-olds. One set of actions consisted of unambiguous humorous

actions. These were marked by the experimenter laughing with a positive facial

expression. Another set of actions consisted of unambiguous mistake actions. These

were marked by the experimenter saying, "Woops!" with a negative facial expression.

The final set of actions consisted of ambiguous actions that could on their own be

seen either as humorous or as mistakes, that is, they were incomplete actions that

were somewhat similar to actions normally applied to those objects, but compared to

the unambiguous mistake actions, were less likely to have occurred by accident.

These actions were marked either with laughter with a positive facial expression, or

by the experimenter saying, "Woops!" with a negative facial expression. After all

actions, the experimenter asked the child to try. The first two sets of actions should

reveal whether children can differentiate jokes and mistakes in general, while the last

set should reveal whether children understand that when others do wrong actions, it

could either be because they intended to do it correctly, but made a mistake, or

because they intended to make a joke.

Our first prediction concerned toddlers' ability to distinguish mistakes from

jokes based on similarity or dissimilarity to conventional actions. The unambiguous

humorous actions used in this study were highly dissimilar to the actions that toddlers

would normally see applied to these objects, such as putting a toy cat on one's head.

The unambiguous mistake actions by contrast were similar to the actions that toddlers

would normally see applied to these objects, but incomplete, such as trying to put a lid

on a sugar jar and missing. It was reasoned that if toddlers are able to distinguish

jokes from mistakes based on dissimilarity of actions, they would copy unambiguous

humorous actions and correct unambiguous mistakes, as they themselves would want to make jokes and avoid mistakes. It was predicted that toddlers from all three age groups would understand the difference between a mistake and a joke as long as that distinction could be based on similarity or dissimilarity to conventional actions. This prediction was based on Meltzoff's (1995) report that toddlers complete mistakes from 18 months, and McGhee's (1979) proposal that toddlers from 18 months joke by using incongruous actions towards objects. Furthermore babies as young as eight months repeat their own actions to re-elicit laughter, known as clowning (Reddy, 2001), and toddlers are keen to copy others' actions (Carpenter et al., 1998; Meltzoff, 1995; Sakkalou & Gattis, 2006), thus toddlers should be eager to both imitate and make jokes.

Our second prediction concerned toddlers' ability to distinguish jokes from mistakes based on intention alone. This prediction concerned the third set of actions, the ambiguous actions, which were similar to the sorts of actions that toddlers might normally see applied to objects, but slightly different, such as putting the wrong end of the toothbrush in one's mouth. Ambiguous actions marked as jokes or mistakes were counterbalanced across participants, providing a strict test of toddlers' ability to distinguish jokes from mistakes based on intention alone. It was reasoned that if toddlers are able to distinguish jokes from mistakes based on intention alone, they would copy ambiguous actions marked as humorous and would correct ambiguous actions marked as accidental. This prediction is similar to the results reported by Carpenter et al. (1998), Meltzoff (1995), and Sakkalou and Gattis (2006), but humour requires a more complex understanding of intentions than that displayed in those studies. Past studies required understanding that someone meant to do the right thing,

whereas humour requires one to understand that another could intend to the wrong thing. Thus it was predicted that toddlers would understand humorous intentions after they understand intentions to do the right thing, that is, after 14-18 months. However understanding intentions as humorous is less complex than understanding intentions as pretense or lying, which both occur around three years. Thus it was predicted that toddlers would be able to understand humorous intentions earlier than three years.

4.2. Method

4.2.1. Participants

A total of 78 children participated. Twenty-eight were 19 to 24 months (15 boys, 13 girls, mean age 22 months and 20 days), 27 were 25 to 30 months (12 boys, 15 girls, mean age 28 months and 4 days), and 23 were 31 to 36 months (15 boys, 8 girls, mean age 33 months and 28 days). The data of 13 additional children tested in a daycare setting were excluded as their behaviour differed dramatically from the rest of the children, who were all tested in a laboratory setting. The data from three further children were excluded, one due to equipment failure, and two due to fussiness. Participants were recruited from day care centres, play groups, the NHS, and libraries.

4.2.2. Materials

Materials included four sets of objects for a warm-up trial with conventional actions on objects (comb, duck, spoon and cup, and blocks); four sets of objects for the unambiguous joke trials (teapot and boot, brush, cat, and boot); four sets of objects for the unambiguous mistake trials (ring stacker with rings, paper and marker, glove, and sugar jar and lid); and four objects for ambiguous trials (cup, toothbrush, spoon, hat). See Appendix A for a list of demonstrated actions. A Sony digital video

camera, a Sony DV cam recorder and a mixing board were used to record the reading session.

4.2.3. Design

The experiment was a mixed design. All toddlers participated in the same unambiguous joke and mistake trials, making this part a within-subjects design. For the unambiguous joke and mistake trials, the independent variable was whether the action was an unambiguous joke (e.g. putting a toy cat on one's head) accompanied by laughter and a positive facial expression, or an unambiguous mistake (e.g. trying to put a lid on a sugar jar and missing) accompanied by the utterance, "Woops!" and a negative facial expression. All toddlers participated in the ambiguous joke and mistake trials, however order of joke and mistake trials, and the toys used for mistake and joke trials, were counterbalanced between children. For the ambiguous joke and mistake trials, all actions could be perceived either as a joke or mistake, and so the independent variable was the intentional cue accompanying the demonstration of an unconventional action: either laughter and a positive facial expression, or the utterance, "Woops!" with a negative facial expression. The dependent variable for all trials was whether the child first copied or corrected the demonstrator's action, or never did either.

4.2.4. Procedure

The set-up of the warm-up and experimental trials is based on studies by Rakoczy, et al. (2004). The experiment began with four warm-up trials in which the experimenter demonstrated a conventional action on an object, and then said to the child, "There" with a neutral facial expression offering the object to the child, and

then said, "Now you try." The purpose of this warm-up phase was to get the child used to imitating the experimenter in a conventional way. Next, children were shown two unambiguous joke actions and two unambiguous mistake actions in alternation. After each joke action, the experimenter laughed with a positive facial expression, gave the child the toy, and then said, "Now you try." After each mistake action, the experimenter said, "Woops!" with a negative facial expression, gave the child the toy, and then said "Now you try." Next, the experimenter demonstrated two ambiguous actions, after which she either laughed with a positive facial expression or said, "Woops!" with a negative facial expression for both, gave the child the toy, and then said, "Now you try." The experimenter then repeated the unambiguous and ambiguous trials using the remaining toys. If in the first ambiguous condition, the experimenter had said, "Woops!", the experimenter then laughed in the second ambiguous condition, and vice versa. Children did not receive feedback for their actions.

4.2.5. Coding

The experimenter coded children's actions on objects from a videotaped record. If a child copied the experimenter's action without having corrected it beforehand, the action was coded as a copied action. If a child corrected the experimenter's action (e.g. the child placed a ring on a ring stacker, rather than letting it drop next to the ring stacker) without having copied it beforehand, the action was coded as a corrected action. If the child never copied or corrected the experimenter, the action was coded as no action. See Appendix B for criteria for coding actions as copying or correcting.

4.3. Results

The number of matches for corrected actions was calculated by subtracting the number of times toddlers corrected jokes from the number of times toddlers corrected mistakes. The numbers of matches for copied actions was calculated by subtracting the number mistakes that toddlers copied from the number of jokes that toddlers copied. Significance levels for matches were one-tailed, as there was no theoretical reason why toddlers should tend to mismatch actions to intentions. Significance levels for age effects were one-tailed as toddlers should tend to get better at matching action to intentions with age. Order effects were tested two-tailed. No effects of gender (two-tailed) were found in any of the analyses. Twenty per cent of the videos (randomly selected) were second coded by a blind rater. Agreement was excellent, Cohen's Kappa = 0.85.

4.3.1. Unambiguous Actions

Figure 4.2 shows the means of correcting and copying for unambiguous mistakes and jokes. One outlier was cut from the 31- to 36-month-olds' data, and one from the 25- to 30-month-olds' data for the number of matches for corrected actions. No effects of age were found. Toddlers corrected mistakes significantly more than they corrected jokes, $t(75)=23.10$, $p<.001$ (one-tailed). Toddlers in each age group also corrected mistakes significantly more than they corrected jokes (19-24 months: $t(27)=15.00$, $p<.001$; 25-30 months: $t(25)=14.23$, $p<.001$; 31-36 months: $t(21)=11.22$, $p<.001$, all one-tailed). Toddlers copied jokes significantly more than they copied mistakes, $t(77)=11.49$, $p<.001$ (one-tailed). Toddlers in each age group also copied jokes significantly more than they copied mistakes (19-24 months: $t(27)=7.62$,

p<.001; 25-30 months: t(26)=5.72, p<.001; 31-36 months: t(22)=6.55, p<.001, all

one-tailed).
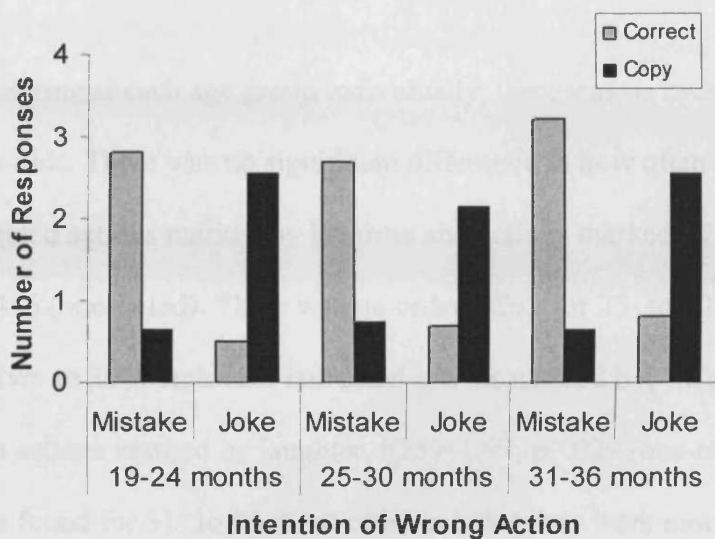
Figure 4.2. Mean number of responses for which children copied or corrected the demonstrator as a function of age and model type in the unambiguous condition.

4.3.2. Ambiguous Actions

Figure 4.3 shows the means of correcting and copying for ambiguous mistakes

and jokes. One outlier was cut from the 19- to 24-month-olds' data, and one from the

25- to 30-month-olds' data for the number of matches for corrected actions. Toddlers

corrected actions marked by, "Woops!" significantly more than they corrected action

marked by laughter, F(1, 70)=10.37, p=.001 (one-tailed). An age effect was found

such that older toddlers made significantly more correction matches than younger

toddlers, F(2, 70)=2.56, p=.043 (one-tailed). A Helmert analysis found that 25- to 30-

and 31- to 36-month-olds (grouped together) made significantly more correction

matches than 19- to 24-month-olds, p=.022 (one-tailed). However no difference was

found between 25- to 30- and 31- to 36-month-olds, p=.153 (one-tailed). An order

effect was found such that toddlers were more likely to match corrections if they were

shown ambiguous action marked by laughter before they were shown ambiguous actions marked by, "Woops!", $F(1, 70)=6.95$, $p=.010$ (two-tailed).

Looking at each age group individually, there was no order effect for 19- to 24-month-olds. There was no significant difference in how often 19- to 24-month-olds corrected actions marked by laughter and actions marked by, "Woops!", $t(26)=-0.21$, $p=.416$ (one-tailed). There was no order effect for 25- to 30-month-olds. Twenty-five- to 30-month-olds corrected actions marked by, "Woops!" significantly more than actions marked by laughter, $t(25)=1.99$, $p=.029$ (one-tailed). An order effect was found for 31- to 36-mont-olds such that they were more likely to match corrections if they were shown ambiguous action marked by laughter before they were shown ambiguous actions marked by, "Woops!", $F(1, 21)=11.36$, $p=.003$ (two-tailed). Thirty-one- to 36-month-olds corrected actions marked by, "Woops!" significantly more than actions marked by laughter, $F(1, 21)=15.86$, $p<.001$ (one-tailed).

Two outliers were cut from the 19- to 24-month-olds' data, and one from the 25- to 30-month-olds' data for the number of matches for copied actions. No effects of age or order were found. Toddlers copied actions marked by laughter significantly more than they copied actions marked by, "Woops!", $t(74)=3.23$, $p=.001$ (one-tailed). There was no significant difference in how often 19- to 24-month-olds copied actions marked by laughter and actions marked by, "Woops!", $t(25)=1.07$, $p=.147$ (one-tailed). Twenty-five- to 30-month-olds copied actions marked by laughter significantly more than action marked by, "Woops!", $t(25)=1.87$, $p=.036$ (one-tailed).

Thirty-one- to 36-month-olds copied actions marked by laughter significantly more

than action marked by, "Woops!", t(22)=2.65, p=.008 (one-tailed).
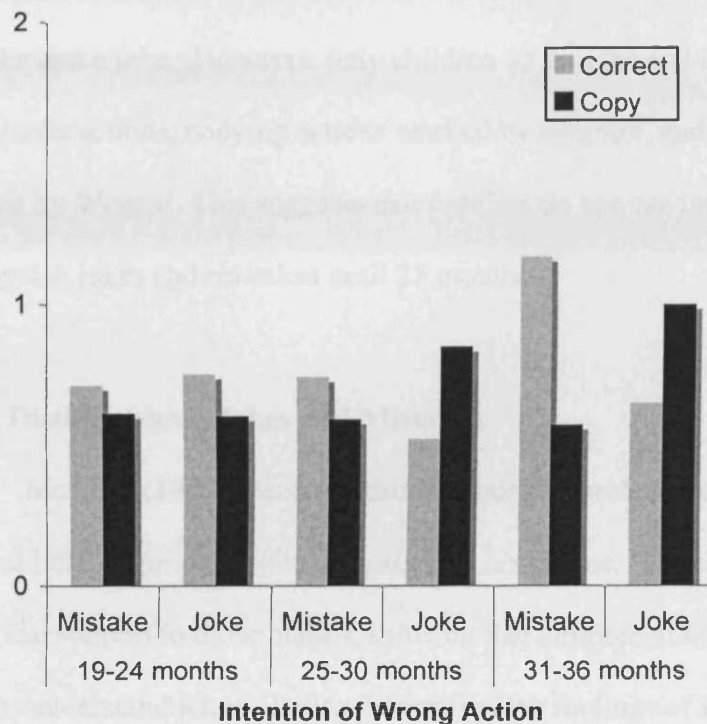
Figure 4.3. Mean number of responses for which children copied or corrected the demonstrator as a function of age and model type in the ambiguous condition.

Linear regression analyses found that toddlers corrected more mistakes than

jokes as they got older (F(77)=6.57, p=.012), and copied more jokes than mistakes as

they get older (F(77)=5.64, p=.020).

4.4. Discussion

We investigated whether toddlers can (1) differentiate mistakes and jokes

based on similarity of action, and (2) differentiate mistakes and jokes based on

intention alone. The results of the study show that children in all three age groups

(19-24, 25-30, and 31-36 months) copied unambiguous humorous actions

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significantly more than unambiguous mistake actions, and corrected unambiguous mistake actions significantly more than unambiguous humorous actions. This suggests that from at least 19 months, children can tell the difference between a mistake and a joke. However, only children 25 months and older distinguished ambiguous actions, copying actions marked by laughter, and correcting actions marked by Woops! This suggests that toddlers do not use intention alone to distinguish jokes and mistakes until 25 months.

4.4.1. Distinguishing Jokes and Mistakes

McGhee (1979) theorised that humour comprehension emerges at 18 months, but had little empirical evidence to support his claims. The current study gives empirical support to those claims, showing that children at least as young as 19 months understand jokes. It also generalises the findings of Dubois, Farmer and Farmer's (1984) case study in which they found that the subject B laughed at physical and social visual jokes from two years.

Considering which aspects are necessary for a child to get a joke, for children 19-24 months old, it would seem that it is *necessary* that the action be unambiguous. It may be that the difference or similarity of an action to their knowledge of conventional actions on objects is necessary for children up to 24 months to determine a mistake from a joke, and without such a difference, no intentional cues could help. However, it is not clear from the current study whether the difference or similarity of an action to their knowledge of conventional actions on objects is sufficient in understanding the difference between a mistake and a joke as intentional cues were offered as well, which may or may not have helped the toddlers. While it is possible

that toddlers in this age group matched their actions to the experimenter's intentions by using the experimenter's intentional cues as a clue, it is also possible that the toddlers found the unambiguous humorous actions intrinsically funny such that, if they were to laugh, they would laugh at the experimenter rather than laugh with the experimenter. They may then want to repeat the joke because they themselves found it funny, and not because the experimenter had intended it to be a joke. To be certain that toddlers understand humorous intentions, toddlers would need to pass the ambiguous condition.

4.4.2. Understanding Humorous Intentions

Looking at whether toddlers understand humorous intentions, the results suggest that children understand humorous intentions at just over two years. That is three years younger than previously shown (Sullivan, et al. 1995).

Our results demonstrate that from 25 months, children can distinguish mistakes from jokes based on intentional cues alone. Perhaps there is a shift around the second birthday, where children begin to understand that it is not simply similarity of action that determines whether actions are funny or accidental, but also the actor's intentions. Thus whether the actor meant or did not mean to do the action could come into play as to whether the unconventional action should be perceived as a mistake or a joke, and the actor's intention coupled with any unconventional action could be sufficient in distinguishing jokes from mistakes. Furthermore, the ability to distinguish humorous intentions from mistakes increases with age, suggesting that this ability is developing between 19 and 36 months.

Comparing the results to the original model, this study places the ability to distinguish humorous intentions from mistakes (25-36 months) after distinguishing intentional actions from mistakes (14-18 months, Carpenter et al., 1998), but before distinguishing pretending from trying (36 months, Rakoczy et al., 2004), and before distinguishing lying from joking (over 5 years, Sullivan et al., 1995). This supports the hypothesis that humour is the first step in understanding that one can intend to do the wrong thing, and could be a basis for later understanding of intentions behind pretense and lying. Reddy (1991, 2001), suggests that understanding humour in infants can allow them to bootstrap an understanding of pretense.

4.4.3. Other Possible Interpretations: Discrimination of Jokes vs. Mistakes

It could be suggested that 19- to 24-month-olds do not really understand the difference between jokes and mistakes. Perhaps they did not find the actions themselves to be funny or a mistake, and were simply copying the experimenter when they laughed, as the experimenter seemed positive about what they were doing, and avoided copying, thus correcting the experimenter when they said, "Woops!", as they did not want to do something negative. However, this seems unlikely. If this were the case, children as young as 19 months would also follow this pattern in the condition in which actions were ambiguous, but toddlers only did this from 25 months.

Another possible interpretation is that in the unambiguous joking condition, the actions were so far from the toddlers' knowledge of what was conventional that they could not relate the demonstrated actions to their knowledge, and copied the actions by default, as though learning something new. In the case of mistakes, where

actions are more similar to their knowledge of conventional actions, perhaps they were able to compare the demonstration to their knowledge of conventional actions, which would allow them to correct the action. However, a post-hoc analysis found that 19- to 24-month-olds produced a significantly higher percentage of actions (copied and corrected actions summed together) in the unambiguous condition than in the ambiguous condition (t(27)=6.45, p=.000). If toddlers were simply correcting actions if they were close enough to what toddlers knew were the right actions, and copying otherwise, then they should have produced the same percentage of actions in the unambiguous condition. More likely, instead of following a simple knowledge-matching heuristic, they understand jokes and mistakes. Thus in an ambiguous situation, when they realise that an action could either be a joke or a mistake, or do not think it makes for either a very good joke or mistake, they may be confused about how to respond, be uninterested, or want to avoid making an error. Thus it is more likely that toddlers from 19 months onward really do understand what constitutes jokes and mistakes.

4.4.4. Other possible interpretations: Understanding Humorous Intentions

It could be argued that 25-30 and 31- to 36-month-olds do not actually understand humorous intentions, but are instead simply responding to the positivity or negativity displayed by the experimenter. Whilst possible, this seems unlikely as the 19- to 24-month-olds did not differentiate ambiguous actions even though they were given positive and negative intentional cues. Infants as young as four months can detect different facial emotions (Montague and Walker-Andrews, 2001; Kotsoni, de Haan, & Johnson, 2001; Termine & Izard, 1988; Soken & Pick, 1999), and infants as young as six months also respond differently to positive and negative intonation

patterns (Fernald, 1993; Singh, et al. 2002). It is unlikely then that 19- to 24-month-olds who have the ability to distinguish positive from negative, both facially and vocally, would choose not to, and that 25- to 36-month-olds would. Indeed, 14- to18-month-olds can already differentiate actions marked as normal or mistaken (Carpenter, et al. 1998). Thus it would appear that it is humour-specific intention cues that begin to be understood at 25 months.

4.4.5. Conclusions

The current study is the first to provide experimental evidence that toddlers understand jokes. Furthermore, the results suggest that toddlers are able to understand that others can intend to joke before they understand that others can intend to pretend or lie. Thus understanding that others intend to joke could be the first step in humans being able to understand that others can intend to do the wrong thing.

Chapter 5: The Acoustic Features of Parental Speech during Storybook Reading Discriminate between Positive Mental States

5.1. Introduction

Since the earliest reports of young children's understanding of mental states such as *think* and *know* (Johnson & Maratsos, 1977; Wimmer & Perner, 1983), the relatively rapid emergence of this set of abilities has motivated proposals emphasising innateness and modularity. Leslie, for instance, proposed that the emergence of false belief understanding relied on an innately-specified decoupling mechanism, stating "It is hard to see how perceptual evidence could ever force an adult, let alone a young child, to invent the idea of unobservable mental states (1987, p.422)." Later studies, however, documented broad environmental impacts on children's understanding of mental states. For example, Perner, Ruffman, and Leekam (1994) compared false belief performance of three and four-year-olds from larger and smaller families, and reported that children from larger families performed better on a false belief test compared to children from smaller families. Similarly, Dunn, Brown, Slomkowski, Tesla, and Youngblade (1991) observed 33-month-old children interacting with their families at 33 months, and then tested their understanding of emotions, perspective, and belief at 40 months. They reported that children from families characterised by cooperation and conversations about emotions at 33 months performed better on measures of mental state understanding at 40 months.

More recently, several studies have started to examine which specific information sources in the developing child's environment might impact on mental state understanding. Meins, Fernyhough, Wainwright, Gupta, Fradley and Tuckey (2002) reported a longitudinal study in which they recorded mothers' use of mental state language with their six-month-old infants and over three years later measured the children's performance on several measures of mental state understanding. Meins et al. reported that children's theory of mind performance at 45 and 48 months was predicted by the amount of mental state language mothers used during the free-play session at six months. A rich language environment, and particularly one rich in mental state terms, thus appears to be a strong influence on the development of mental state understanding. Because infants' language comprehension is relatively limited at six months, however, and because the Theory of Mind tests occurred so much later, at four years of age, it is quite possible that the influence of mental state language on developing mental state understanding actually occurs at a later point in development. For the most part, environmental factors such as family size and conversations about emotions and mental states are presumed to have their greatest effect after the child becomes a competent consumer and user of language. Although accurate performance on false belief tests and other verbal measures of mental state understanding does not occur until around four years, infants' performance on non-verbal measures such as imitation indicate that at least some forms of mental state understanding develop between the first and second birthdays (e.g. Carpenter et al., 1998; Carpenter, Call, & Tomasello, 2005). This chapter considers which environmental cues might influence the development of mental state understanding during this period in life.

The studies reported in this chapter focus on extra-linguistic vocal cues to mental states available in the toddler's environment. For the most part, studies of extra-linguistic environmental cues to mental states have focused on infants' sensitivity to emotions expressed facially. Montague and Walker-Andrews (2001) found that during a game of peek-a-boo, four-month-olds noticed a difference when presented with anger, fear or sadness rather than surprise or happiness. Thus infants as young as four months can detect different facially emotive mental states. Other studies have shown that infants can distinguish happiness from anger (Kotsoni, de Haan, and Johnson, 2001), joy from sadness (Termine and Izard, 1988), and between happiness, interest, anger, and sadness (Soken and Pick, 1999).

Vocal expression has an advantage over facial expression in that infants' hearing is mature much earlier than their visual abilities. Kuhl (1987) notes that the auditory system is functional before birth, and that infants can discriminate very similar phonemes at one month. Atkinson (1995) notes that many visual processes are poor at one month, for example visual acuity and contrast. Indeed, some visual discriminations do not occur until around three months, for example, texture segregation and stereo acuity. Overall, it takes until around six months for most of the visual processes to mature, and full vision can take a few years to develop, that is, into toddlerhood.

The studies that have been conducted thus far indicate that the acoustic features of speech are a rich source of information, and that infants are sensitive to

these features. In a typical study, Fernald (1993) played previously recorded parental vocalisations expressing either approval or prohibition to five-month-olds. Fernald recorded how long infants looked towards the origin of the vocalisation, and also coded the infants' positive facial affect (e.g. smile) and negative facial affect (e.g. frown). While she found no difference in looking time towards either vocalisation, she found that infants showed significantly more positive facial affect when listening to an approval than when listening to a prohibition. This research shows that infants respond differently to approvals and prohibitions, and so, at some level, can distinguish between these positive and negative intonation patterns.

It has also been found that infants show a preference for emotional prosody that is relatively more positive as young as six months (Singh, Morgan, & Best, 2002). Singh et al. reported an experiment in which they flashed a light, and once an infant looked at the light, a negatively, neutrally, or positively intonated utterance was made until the infant looked away. Infants looked significantly longer at the light when hearing a positive utterance versus a neutral or negative utterance and when hearing a neutral utterance versus a negative utterance.

While these papers demonstrate that infants can distinguish between positive, negative and neutral vocal expression, they do not address whether infants can differentiate between two positive vocal expressions. This is important as different positive vocal expressions can have different mental state meanings, beyond simply being positive. Without knowing this, we do not know whether or not vocal cues can be valid cues for distinguishing mental states

beyond basic emotional states. To date, no one has investigated the vocal cues that parents use to express different positive mental states, and so we do not know which vocal cues are available to distinguish positive mental states in the infant's or toddler's environment.

The main purpose of this set of studies was to find out whether parents give appropriate or significant vocal cues that could allow a toddler to distinguish between different mental states which are both positive. The current studies provide new data on the vocal expression of parents to their toddlers, specifically, the expression of sweet and humorous speech, as compared to each other and neutral speech. This comparison is especially interesting because where other studies have compared positive to negative or neutral vocal expression, this study compares two positive vocal expressions, each expressing different mental states.

Humour has been chosen as a mental state in this study for several reasons. It is positive, yet much more complex than sweetness. Not only do parents have to express that they feel positive in order to convey humour, but they have to express that they are positive about something that they know is wrong or incongruous (McGhee, 1979). Thus while parents would be expressing something happy to their children in both cases, the reasons for being happy that are being communicated in each scenario are quite different. This method can allow one to distinguish which aspects of prosody result from different types of mental states, exclusive of their positivity, as well as identify which features differentiate these mental states from a neutral standpoint, inclusive of positivity.

If parents intend to communicate humour and sweetness in different ways, and differently from being neutral, it would make sense for them to do so vocally. During toddlerhood, children's vocabularies are limited, but develop rapidly, so extra prosodic cues would certainly help. Indeed, even adults make use of acoustic disambiguation cues in order to express and understand an utterance as sarcastic, which involves a more advanced humour type (Bryant and Fox Tree, 2002).

Seven summary features that have been found to characterise distinct vocal profiles for different emotional states were considered: fundamental frequency (F_0; pitch), F_0 range, F_0 standard deviation, amplitude (loudness), amplitude range, amplitude standard deviation, and speech rate (Scherer, 1986; Banse and Scherer, 1996). It was reasoned that these acoustic features of speech might also be important for distinguishing between mental states. Anolli et al. (2000) reported that these features distinguished two types of irony from neutral speech and from each other. Trainor, Austin and Desjardins (2000) also reported that infant-directed speech differs from adult-directed speech for mean fundamental frequency and speech rate, and differed across emotions for these summary features as well as fundamental frequency range. Vocal summary features thus appear to be an ideal way to convey that something is meant to be sweet or humorous when speaking to a toddler.

Another important vocal cue to consider when looking at different mental states is the intonation contour. While summary features can convey a general emotion, intonation contours reflect the actual content of the sentence, and so are

ideal to differentiate mental states. Gussenhoven (2004) shows many examples of how intonation contours can convey different meanings for a sentence with the same content. For example, a declarative sentence e.g. "You like chocolate." will fall in pitch across the sentence, while a question e.g. "You like chocolate?" will rise in pitch across the sentence. Previous research has shown that intonation contours are used to convey different meanings to infants. Katz et al. (1996) found that mothers use different intonation contours in order to elicit infants' attention, show approval and provide comfort. In the current study, neutral and sweet sentences need only convey a fact or description, while humorous sentences must convey that the content is abnormal, a situation for which the use of intonation contours is ideal.

In the two studies presented in this chapter, parents read a book to their child comparing neutral, humorous and sweet utterances. Study 1 was a within-subjects design with all parents reading the same book. Study 2 was a within-between subjects design, in which parents read one of two books.

5.2. Study 1

In the first study, each parent read a book that contained neutral, humorous, sweet, and both humorous and sweet pages to their 19- to 26-month-old toddler. This reading method allows one to control the utterances made by the parents for comparison purposes, as well as to identify the mental state on each page based on parental ratings of pages. This allows for different utterances to be clearly labelled as neutral, humorous, sweet, or both humorous and sweet, which may be difficult in another situation. A within-subjects design was also chosen

because it created a natural context similar to daily life. In everyday life, parents switch between mental states while interacting with their children, and this book allowed parents to convey both humorous and sweet mental states within a short time frame.

5.2.1. Method

5.2.1.1. Participants

Thirty-five parent-toddler dyads participated. Five mother-toddler dyads were dropped from the study because the children were restless. Of the 30 parent-toddler dyads left, 22 parents were mothers and eight were fathers. Toddlers ranged in age from 19 to 26 months with a mean age of 22 months and 0 days and a standard deviation of 2 months and 0 days. Sixteen of the toddlers were girls, and 14 were boys. Parent-toddler dyads were recruited from postcards sent out to playgroups and nurseries. All parent-toddler dyads participated in both conditions as it was a within-subjects design. Twenty of the parents rated the book for humour and sweetness as 10 parents failed to return their ratings forms.

5.2.1.2. Materials

The book used in this study was One Gorgeous Baby by Martine Oborne and Ingrid Godon (see Appendix C). A Sony digital video camera, a Sony DV cam recorder and a mixing board were used to record the reading session. The computer program Praat was used for coding. The testing room was white with a green sofa that had a large seat for a parent and a small, elevated seat for a toddler so that the toddler sat approximately at eye level with his or her parent. Materials

also included a questionnaire that asked for humour and sweetness ratings (0-9) for each page of the book (see Appendix D).

5.2.1.3. Design

Two different sets of independent variables were used in a within-subjects design. For the first set of analyses, the independent variable was the mental state of the page (humorous, sweet). For the second set of analyses, two independent variables were used: page humour (high, low) and page sweetness (high, low). The dependent variables included the following summary features: mean F_0 (Hertz; Hz), standard deviation of F_0 (Hz), F_0 range (semitones, st), mean amplitude (decibels, db), standard deviation of amplitude in (db), amplitude range (db), and speech rate (number of seconds per syllable). The intonation dependent variables include the shape of the contour (linear, quadratic, or neither) and the change in F_0 from beginning to end of sentence (st).

5.2.1.4. Procedure

Before the study, parents signed consent forms and were asked to read a book to their child as they would at home. The parent was given the book to read alone before reading aloud to the child. Parent-toddler dyads were brought into the lab and asked to sit on the sofa and to read the book when ready. When they were done reading, parents filled out a questionnaire asking them to rate each page for humour (0-9) and sweetness (0-9). Parents were debriefed.

5.2.1.5. Coding

Each sentence of the book for each parent was copied into a wav file and analysed using the language software program Praat. Parent ratings of humour and sweetness for each sentence were averaged. The average humour scores for each sentence were ranked. The same was done for sweetness. Humorous sentences were those that ranked in the top half for humour and the bottom half for sweetness. These included pages 3 4, 7, and 8. Sweet sentences were those that ranked in the top half for sweetness and the bottom half for humour. These included pages 1, 2, 5, and 11. The only sentence that scored in the bottom half for both humorous and sweet ratings, and which was significantly neutral was page 6. Sentences chosen to be both humorous and sweet were those that rated in the top half for both humour and sweetness: pages 10 and 12. See Appendix E for sentences per category, and Appendix F for humour and sweetness ratings.

In order to check that the sentences chosen to be humorous and both humorous and sweet were equally humorous as well as more humorous than those chosen to be sweet and neutral, and that sweet and neutral sentences were also equally humorous, a within-subjects ANOVA was run with mental state (both humorous and sweet, humorous, sweet, neutral) as the independent variable and the humour rating (0-9) as the dependent variable. Mauchly's test of sphericity was violated $(W(5)=.505, p=.034)$. After a Greenhouse-Geisser adjustment, an overall difference was found between the mental state categories, $F(2.20, 41.77)=11.82, , p<.001$. After a Bonferroni adjustment, pair wise comparisons revealed significant differences between the sweet, and the both humorous and sweet sentences, $p<.001$, the neutral and the both humorous and sweet sentences,

p=.019, the humorous and the sweet sentences, p=.001, and the humorous and the neutral sentences, p=.023. No significant differences were found between the humorous and the both humorous and sweet sentences, nor between the sweet and the neutral sentences.

To ensure that the sentences chosen to be the sweet and the both humorous and sweet sentences were actually sweeter than the humorous and the neutral sentences, that the sweet and the both humorous and sweet sentences were equally sweet, and that the humorous and the neutral sentences were equally sweet, a within-subjects ANOVA with mental state as the independent variable (both humorous and sweet, humorous, sweet, neutral) and the humour rating as the dependent variable. Mauchly's test of sphericity was violated, $W(5)=.452$, $p=.015$. After a Greenhouse-Geisser adjustment, an overall differences was found between the mental state categories, $F(2.23, 42.44)=21.71$, , $p<.001$. After a Bonferroni adjustment, pair wise comparisons revealed significant differences between the humorous and the both humorous and sweet sentences, $p<.001$, the both humorous and sweet and the neutral sentences, $p=.001$, the sweet and the humorous sentences, $p<.001$, and the sweet and the neutral sentences, $p<.001$. No significant differences were found between the both humorous and sweet and the sweet sentences, nor between the humorous and the neutral sentences.

There were 330 possible sentences to analyse for summary feature based dependent variables (11 pages by 30 participants). Twenty-two sentences were missing either because they were incomplete or not said. An additional 45 sentences contained noise (e.g. child speaking, banging feet) and were cut from

the sample for all F_0 and amplitude analyses. This left 308 samples for speech rate and 263 samples for F_0 and amplitude measures.

For analysis of intonation, all the same sentences were used, except that sentence 11 was cut as it was a question, which would affect the intonation contour. There were 300 possible sentences to analyse for intonation (10 pages by 30 participants). Sixty-one sentences were not included in the sample due to noise, or because they were not said, leaving 239 sentences for analysis.

Mean, range and standard deviation of F_0 of each sentence were coded by the language program Praat within a 75-1200 Hz range. This range was chosen for several reasons. Gussenhoven (2004) states that men's speech is generally in the 75-400 Hertz range and women's is generally in the 100-600 Hertz range. However, the F_0 range should be higher in this case as parents speaking to infants tend to use higher voices (Singh et al., 2002). Furthermore, Katz et al. (1996) coded pitch contours of mothers expressing approval and comfort to their four-month-olds and mothers trying to get their infants' attention. For this they used a F_0 range of up to 1200 Hz. In the current study, where maximum F_0 was over 600 Hertz or out of context (e.g. where most maximum F_0s by the same speaker were around 200 Hz and one was 500Hz), sentences were looked at individually for maximum F_0 in case of error resulting from unheard background noise.

Mean, standard deviation, and range of amplitude were coded in decibels (db) over each sentence in decibels from a threshold of 75 Hz. The time of each sentence was coded in seconds and milliseconds and the number of syllables in

each sentence was counted. The number of seconds was then divided by the number of syllables for speech rate.

To code the intonation contours, the F_0 of the stressed syllable of each word on the page was coded (e.g. **Two beau**tiful **eyes,** see Appendix E). These were run through a General Linear Model (GLM) analysis in order to find out whether the sentence was linear, quadratic, or held no pattern. The F_0 of the first and last syllable of the sentence was coded, and the F_0 of the last syllable was subtracted from the F_0 of the first syllable in order to find out whether sentences fell or rose, and by how much.

For each parent, on each measure (F_0, amplitude, and so on) the results for each of the humorous pages were averaged to give a score for humorous utterances. For example, looking at fundamental frequency in the humorous condition, each participant's score was the average of the mean fundamental frequencies found on pages 3, 4, 7 and 8. The same was done for sweet sentences. This was done because if only one sentence was coded for each mental state type (e.g. only coding page 7 in the humorous condition), it could be argued that any differences found were related to something specific about the pages used. In averaging out the results across pages, the mental state is maintained without the specifics of the content of each page. Where a parent had not said one or more of the sentences within a category, or one or more of the sentences had been masked by noise, whichever sentences were present in a category for a parent were averaged. For example, given that pages 3, 4, 7 and 8 of the book were humorous,

if a parent had not read page 4, then the average of the parent's utterances of page 3, 7 and 8 were used rather than the average of all four pages.

5.2.2. Results

Two types of ANOVAs or t-tests were performed for each of the summary features as well as the F_0 change from beginning to end of the sentence. The first set of analyses consisted of within-subjects ANOVAs and t-tests with mental state (humorous, sweet) as the within-subjects independent variables. This set of analyses will reveal any differences between positive mental states. The second set of analyses were 2X2 within-subjects ANOVAs with mental state (humorous, not humorous) and mental state (sweet, not sweet) as the within-subjects independent variables, such that sentences could be either both humorous and sweet, just humorous, just sweet, or neutral. This was done to comparing humorous and sweet mental states to a neutral mental state.

Intonation analyses were carried out using General Linear Models (GLMs) with sentence (word 1 F_0, word 2 F_0, word 3 F_0) as one of the within-subjects variables, and either (1) mental state (humorous, sweet) or (2) humour (high, low) and sweetness (high, low) as the within-subjects independent variable(s). A GLM was chosen as it can calculate whether a linear or quadratic pattern exists across the sentence.

T-tests prior to all of the analyses revealed that there was no effect of child's gender or child's age (under 22 months, over 22 months; 22 months is the mean age) on any of the variables. Thus these between-subjects independent

variables were not included in the final within-subjects ANOVAs. T-tests revealed that a parent gender difference existed for mean F_0, F_0 standard deviation and intonation contours for analyses comparing humorous and sweet mental states to each other, and for analyses comparing humorous and sweet mental states to a neutral standpoint. A parent gender difference was also found for F_0 range for analyses comparing humorous and sweet mental states. Thus parent gender was included as a between-subjects variable for these analyses. Due to equipment failure, the last 10 subjects of the sample had their amplitude measured at a different baseline than the first 20. For this reason, a dummy between-subject "date of testing" variable was used to avoid additional error in all amplitude analyses.

5.2.2.1. Humorous vs. Sweet Pages

Mean F_0 and F_0 standard deviation were analyzed with 2X2 within-between subjects ANOVAs with mental state (humorous, sweet) as a within-subjects independent variable, and parent gender as a between-subjects independent variable. Mean amplitude, amplitude standard deviation and amplitude range were analyzed with 2X2 within-between subjects ANOVAs with mental state (humorous, sweet) as a within-subjects independent variable and date (early, late) as a dummy between-subjects variable. F_0 range, speech rate, and F_0 change across the sentence were analyzed with paired-samples t-tests with mental state (humorous, sweet) as a within-subjects independent variable. Table 5.1 shows the means and standard deviations for the aforementioned vocal acoustic features, as well as the results of the 2X2 within-between subjects ANOVAs and paired-samples t-tests. Table 5.1 shows that when parents read humorous pages,

they used a significantly higher mean F_0, and a significantly higher mean amplitude. The F_0 increased across humorous sentences more than across sweet sentences, and this approached significance. No other significant differences were found.

Table 5.1

Means, standard deviations, and 2X2 within-between subjects ANOVAs or paired-samples t-tests for vocal summary features and F_0 change across sentence.

	Humorous	Sweet	F/t(df)	p
Mean F_0 (Hz) MEAN	265.33	235.47	F(1, 27) =	
SD	(70.51)	(59.05)	11.19**	.002
F_0 standard deviation (Hz) MEAN	79.48	66.44	t(28) =	
SD	(39.11)	(29.96)	1.00	.326
F_0 range (st) MEAN	18.99	20.53	F(1, 27) =	.075
SD	(7.57)	(6.34)	3.44	
Mean amplitude (dB) MEAN	44.36	44.06	F(1, 27)	.003
SD	(1.84)	(1.24)	11.01**	
Amplitude standard deviation (dB)				
MEAN	0.90	0.83	F(1, 27)	.184
SD	(1.23)	(1.11)	1.86	
Amplitude range (dB) MEAN	3.88	3.47	F(1, 27)=	.069
SD	(4.25)	(4.12)	3.59	
Speech rate (seconds / syllable)				
MEAN	0.45	0.43	t(28)=	.299
SD	(0.13)	(0.10)	1.06	
F_0 change across sentence (st) MEAN	7.45	3.76	t(28)=	.052
SD	(8.81)	(5.72)	2.02	

*p < .05. **p < .01.

5.2.2.2. Effects of Humour and Sweetness

Mean F_0, F_0 standard deviation and F_0 range were analyzed with 2 (mental state: humorous, not humorous) X 2(mental state: sweet, not sweet) X 2 (gender) within-between subjects ANOVAs. Mean amplitude, amplitude standard deviation and amplitude range were analyzed with 2(mental state: humorous, not humorous) X 2(mental state: sweet, not sweet) X 2 (dummy variable: date of testing) within-between subjects ANOVAs. Speech rate and F_0 change across the sentence were analyzed with 2 (mental state: humorous, not humorous) X 2(mental state: sweet, not sweet) within-subjects ANOVAs. Table 5.2 shows the means and standard deviations for the aforementioned vocal acoustic features, as well as the results of the ANOVAs. Table 5.2 shows a humorous mental state compared to a neutral mental state increases mean F_0 , mean amplitude, amplitude standard deviation, and amplitude range. A sweet mental state compared to a neutral mental state increase F_0 range, mean amplitude, amplitude standard deviation, and amplitude range. No other differences were found.

Table 5.2

Means, standard deviations, and ANOVAs for vocal summary features and F_0 change across sentence for humorous and sweet mental state combinations, and main effects of humorous compared to neutral mental states, and sweet compared to neutral mental states.

	Humo-rous and Sweet	Humo-rous	Sweet	Neutral	Main effects of Humor	Main effects of Sweet-ness
Mean F_0 (Hz) MEAN SD	 285.46 (105.26)	 261.85 (79.91)	 232.87 (64.10)	 237.99 (69.26)	$F(1, 19)=$ 5.84* p=.026	$F(1, 19)=$ 0.13 p=.726
F_0 standard deviation MEAN SD	 79.56 (40.87)	 79.03 (39.66)	 67.80 (77.51)	 77.51 (56.31)	$F(1, 19)=$ 0.77 p=.391	$F(1, 19)=$ 0.25 p=.625
F_0 range (st) MEAN SD	 24.69 (7.58)	 19.24 (8.20)	 21.75 (6.38)	 20.02 (10.22)	$F(1, 19) =$ 0.33 p=.570	$F(1, 19)=$ 4.38* p=.050
Mean amplitude (dB) MEAN SD	 44.53 (2.05)	 44.32 (1.68)	 44.10 (1.19)	 44.08 (1.32)	$F(1, 19) =$ 8.64** p=.008	$F(1, 19)=$ 26.54** p<.001

	Humo-rous and Sweet	Humo-rous	Sweet	Neutral	Main effects of Humor	Main effects of Sweet-ness
Amplitude standard deviation (dB) MEAN SD	1.09 (1.33)	0.88 (1.09)	0.87 (1.12)	44.08 (1.32)	$F(1, 19)=$ 6.43* $p=.020$	$F(1, 19)=$ 24.27** $p<.001$
Amplitude range (dB) MEAN SD	4.82 (5.04)	3.96 (4.12)	3.76 (4.21)	3.55 (4.14)	$F(1, 19)=$ 8.85** $p=.008$	$F(1, 19)=$ 13.31** $p=.002$
Speech rate (sec/syll) MEAN SD	0.49 (0.03)	0.46 (0.03)	0.44 (0.02)	0.45 (0.03)	$F(1, 25)=$ 3.58 $p=.070$	$F(1, 25)=$ 0.09 $p=.768$
F_0 change across sentence (st) MEAN SD	6.67 (7.08)	7.59 (9.98)	3.19 (4.99)	7.22 (11.39)	$F(1, 20)=$ 1.13 $p=.301$	$F(1, 20)=$ 2.09 $p=.164$

*$p < .05$. **$p < .01$.

5.2.2.3. Intonation contours

Figure 5.1 shows the intonation contours for both humorous and sweet sentences. These shows the difference between intonation contours of humorous and sweet mental states. Figure 5.2 shows the intonation contours for sentences that are both humorous and sweet, just humorous, just sweet, and neutral. These

shows the differences between humorous and neutral mental states, and sweet and

neutral mental states.
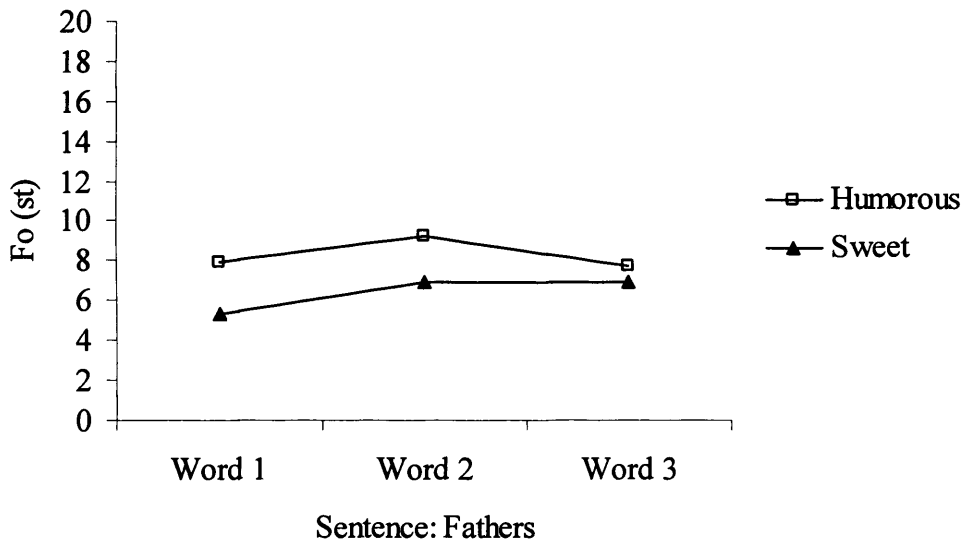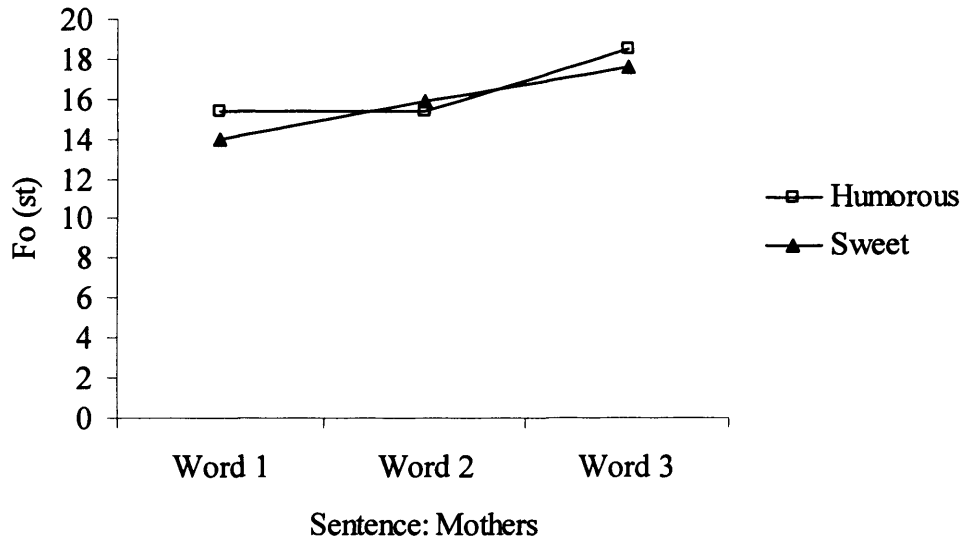
Figure 5.1. Intonation contours comparing humorous and sweet mental states
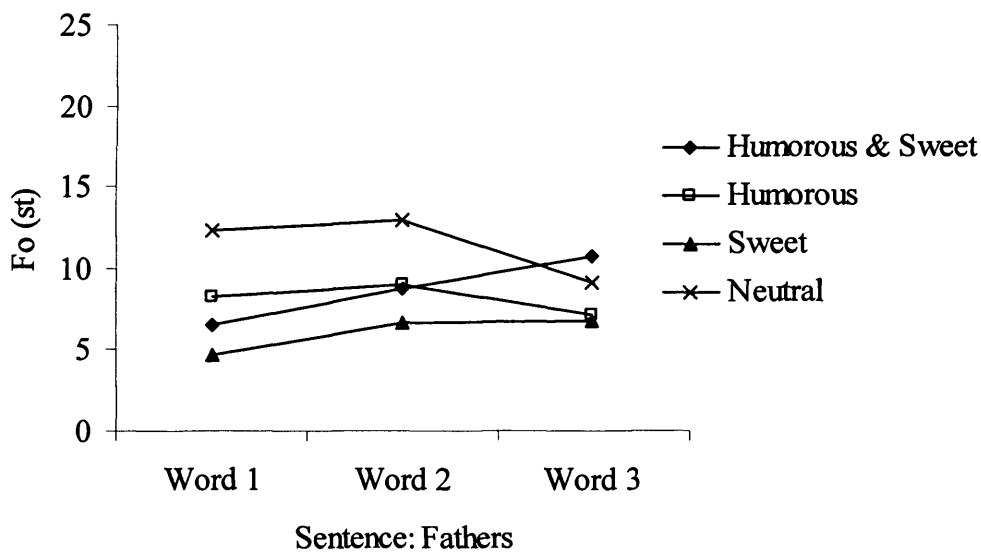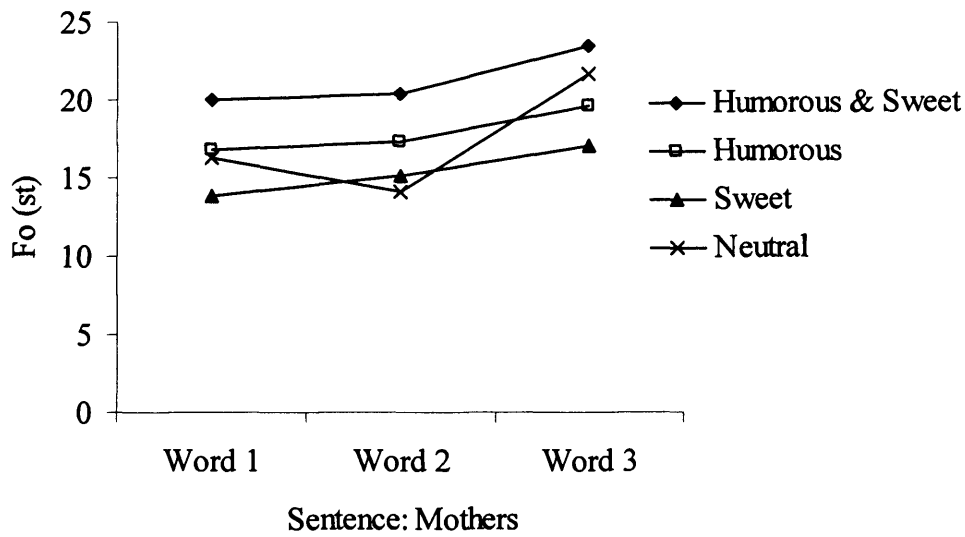
Figure 5.2. Intonation contours for the comparison of humorous and neutral mental states, and sweet and neutral mental states.

A 3X2 within-between subjects GLM comparing humorous and sweet pages found a significant trend for the contour, F(2,52)=9.22, p=.001. The linear trend for the contour was found to be significant, F(1,26)=15.33, p=.001, but the quadratic contour was not, F(1,26)=0.18, p=.679. No significant difference was

found between humorous and sweet pages for the contour shape, $F_{(1,26)}=0.78$, $p=.472$.

A 3X2X2 within-between-subjects GLM for intonation contour revealed a significant trend for the overall intonation contour, $F_{(2,34)}=5.03$, $p=.020$. A linear trend was found to be significant, $F_{(2,16)}=9.92$, $p=.006$, but the quadratic trend was not, $F_{(2,16)}=0.32$, $p=.581$. No significant effects of humour, $F_{(1,17)}=2.42$, $p=.138$, nor sweetness, $F_{(1,17)}=0.97$, $p=.338$, were found on the shape of the contour.

5.2.2.4. Gender Differences

The previous 2X2 ANOVAs between humorous and sweet pages revealed that women spoke with a significantly higher mean F_0 than men, $F_{(1,27)}=69.48$, , $p<.001$. Women were also found to use a significantly higher standard deviation of F_0 than men, $F_{(1,27)}=17.57$, $p<.001$.

The previous 2X2X2 ANOVAs for humour and sweetness revealed that women spoke with a significantly higher F_0 than men, $F_{(1,19)}=36.75$, $p<.001$. Women were also found to use a significantly higher standard deviation of F_0 than men, $F_{(1,19)}=13.222$, $p=.002$. Women also used a wider F_0 range than men, $F_{(1,19)}=6.987$, $p=.016$.

In the 3X2 within between-subjects GLM of the humorous and sweet intonation contours, a gender X intonation contour difference was found, $F_{(2,25)}=3.71$, $p=.039$. When mothers were looked at alone, there was a

significant overall trend for the contour, $F_{(2,19)}=20.40$, $p<.001$. This trend was found to be significantly linear, $F_{(1,20)}=41.85$, $p<.001$, but not quadratic, $F_{(1,20)}=2.18$, $p=.156$. No effect of mental state(humorous, sweet) on the intonation contour was found, $F_{(2,19)}=1.58$, $p=.232$.

When fathers were looked at alone, no trend was found for the intonation contour, $F_{(2,5)}=1.73$, $p=.269$. No effect of mental state (humorous, sweet) was found, $F_{(2,5)}=0.93$, $p=.455$.

In the 3X2X2 within-between subjects GLM of the intonation contours, a gender X intonation contour difference was found, $F_{(2,18)}=3.69$, $p=.048$. This difference could be described as linear, $F_{(2,18)}=5.70$, $p=.029$, or quadratic, $F_{(2,18)}=5.49$, $p=.032$. Separate 3X2X2 within subjects GLMs were performed in order to find out the intonation contours of mothers and fathers separately.

When mothers were looked at alone, there was a significant overall trend for the intonation contour, $F_{(2,12)}=13.43$, $p=.001$. The contour could be described as linear, $F_{(2,12)}=29.08$, $p<.001$, or quadratic, $F_{(2,12)}=6.76$, $p=.022$. However, there were no effects of humour, $F_{(2,12)}=1.06$, $p=.378$, or sweetness, $F_{(2,12)}=1.73$, $p=.218$, on the intonation contour.

When fathers were looked at alone, no trend was found for the intonation contour, $F_{(2,3)}=1.35$, $p=.381$, and no effects of humour, $F_{(2,3)}=1.35$, $p=.383$, nor sweetness, $F_{(2,3)}=3.15$, $p=.183$, on the intonation contour were found. No other gender differences were found.

5.2.2.5. Interactions

In the 2X2 within-between-subjects ANOVA with amplitude range as the dependent variable, a humour by sweetness interaction was found, $F(1,19)=8.544$, $p=.009$. A humour X sweetness X gender effect was also found, $F(1,19)=7.366$, , $p=.014$. When women were tested alone, sweetness was found to increase mean F_0, $F(1,13)=5.989$, $p=.028$, as was humour X sweetness, $F(1,13)=7.053$, $p=.019$. When men were tested alone, no effects were found for humour, $F(1,5)=4.68$, $p=.083$, nor sweetness, $F(1,5)=0.35$, $p=.580$. No other interactions were found.

5.2.3. Discussion

Looking at the summary features, the results revealed that when parents expressed humour versus sweetness they used a higher mean F_0 and a louder mean amplitude. When parents expressed humour compared to a neutral standpoint, they increased their mean F_0, mean amplitude, amplitude standard deviation, and amplitude range. When parents expressed sweetness compared to a neutral standpoint, they increased their F_0 range, mean amplitude, amplitude standard deviation and amplitude range.

As for intonation patterns, all mental states were said with a rising linear pattern. Humorous sentences rose more than sweet sentences, and this result approached significance. Sweetness and humour had no effect on how much the contour rose in F_0 from beginning to end of sentence, compared to a neutral standpoint.

5.3. Study 2

In the second study, parents either read a humorous or sweet book to their 18- to 24-month-old child. These books were edited versions of the book used in Study 1. The books were matched for pictures, sentence structure, and general content, controlling for error due to any of these factors. More importantly, by matching the sentence structure, intonation patterns could be compared syllable by syllable, and as the sentences were matched for length, this could reduce error for vocal cues such as speech rate. Re-writing the books to express these specific mental states also allowed the humorous pages to be very humorous and the sweet pages to be very sweet, intensifying the mental states. Finally, re-writing the book allowed for a better story structure to be created which would also avoid the list-like quality of the original book, which could have affected intonation. Both books also contained neutral opening and closing pages, allowing for comparisons between sweet and neutral, and humorous and neutral mental states.

5.3.1. Method
5.3.1.1. Participants

Forty-six mother-toddler dyads participated. Five mother-toddler dyads were dropped from the study because the children were restless, leaving 41 mother-toddler dyads. Toddlers were aged 18-24 months with a mean age of 20 months and 9 days and a standard deviation of 1 month and 8 days. Twenty-seven of the toddlers were girls, and 14 were boys. Twenty-one mother-toddler dyads participated in the humorous condition and 20 mother-toddler dyads participated in the sweet condition.

5.3.1.2. Materials

The books used in this study were edited versions of One Gorgeous Baby by Martine Oborne and Ingrid Godon. The book for the sweet condition was re-named One Lovely Baby and was given very sweet sentences for each page, e.g. "Baby loves mummy's cuddle". The book for the humorous condition was re-named One Funny Baby and was given very humorous sentences for each page, e.g. "Mummy drinks baby's bottle". Some pictures in the humorous condition were also altered to correspond to sentence content. See Appendix G for book pages. The equipment and testing room were the same as in Study 1.

5.3.1.3. Design

This was a between-subjects and a within-subjects experiment. The between-subjects independent variable was the mental-state that the book conveyed, that is, humorous or sweet. The within-subjects experiment also included mental state as the independent variable: either humorous and neutral, or sweet and neutral. See Appendix H for sentences per category. The dependent variables included the following summary features: mean F_0 (Hz), standard deviation of F_0 (Hz), F_0 range (st), mean amplitude (db), standard deviation of amplitude in (db), amplitude range (db), and speech rate (seconds/syllable). The intonation dependent variables included the shape of the intonation contours (linear, quadratic, cubic, or none of the above), and the F_0 change over sentence (st).

5.3.1.4. Procedure

The procedure was the same as in Study 1.

5.3.1.5. Coding

Sentences from pages 1-5 and 7 of the book for each parent was copied into a wav file and analysed using the language software program Praat. Pages 1 and 7 were the neutral sentences in both books. Pages 2-5 were the humorous or sweet sentences, depending on the book. Page 6 was omitted from analyses as, on later inspection, it was found to be more neutral than humorous or sweet.

There were 246 possible sentences to analyse for summary features-based dependent variables (six pages by 41 participants). Eight sentences were missing either because they were incomplete or not said. An additional 37 sentences contained noise and were cut from the sample for all F_0 and amplitude analyses. This left 238 samples for speech rate and 201 samples for F_0 and amplitude measures.

For analysis of intonation, pages 1 to 4 and page 7 were matched for grammatical intonation contours in the humorous and sweet books, however page 5 was not. Thus only sentences 1, 2, 3, 4 and 7 were examined for intonation contours. Forty-three sentences were lost due to noise or not being said, leaving 163 out of 205 sentences. The overall increase or decrease in F_0 was measured for each sentence, and for this, all six pages were included as they need not be matched. Fifty-one sentences were not included in the sample due to noise, not being said, or unvoiced initial or final syllables, leaving 193 out of 244 sentences for analysis.

Mean, range and standard deviation of F_0 of each sentence were coded by the language program Praat within a 75-1200 Hz range. Mean, minimum and maximum amplitude and standard deviation of amplitude were coded over each sentence in decibels from a threshold of 75 Hz. The time of each sentence was coded in seconds and milliseconds and the number of syllables in each sentence was counted. The number of seconds was then divided by the number of syllables for speech rate.

In order to figure out what kinds of intonation contours the sweet and humorous sentences had, the F_0 at the beginning of each syllable in each word of a sentence was coded. These F_0s were then entered into GLMs in order to find out whether the sentence had a linear (rising or falling), quadratic (bell shaped, either rise-fall or fall-rise), or cubic (sinusoidal) contour, based on the contours from Katz et al. (1996). Furthermore, as the sentences were matched for grammatical contours in the two books, humorous and sweet mental states were compared to see if the contours were the same or different.

The F_0 of the first and last syllable of the sentence was coded, and the F_0 of the last syllable was subtracted from the F_0 of the first syllable in order to find out whether sentences fell or rose, and by how much.

For each parent, on each measure (F_0, amplitude, and so on) the results for each of the humorous pages were averaged out to give a score for humorous utterances. The same was done for sweet and neutral sentences. Where a parent had not said one or more of the sentences within a category, or one or more of the

sentences had been masked by noise, whichever sentences were present in a category for a parent were averaged.

5.3.2. Results

One participant was dropped from the analyses of F_0 and amplitude variables because all of her sweet sentences contained noise. Another participant in the humorous condition was dropped from amplitude analyses because she sat on the floor away from the microphone rather than on the sofa next to it. Another three participants from the sweet condition were dropped from the analyses of F_0 and amplitude variables between the sweet and neutral pages because both of their neutral sentences contained noise. Another two participants from the humorous condition were dropped from the analyses of F_0 and amplitude variables between the humorous and neutral pages because both of their neutral sentences contained noise. As several sentences contained noise, smaller sample sizes were used in the analysis of sentence intonation patterns.

T-tests prior to all of the analyses revealed that there was no effect of child's gender or child's age (under 20 months, over 20 months) on any of the variables. Thus these between-subjects independent variables were not included in the final t-tests.

5.3.2.1. Summary Features and F_0 Change across Sentence for Humorous, Sweet and Neutral Pages.

Table 5.3 shows the values and t-tests for the humorous pages in the humorous book and the sweet pages in the sweet book. Table 5.3 reveals that

humorous pages were said with a significantly higher mean F_0, higher F_0 standard deviation, wider F_0 range, larger mean amplitude, larger amplitude standard deviation, wider amplitude range, slower speech rate than sweet sentences. Humorous sentences also increased in F_0 across the sentence significantly more than sweet sentences.

Table 5.3

Means, standard deviations, and independent-samples t-tests for vocal summary features between humorous pages in the humorous book and sweet pages in the sweet book.

	Mean		Sample Size		t-test	
	Humorous Pages	Sweet Pages	Humorous Pages	Sweet Pages	t	p
Mean F_0 (Hz)						
MEAN	285.12	222.40	21	19	7.01**	<.001
SD	(26.12)	(30.48)				
F_0 standard deviation (Hz)						
MEAN	106.29	67.14	21	19	4.07**	<.001
SD	(29.97)	(30.90)				
F_0 range (st)						
MEAN	27.14	20.97	21	19	5.54**	<.001
SD	(2.80)	(4.19)				
Mean amplitude (dB)						
MEAN	44.85	44.19	20	19	2.51*	=.018
SD	(1.02)	(0.56)				

	Mean		Sample Size		t-test	
	Humorous Pages	Sweet Pages	Humorous Pages	Sweet Pages	t	p
Amplitude standard deviation (st)						
MEAN	1.53	0.98	20	19	2.32*	=.026
SD	(0.87)	(0.56)				
Amplitude range (st)						
MEAN	6.83	4.52	20	19	2.44*	=.020
SD	(3.53)	(2.21)				
Speech rate (seconds/syllable)						
MEAN	0.41	0.30	21	20	5.51**	<.001
SD	(0.07)	(0.04)				
F_0 change over sentence (st)						
MEAN	5.97	2.40	20	18	2.90**	=.006
SD	(2.93)	(4.77)				

*p < .05. **p < .01.

Table 5.4 shows the values and t-tests for the humorous and neutral pages in the humorous book. Table 5.4 reveals that humorous pages were said with a significantly higher mean F_0, larger mean amplitude, larger amplitude standard deviation, wider amplitude range, slower speech rate than neutral sentences.

Humorous sentences also increased in F_0 across the sentence significantly more than neutral sentences. No other differences were found.

Table 5.4

Means, standard deviations, and paired-samples t-tests for vocal summary features between humorous and neutral pages in the humorous book.

	Humorous Pages	Neutral Pages	Sample size	t	p
Mean F_0 (Hz)					
MEAN	284.57	245.79	19	5.87**	<.001
SD	(27.09)	(31.27)			
F_0 standard deviation (Hz)					
MEAN	106.54	101.42	19	0.45	=.661
SD	(31.53)	(46.58)			
F_0 range (st)					
MEAN	27.19	24.34	19	1.49	=.153
SD	(2.93)	(7.75)			
Mean amplitude (dB)					
MEAN	44.74	43.26	18	6.57**	<.001
SD	(0.96)	(0.08)			
Amplitude standard deviation (dB)					
MEAN	1.46	1.00	18	4.16**	=.001
SD	(0.87)	(0.64)			
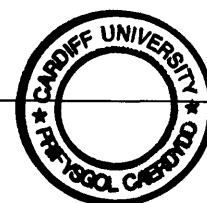
	Humorous Pages	Neutral Pages	Sample size	t	p
Amplitude range (dB)					
MEAN	6.46	5.13	18	2.70*	=.015
SD	(3.40)	(3.27)			
Speech rate (seconds/syllable)					
MEAN	0.41	0.33	21	5.49**	<.001
SD	(0.07)	(0.05)			
F_0 change over sentence (st)					
MEAN	5.86	3.23	20	2.41*	=.027
SD	(2.98)	(6.58)			

*$p < .05$. **$p < .01$.

Table 5.5 shows the values and t-tests for the sweet and neutral pages in the sweet book. Table 5.5 reveals that sweet pages were said with a significantly larger mean amplitude, and faster speech rate than neutral sentences. No other significant differences were found.

Table 5.5

Means, standard deviations, and paired-samples t-tests for vocal summary features between sweet and neutral pages in the sweet book.

	Sweet Pages	Neutral Pages	Sample size	t	p
Mean F_0 (Hz)					
MEAN	221.80	227.94	16	1.09	=.293
SD	(30.21)	(36.24)			
F_0 standard deviation (Hz)					
MEAN	62.34	80.65	16	1.94	=.071
SD	(26.10)	(42.63)			
F_0 range (st)					
MEAN	20.64	24.47	16	1.38	=.187
SD	(3.90)	(11.77)			
Mean amplitude (dB)					
MEAN	44.22	43.29	16	7.12**	<.001
SD	(0.60)	(0.12)			
Amplitude standard deviation (dB)					
MEAN	1.01	0.92	16	1.19	=.254
SD	(0.60)	(0.46)			
Amplitude range (dB)					
MEAN	4.54	4.46	16	0.23	=.821
SD	(2.37)	(1.96)			

	Humorous Pages	Neutral Pages	Sample size	t	p
Speech rate (seconds/syllable)					
MEAN	0.30	0.32	20	2.10*	=.049
SD	(0.04)	(0.06)			
F_0 change over sentence (st)					
MEAN	2.95	3.51	17	0.24	=.814
SD	(4.66)	(9.77)			

*$p < .05$. **$p < .01$.

Table 5.6 shows the values and t-tests for the neutral pages in the humorous and sweet books. Table 5.6 reveals no differences between neutral pages in the humorous and sweet books.

Table 5.6

Means, standard deviations, and independent-samples t-tests for vocal summary features between neutral pages in the humorous and sweet books.

	Mean		Sample Size		t-test	
	Humorous Book	Sweet Book	Humorous Book	Sweet Book	t	p
Mean F_0 (Hz)						
MEAN	245.79	227.38	19	17	1.66	.106
SD	(31.27)	(35.16)				
F_0 standard deviation (Hz)						
MEAN	101.42	80.77	19	17	1.40	.172
SD	(46.84)	(41.28)				
F_0 range (st)						
MEAN	24.34	24.70	19	17	0.11	.913
SD	(7.75)	(11.38)				
Mean amplitude (dB)						
MEAN	43.26	43.29	18	17	0.88	.383
SD	(0.08)	(0.12)				

	Mean		Sample Size		t-test	
	Humorous Pages	Sweet Pages	Humorous Pages	Sweet Pages	t	p
Amplitude standard deviation (st)						
MEAN	1.00	0.88	18	17	0.60	.550
SD	(0.64)	(0.46)				
Amplitude range (st)						
MEAN	5.13	4.33	18	17	0.88	.385
SD	(3.27)	(1.98)				
Speech rate (seconds/syllable)						
MEAN	0.32	0.32	21	20	0.15	.883
SD	(0.05)	(0.06)				
F_0 change over sentence (st)						
MEAN	2.50	3.51	19	17	0.38	.706
SD	(5.89)	(9.77)				

*$p < .05$. **$p < .01$.

5.3.2.2. Intonation Contour Data

Figures 5.3 shows the intonation contours for humorous and sweet sentences in pages 2, 3, and 4 of the humorous and sweet books. Figure 5.4 shows the intonation contours for neutral sentence 1 and 7 in the humorous and sweet books. For analyses that violated Mauchly's test of Sphericity, a conservative Greenhouse-Geisser adjustment was used to ensure that results were significant. Where results were not significant, a less conservative Huynh-Feldt adjustment was used to ensure that no significant differences were overlooked (Field, 2000).
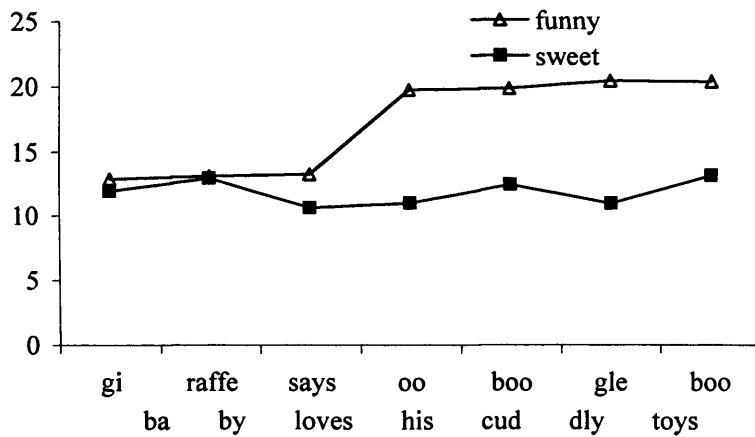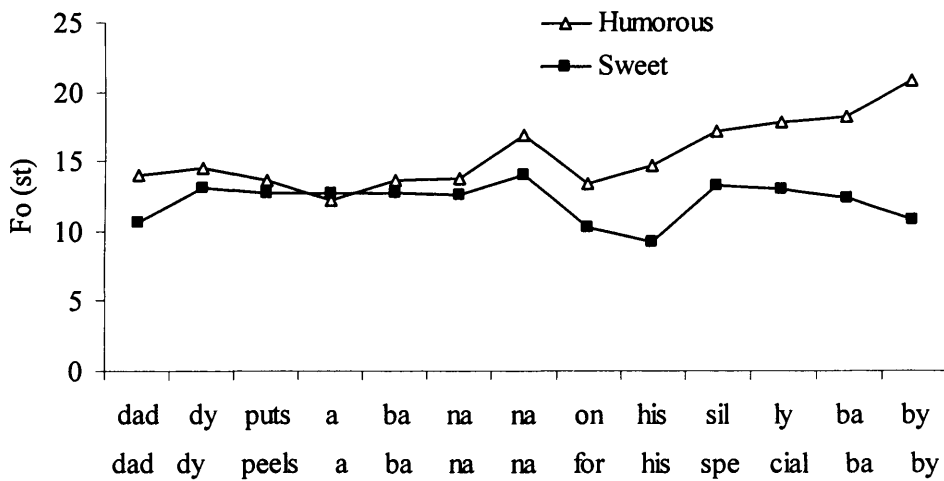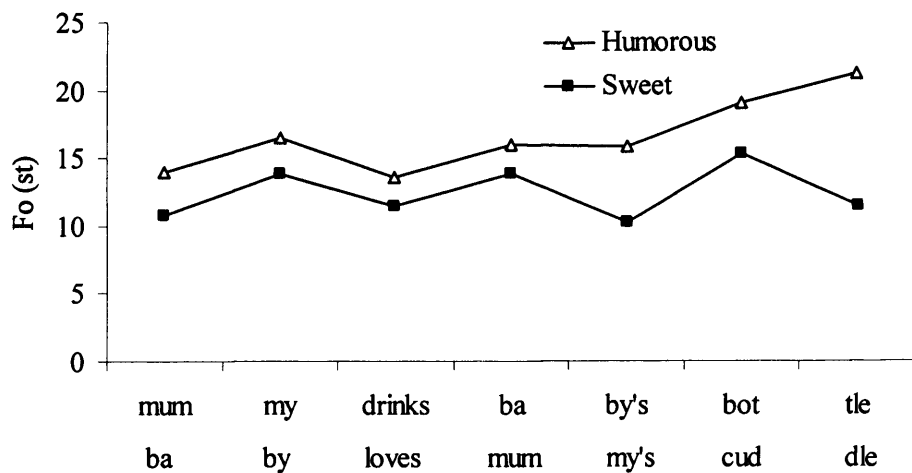
Figure 5.3. Intonation contours for sentences 2, 3, and 4 in both the humorous and sweet books in Study 2.
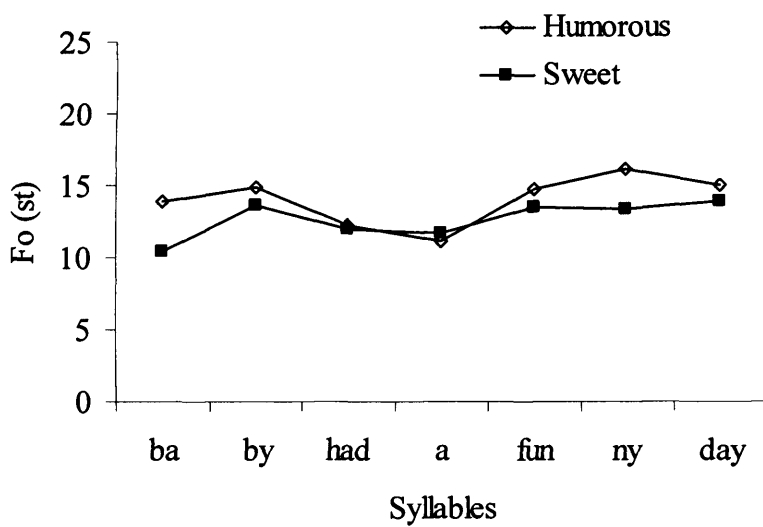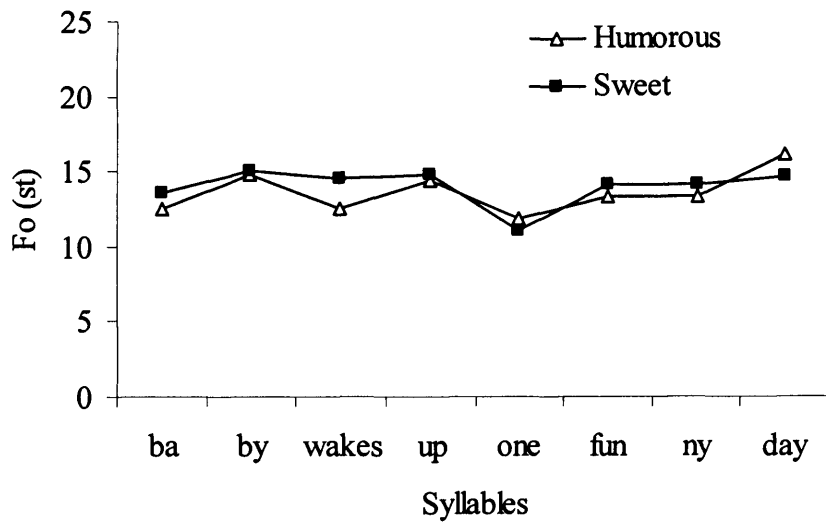
Figure 5.4. Intonation contours for neutral sentences 1 and 7 in both the humorous and sweet books in Study 2.

A 7X2 repeated measures between-subjects GLM for page 2 with mental state (humour, sweetness) as a between-subjects variable violated Mauchly's test of Sphericity, $W(20)=0.106$, $p<.001$. After a Greenhouse-Geisser adjustment, a general trend for the contour was found, $F(3.543,124.01)=6.82$, $p<.001$. This

contour had significant linear, $F_{(1,35)}=8.14$, p=.007, and cubic, $F_{(1,35)}=7.06$, p=.012, trends, but no significant quadratic trend, $F_{(1,35)}=2.90$, p=.097. After a Greenhouse-Geisser adjustment, a mental state by intonation contour difference was found, $F_{(3.543,124.01)}=5.82$, p<.001. The intonation contours of each mental state differed linearly, $F_{(1,35)}=14.67$, p=.001.

A repeated measures GLM for the humorous version of the sentence on page 2 violated Mauchly's test of Sphericity, $W_{(20)}=0.105$, p=.019. After a Greenhouse-Geisser adjustment, the GLM revealed a general trend for the sentence, $F_{(3.42,61.58)}=11.39$, p<.001. More specifically, the sentence had a trend that could be described as linear, $F_{(1,18)}=34.49$, p<.001, or quadratic, $F_{(1,18)}=5.35$, p=.033, but not cubic, $F_{(1,18)}=1.69$, p=.211.

A repeated measures GLM for the sweet version of the sentence on page 2 violated Mauchly's Test of Sphericity, $W_{(20)}=0.03$, p<.001. After a Huynh-Feldt adjustment, no significant trend for the contour was found, $F_{(3.59,60.96)}=1.77$, p=.153.

A 13X2 repeated measures between-subjects GLM for page 3 with mental state (humour, sweetness) as a between-subjects variable violated Mauchly's test of sphericity, $W_{(77)}=0.00$, p<.001. After a Greenhouse-Geisser adjustment, a significant overall trend for the contour was found, $F_{(4.57,123.51)}=5.14$, p<.001. The intonation contour was found to be significantly linear, $F_{(1,27)}=7.41$, p=.011, but not quadratic, $F_{(1,27)}=2.53$, p=.124, or cubic, $F_{(1,27)}=1.24$, p=.275. After a Greenhouse-Geisser adjustment, a general difference between the two sentence

types emerged, $F_{(4.57, 123.51)} = 4.60$, $p = .001$. There was a significant linear difference between the groups, $F_{(1,27)} = 11.31$, $p = .002$, as well as quadratic, $F_{(1,27)} = 6.43$, $p = .017$, but not cubic, $F_{(1,27)} = 0.77$, $p = .389$ difference.

A repeated measures GLM for the humorous version of the sentence on page 3 violated Mauchly's test of Sphericity, $W_{(77)} = 0.00$, $p < .001$. After a Greenhouse-Geisser adjustment, the GLM revealed a general trend for the sentence, $F_{(3.59, 53.81)} = 7.194$, $p < .001$. More specifically, the trend could be described as linear, $F_{(1,15)} = 17.037$, $p = .001$, or quadratic, $F_{(1,15)} = 6.242$, $p = .025$, but not cubic, $F_{(1,15)} = 0.03$, $p = .859$.

A repeated measures GLM for the sweet version of the sentence on page 3 violated Mauchly's test of sphericity, $W_{(77)} = 0.00$, $p < .001$. After a Greenhouse-Geisser adjustment, a general trend was found, $F_{(4.33, 51.92)} = 2.61$, $p = .042$. However this trend could not be described as linear, $F_{(1,12)} = 0.25$, $p = .623$, quadratic, $F_{(1,12)} = 1.17$, $p = .302$, nor cubic, $F_{(1,12)} = 1.78$, $p = .207$.

A 7X2 repeated measures between-subjects GLM for page 4 with mental state (humour, sweetness) as a between-subjects variable violated Mauchly's test of Sphericity, $W_{(20)} = 0.06$, $p < .001$. After a Greenhouse-Geisser adjustment, a general trend for the intonation contour emerged, $F_{(2.94, 103.05)} = 9.315$, $p < .001$. The overall contour could be described as linear, $F_{(1,35)} = 16.37$, $p < .001$, but not quadratic, $F_{(1,35)} = 0.00$, $p = .953$, or cubic, $F_{(1,35)} = 3.41$, $p = .073$. After a Greenhouse-Geisser adjustment, a difference between the two sentence types was found, $F_{(2.94, 103.05)} = 9.158$, $p < .001$. The difference between the groups could

be described as linear, $F_{(1,35)}=14.51$, $p=.001$, quadratic, $F_{(1,35)}=6.49$, $p=.015$, or cubic, $F_{(1,35)}=7.90$, $p=.008$.

A repeated measures GLM for the humorous version of the sentence on page 4 violated Mauchly's test of Sphericity, $W_{(20)}=0.01$, $p<.001$. After a Greenhouse-Geisser adjustment, the GLM revealed a general trend for the contour, $F_{(2.50,50.03)}=14.63$, $p<.001$. More specifically, the sentence could be described as having a linear trend, $F_{(1,20)}=25.30$, $p<.001$, or cubic trend, $F_{(1,20)}=9.74$, $p=.005$, but not a quadratic trend, $F_{(1,20)}=2.57$, $p=.125$.

A repeated measures GLM for the sweet version of the sentence on page 4 violated Mauchly's Test of Sphericity, $W_{(20)}=0.03$, $p=.002$. After a Huynh-Feldt adjustment, no significant trend was found, $F_{(2.93,44.00)}=2.09$, $p=.116$.

An 8X2 within-between subjects GLM for neutral page 1 with mental state of book (humorous, sweet) as a between-subjects variable violated Mauchly's test of Sphericity, $W_{(27)}=0.04$, $p<.001$. After a Huynh-Feldt adjustment, the trend was found not to be significant, $F_{(4.85,111.50)}=1.75$, $p=.132$. Furthermore, after a Huynh-Feldt adjustment, the mental state of the book had no effect on the contour shape, $F_{(4.85,111.50)}=0.41$, $p=.835$.

A repeated measures between-subjects GLM for page 7 with mental state of the book (humorous, sweet) as a between-subjects variable violated Mauchly's test of Sphericity, $W_{(20)}=0.19$, $p=.002$. After a Greenhouse-Geisser adjustment, a general trend for the contour was found, $F_{(3.94,110.43)}=3.846$, $p=.006$. This

contour was not found to be significantly linear, $F(1,28)=3.29$, $p=.080$, quadratic, $F(1,28)=2.16$, $p=.153$, nor cubic, $F(1,28)=0.00$, $p=.958$. After a Huynh-Feldt adjustment, there was no significant effect of the book's mental state type on the contour shape, $F(4.84,135.38)=0.94$, $p=.454$.

5.3.3. Discussion

The results of Study 2 give a more complete picture of how humorous and sweet vocal cues differ. In this study, parents expressing humour used a higher mean F_0, a wider F_0 range, a higher F_0 standard deviation, a higher mean amplitude, a wider amplitude range, a higher amplitude standard deviation, and a slower pace compared to parents expressing sweetness. Looking at the intonation contours, differences were found between humorous and sweet pages for all three humorous/sweet pages measured (2, 3, and 4). Furthermore, the best fits for the humorous sentences were always linear, while sweet sentences were never found to have a linear, quadratic or cubic trend. While both humorous and sweet sentences rose in F_0 from beginning to end, humorous sentences rose significantly more.

Humorous pages were found to have a significantly higher mean F_0, mean, standard deviation and range of amplitude, and a slower speech rate than neutral pages. While neutral pages rose in F_0 across the sentence, humorous pages did so significantly more. While no direct comparison was made between the intonation contours of humorous and sweet sentences, neutral sentences did not have a significant linear, quadratic or cubic trend, while humorous sentences followed a rising linear trend.

Sweet pages were found to have a significantly higher mean amplitude and faster speech rate than neutral pages. Sweet pages did not differ from neutral pages in terms of how much they rose in F_0 from beginning to end of sentence. While sweet and neutral pages were not directly compared for intonation contours, neither type of sentence displayed a significant linear, quadratic or cubic trend. The neutral pages in the humorous and sweet books did not significantly differ on any measures, which confirms the internal validity of the experiment.

5.4. General Discussion

The main purpose of this study was to find out whether parents express appropriate or significant vocal cues to their toddlers that could allow their toddlers to distinguish between different positive mental states, specifically, humour and sweetness. The two main results were that 1. positive mental states (humour and sweetness) are vocally discriminated from one another, and 2. positive mental states are vocally discriminated from a neutral mental state.

Both studies showed that humorous sentences are higher in mean F_0 and mean amplitude, and rise more in F_0 from beginning to end of sentence than sweet sentences. The second study also showed that parents use a higher F_0 standard deviation, F_0 range, amplitude standard deviation, amplitude range and a lower speech rate when expressing humour versus sweetness. Finally, the second study also showed that the intonation contours of humorous and sweet sentences were significantly different such that sweet sentence contours had no linear, quadratic, or cubic pattern, whereas humorous sentences had a linear, rising pattern.

The results of both studies also showed that positive mental states change the way in which parents express acoustic features in speech compared to neutral speech. Humour increased mean F_0 and mean, standard deviation and range of amplitude in both studies. Furthermore, humour decreased speech rate, increased mean F_0 across the sentence, and showed a rising linear pattern that neutral sentences failed to show in Study 2. Sweet sentences increased mean amplitude in both studies, increased F_0 range, and standard deviation and range of amplitude in Study 1, and increased speech rate in Study 2.

5.4.1. Why is Humour Louder and Higher, but also Slower?

The acoustic features of humorous speech can be compared to several previously studied acoustic patterns. Because humour is higher and louder than sweetness, one might claim that parents' expressions of humour and sweetness resemble the expression of different levels of an elated mental state, rather than contrasting positive mental states. Scherer (1986) and Banse and Scherer (1996) found that an elated or joyous expression is higher in mean F_0, F_0 range, F_0 variability, mean energy (amplitude), energy range, energy variability and speech rate compared to a neutral standpoint. Studies 1 and 2 point to this interpretation for sweetness as the vocal characteristics found for sweetness, when compared to neutrality, match those found for elation. However, when comparing humour to both sweetness and neutrality, a different picture emerges because of one factor: the speech rate in humour is slower than sweetness and neutrality, suggesting humour is something different from elation.

A second possibility is that the acoustic features of child-directed humour are simply a more extreme version of infant-directed speech (IDS). Fernald and Simon (1984) found that IDS is characterised by increased mean F_0. Fernald & Kuhl (1987) and Weppelman et al. (2003) suggest that intensity or amplitude is more varied in IDS. Finally, Papousek et al. (1987) found that IDS is characterised by a slower speech rate. This cannot be the full story, however, as again one factor distinguishes humour from IDS. In Study 2, humorous sentences were rising and linear, and rose more in F_0 from beginning to the end of the sentence than both sweet and neutral sentences, whereas no pattern was found in the intonation contours for neutral and sweet sentences. The features of humorous intonation contours are not global features of IDS.

It is proposed that humour is louder, higher, rising, and slower, because parents use these vocal features in order to 1. bid for the toddler's attention, 2. make the sentence content easier to understand, and 3. let their children know that what they are saying is open to interpretation, is questionable, and is not a fact, or a declarative. This interpretation is based on three previous studies. First, Fernald (1989) reported that rising contours used towards infants generally indicated an attention bid. Second, Newman (2003) reported that in noisy situations, parents use a more extreme version of infant-directed speech in order to teach their children a new word, including higher mean F0 and slower speed, and suggest that this is to make it easier for the infant to understand what they are saying. Finally, Gussenhoven (2004) describes a rising contour as "testing", which expresses an utterance as an interrogative and invites the listener to resolve the issue. Based on these three reports, it is proposed that parents speak loudly and use a rising

contour to elicit the toddlers' attention, speak in a higher pitch and more slowly to make the sentence easier to understand, and in addition use rising contours to indicate that the sentence is open to interpretation and is not in fact a statement or declarative. With these acoustic features, parents can signal to their children that what seems to be wrong or false is meant to be a joke, and invite their children to resolve the incongruity.

5.4.2. Humour and Pretend Play

The results found in these studies complement previous results found for vocal cues in pretend play. These studies found that mean F_0 increased when parents read humorous versus neutral pages. Likewise, Reissland and Snow (1996) found that mothers increased their mean F_0 when speaking to their 11- and 15-month-old toddlers during pretend play versus an ordinary situation. Pretend play and humour share similarities such as conveying abstract concepts (McGhee, 1979; Reddy, 1991). Pretend play and humour both convey a mental state in which something false is accepted.

However, the studies in this chapter differed in many important ways. Humorous speech was compared to both a neutral and a positive control whereas Reissland and Snow (1996) only compared pretend play to a normal situation (that of eating). While the results in this chapter indicate that the increase in mean F_0 is due to the mental state of humour (as humour had a significantly higher mean F_0 than both neutrality and sweetness), the increased F_0 observed by Reissland and Snow might be due to the mental state of pretend play or might characterise play more generally. They suggest that the vocal cues characterise play in general.

However, combining these results with theirs suggests an alternative interpretation, namely that the vocal cues characterise pretend play more specifically. A future study might compare pretend play to both a normal and a control play condition, such as stacking blocks.

A second difference is that these studies considered a broader scope of summary features, as well as intonation contours. This comprehensive picture shows a more precise vocal profile for humour than was shown for pretend play in Reissland and Snow's study.

Finally, parents use humour with their children earlier than they use pretend play. Reddy (1991, 2001) proposed that humour could be the basis for pretend play. Thus humour, prior to pretend play, may be a critical context for understanding different mental states.

5.4.3. Conclusions and Future Directions

The studies in this article have shown that parents use distinct vocal cues to express positive mental states as compared to neutral states, and to differentiate positive mental states from one another. What this tells us is that rich cues denoting parents' mental states are present for toddlers to use to interpret those mental states. Indeed, these cues have similarities with the vocal cues denoting pretend play, which also allow others to interpret mental states. This study provides further evidence that children's environments provide rich cues to mental states, even during toddlerhood.

Future studies should investigate whether infants and toddlers can differentiate between two sets of positive vocal cues, that is, humorous and sweet, whether they can use information from these two sets of vocal cues to disambiguate an ambiguous situation, and whether toddlers and children use these intonation patterns themselves to convey different mental states.

Chapter 6: Humour, Abstraction, and Disbelief

If you say something right, it's not a joke.

Leon Sinden, 3 years 6 months

6.1. Introduction

Humour is seriously difficult. Because incongruity is the basis of humour, understanding a humorous statement requires recognising that a person has said or done something wrong (or at least not entirely right), that this error is intentional, and that the intention of the error is not to deceive or mislead, but instead to entertain. Despite these interesting cognitive requirements, the processes involved in humour understanding have rarely been investigated by cognitive scientists. The aim of the studies reported here was to investigate how parents support toddlers' early understanding of humorous statements in a book sharing context.

Book sharing between parents and children has many benefits for a child's intellectual development. For example, de Jong and Leseman (2001) found that opportunities for literacy interactions during the child's first year of school were positively correlated with children's vocabulary comprehension and word decoding during reading. Bus, Van IJzendoorn, and Pellegrini (1995) conducted meta-analyses on the effect of book reading on language, reading skills, and reading achievement. They found that reading to children had a medium to large effect size on children's language and reading performance, accounting for eight per cent of the total variance.

The benefits of book sharing are not uniform, however, because different parents have different reading styles, and reading style impacts children's cognitive abilities. Hammett, Van Kleeck, and Huberty (2003) found that different parents use different conversational styles when reading books to their 3;6- to 4;1-year-old children. Most parents used a limited number of utterances across all categories, and these utterances were split evenly across three categories: print and book convention utterances (either text directly from the book, or sentences such as "Turn the page"), behaviour management and feedback utterances, and story content related utterances, the last of which was further divided into low and high abstraction levels. However several parents used a moderate number of utterances across all categories, including more behaviour management and low abstraction utterances. A few parents used a moderate number of utterances, primarily behaviour management and high abstraction utterances. Finally, a few parents used a high number of utterances across the categories, with more print and book conventions and story content related utterances. Furthermore, Van Kleeck, Gillam, Hamilton, and McGrath (1997) found that increased low abstraction input from parents reading to their 3;6- to 4;1-year-olds lead to decreased low abstraction Preschool Language Assessment Instrument (PLAI) scores at the time of testing. However, both increased low and high abstraction input during the book reading task lead to increased high abstraction PLAI scores one year later.

Differences in parental reading style can affect not only the development of abstraction abilities, but also abilities in social cognition. Adrian, Clemente, Villanueva, and Rieffe (2005) found that when parents used more cognitive and

emotional terms, and a wider variety of cognitive terms when speaking to their four- to five-year-old children, the children performed better on the false-belief task.

Parents change their book sharing behaviours as the context of reading changes. Van Kleeck and Beckley-McCaul (2002) compared how parents read to their two toddlers, one aged 0;9-1;3, and the other aged 2;8-4;9 both separately and together. They found that when parents read to the youngest child alone, the linguistic complexity was at its simplest, when reading to the eldest child alone it was most complex, and when reading to both children it fell in between. The same pattern occurred for the time taken to read the book, with the younger child receiving the least amount of time, the number of mediation strategies used, with the youngest child receiving the most, and the amount of abstract language used, with the youngest child receiving the least. Thus the age of the child, and whether older and younger children are read to at the same time or independently, changes how parents share books.

Given that the way in which parents share books affects children's later cognitive abilities, and that reading context changes how parents share books with their children, whether and how book content influences parents' conversations with toddlers was investigated. In two studies, parents' extra-textual utterances (ETUs) during book sharing of humorous and non-humorous content were compared. Of interest in this study was how humour shapes parent-child interactions because we reasoned that humour is a complex mental state which involves understanding that someone else intends to say something wrong, but

does not intend for the audience to believe what they have said (what Kotthoff, 2003, calls perspective and counter-perspective). At the same time, humour is pleasurable and rewarding for both parents and children, so it was expected that it is a likely early context for learning about complexity in the world. In the first study, parents read a book to their 19- to 26-month-old which contained both humorous and non-humorous pages. ETUs across these page types were compared to ascertain whether humorous material encourages parents to use more high abstraction ETUs. In the second study, a book was re-written so that there were two versions: one that contained humour and one that did not. Parents read one of the two books to their 18- to 24-month-old. As humour needs to provide a counter-perspective (Kotthoff, 2003), the number of ETUs in which parents showed that they intended for their child to disbelieve a past declarative sentence were compared in order to ascertain whether humorous material encourages more disbelief statements.

Storybook reading was chosen as the experimental paradigm for studying how parents support humour understanding and teach their toddlers about abstraction and disbelief because it is an enjoyable setting that would naturally constrain the conversations that parents had with their toddlers. Eighteen- to 26-month-olds were chosen because, according to McGhee (1979), toddlers start to appreciate humour in general at 18 months, but do not start to appreciate verbal humour until two years, making this a perfect window for parents' to scaffold the concept of verbal humour.

6.2. Study 1

It was predicted that humorous pages would encourage parents to use more abstract utterances as humour itself is more abstract than straight-forward utterances. Shammi and Stuss (1999) found biological data that supports the dependence of humour on abstraction abilities. They found that patients with damage to the right frontal lobe showed impairment in verbal humour. This impairment correlated highly with simultaneous impairment in verbal abstraction abilities. Creativity, which requires abstract thought (Williams, Stockmyer, & Williams, 1984; Ohlsson & Regan, 2001; Ward, Patterson, & Sifonis, 2004), correlates with humour ability (Humke & Schaefer, 1996; Rouff, 1975). Furthermore, exposure to humour increases creativity (Ziv, 1988; 1976). Thus abstraction is an important part of humour in general, and has the potential to prime the use of abstract utterances.

The four levels of abstraction used by Van Kleeck et al. (1997) can be used to measure the nature of parental scaffolding of abstract concepts. In level one utterances, the parent labels perceptual items in the book. In level two utterances, the parent relates multiple perceptual items in the book. In level three utterances, the parent relates the story to the real world. In level four utterances, the parent uses imagination or inference. Given that humour is an abstract concept involving imagination and creativity, it was expected that parents would use more high level abstract ETUs when sharing humorous pages.

6.2.1. Method

6.2.1.1. Participants

Twenty parent-toddler dyads participated in this study. Parents included 15 mothers and five fathers. Ten toddlers were boys and 10 were girls. The infants were aged 19-26 months with a mean of 21 months and 24 days. No participants dropped out of the study. Participants were recruited through daycares, play groups, and libraries.

6.2.1.2. Materials

The book used in this study was One Gorgeous Baby by Martine Oborne and Ingrid Godon (see Appendix C). A Sony digital video camera, a Sony DV cam recorder and a mixing board were used to record the reading session. The testing room was white with a green sofa. Materials also included a questionnaire that asked for humour ratings (0-9) for each page of the book (see Appendix D).

6.2.1.3. Design

This was a within-subjects design. The independent variable was whether pages had high or low humour ratings. The dependent variables were the number of parental ETUs for each level of abstraction (1-4), the percentages of parental ETUs for each level of abstraction (1-4), as well as the percentages of parental ETUs for high abstraction in general (levels 3 and 4).

6.2.1.4. Procedure

Parents signed consent forms. The parent was given the book to read alone before reading aloud to the child. Parent-toddler dyads were brought into the lab

and asked to sit on the sofa and to read the book when ready, as they would at home. When they were done reading, parents filled out a questionnaire asking them to rate each page for humour (0-9). Parents were debriefed.

6.2.1.5. Coding

Each video file was transcribed. Each ETU that related to the content of the book was categorised for level of abstraction (abstraction level definitions based on Danis, Bernard & Leproux, 2000):

Level 1 (perceptual identification): The utterance refers solely to one object pictured in the book. This level includes object labelling either at the basic, subordinate, or super ordinate levels. It also includes stating an intrinsic property of the object (e.g. colour), or drawing attention towards the object or one of its properties. Examples are, "What's that?", "Where is the chicken?", "Look how big it is", and "It's a car".

Level 2 (perceptual relationship): The utterance links two objects or events that are both represented in the picture. The link may involve an intrinsic property (same colour), spatial relation (left of, above), a common action (X and Y produce something, or X acts on Y), or a common feeling. Examples are, "This shoe is like this other shoe", "All the green peas are in their pods" and, "She's wearing a blue jumper".

Level 3 (displaced reference): The utterance links a pictured object or event with an object or event that is absent either in space (spatially displaced reference) or time (past talk), typically including subjective experiences with the

object. Examples are, "This apple is green like your bike", "Do you remember the swans you saw in the park?" and, "It's scary in the woods, it's all dark".

Level 4 (inference): The utterance conveys one or several inferences, including logical reasoning and imaginary description, or states some social knowledge. Examples are, "He's saying, 'I like my pyjamas' isn't he", "What do you think he's feeling now?" and, "Where is the rabbit going to go next?".

An independent rater coded 25% of the participant scripts, randomly selected. The inter-rater reliability was good, with a Cohen's Kappa of 0.69. Coding criteria are attached in Appendix I. Examples of category ETUs at different levels of abstraction in the transcripts can be found in Appendix J.

6.2.2. Results

The number of ETUs for each abstraction category were summed across the three most humorous pages (4, 10, and 12) and the three least humorous pages (1, 2, and 6), as rated by the parents.

Means for total number of utterances at each abstraction level by humour level can be found in Figure 6.1. Parents made significantly fewer level 1 ETUs when reading the humorous pages as compared to the non-humorous pages, $t(19)=-4.88$, $p<.001$. Parents made significantly more level 4 ETUs when reading the humorous pages as compared to the non-humorous pages, $t(19)=2.65$, $p=.016$. No differences were found for number of level 2 ETUs, $t(19)=-0.23$, $p=.821$, nor

for level 3 ETUs, t(19) =1.12, p=.278, between humorous and non-humorous
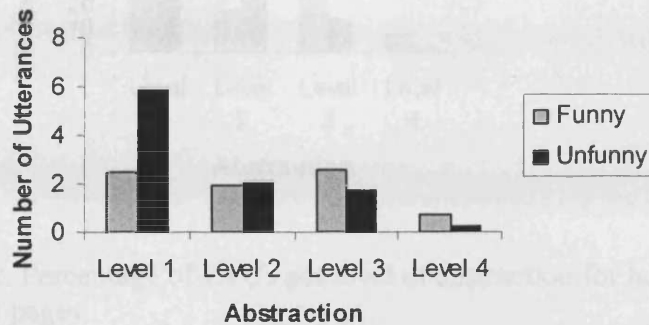
pages.

Figure 6.1. Number of ETUs per level of abstraction for humorous versus non-humorous pages.

In order to investigate the proportion of each level of abstraction to which

the toddlers were exposed, overall percentages of each level of abstraction were

analysed. Means for the percentage of each level of abstraction uttered for each

humour level can be found in Figure 6.2. Since one parent made no ETUs, her

data was eliminated from the analyses. Parents used a significantly higher

percentage of level 4 ETUs during the humorous pages than during the non-

humorous pages, t(18)=2.92, p=.009. No difference was found for percentage of

level 1 ETUs, t(18)=-1.68, p=.110; percentage of level 2 ETUs, t(18)=-0.81,

p=.431; nor for percentage of level 3 ETUs, t(18)=1.64, p=.118.
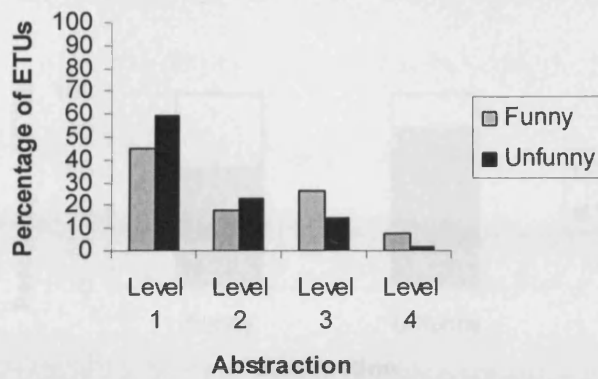
Figure 6.2. Percentage of ETUs per level of abstraction for humorous versus non-humorous pages.

In order to simplify the results to find out the proportion of high abstraction and low abstraction data to which children were exposed, we collapsed levels 1 and 2 together to form a low abstraction category, and collapsed levels 3 and 4 together to form a high abstraction category. Means for the percentage of high abstraction ETUs (levels 3 and 4) for each humour level can be found in Figure 6.3. Since one parent made no ETUs, her data was eliminated from the analyses. Parents used a significantly higher percentage of high abstraction ETUs during the humorous pages than during the non-humorous pages, t(18)=2.82, p=.011.
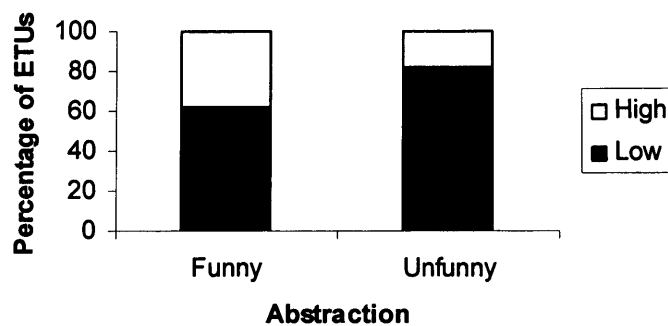
Figure 6.3. Percentage of high and low abstract ETUs for humorous versus non-humorous pages.

6.2.3. Discussion

When parents read humorous pages compared to non-humorous pages, they used significantly more high-level abstractions, and significantly fewer low-level abstractions. Parents also used a higher percentage of high abstraction ETUs in the humorous versus neutral condition. This could help toddlers to think in an abstract way in order to understand that what parents are saying is intended to be humorous, as well as to help toddlers resolve the incongruity inherent to humour.

While the current study showed that parents use more high abstraction language when reading humorous pages of a book, we were interested in finding out which characteristic of humour accounts for this increase. As parents do not intend for toddlers to believe humorous statements, we would expect parents to use more ETUs to indicate that toddlers should not believe past humorous statements. Such statements by their vary nature would be considered high abstraction as they refer to ideas not present in the book. These range from the simple negation of a statement, indicating that the previous statement does not

belong in the parent's knowledge of the world (e.g. Ducks don't say moo), to information not contained in the story drawn from the parents knowledge of the world (e.g. Ducks say quack).

6.3. Study 2

According to Nichols and Stich (2003), people constantly update their beliefs when given new information. Humour offers information that strongly conflicts with the child's beliefs, and so could be considered new information. Given a humorous sentence, the child has the task of either assimilating the new information into his or her belief system, or rejecting it. It was predicted that parents would feel obliged to ask questions and make statements to let their toddlers know that previous humorous statements were not intended to be believed in order to assist toddlers in correctly classifying the information as false, affirming the toddlers' previously held beliefs. A book sharing context is particularly ideal for parents to make such statements as Devescovi and Baumgartner (1993) suggest adults naturally scaffold the child's understanding to appreciate incongruities more in the storybook reading context than real-life.

It was predicted that parents reading the humorous book would make more ETUs that encourage toddlers to understand that the parents did not intend for them to believe previous declarative sentences. It was also predicted that any rise in disbelief statements would not be caused by an increase in speech in general, thus there should be no difference in the number of story-content related declarative sentences between conditions, and parents should use more disbelief statements per declarative sentence in the humorous condition. Finally, it was

predicted that parents' use of disbelief statements would reflect the humorous nature of the sentence rather than the wrong nature of the sentence. Thus we predicted that the quality of parents' disbelief statements following humorous sentences and mistakes would differ.

6.3.1. Method

6.3.1.1. Participants

Forty-five mother-toddler dyads and one father-toddler dyad participated. Five mother-toddler dyads were dropped from the study because the children were restless, leaving 40 mother-toddler dyads and one father-toddler dyad. Toddlers were aged 18-24 months with a mean age of 20 months and nine days. Twenty-seven of the toddlers were girls, and 15 were boys. Twenty-two of the parents participated in the humorous condition and 19 participated in the non-humorous condition. Parents were recruited as in Study 1.

6.3.1.2. Materials

The books used in this study were edited versions of One Gorgeous Baby by Martine Oborne and Ingrid Godon. The book for the non-humorous condition was re-named One Lovely Baby for which pages contained non-humorous sentences, e.g. "Baby loves mummy's cuddle." The book for the humorous condition was re-named One Funny Baby for which pages contained humorous sentences, e.g. "Mummy drinks baby's bottle." (see Appendix G). Some pictures in the humorous condition were altered to correspond to sentence content. Video equipment and location were the same as in Study 1.

6.3.1.3. Design

This was a between-subjects experiment. The between-subjects independent variable was whether the book contained humorous or non-humorous sentences. The dependent variables included (1) the total number of parental disbelief statements, (2) story content related declaratives, and (3) utterances from category (1) divided by utterances from category (2). Details of the categories are in the coding section.

A categorical analysis was also run. The independent variable was whether the declarative sentence for which a disbelief statement had been said was humorous or a mistake. The dependent variable was whether the disbelief statement requested information from, or gave information to the child.

6.3.1.4. Procedure

Same as Study 1, except that parents did not rate the pages of the books for humour.

6.3.1.5. Coding

Parents' and children's utterances were transcribed from video. Utterances were coded into the following two categories: (1) parents' ETUs that indicate that they did not intend for the child to believe a previous sentence (disbelief statements), e.g. "Ducks don't say moo.", and (2) parents' and toddlers' story content related declaratives not classified as (1), e.g. "You like strawberries." This was a selective coding system: all other utterances, including any utterances that did not relate to the book (e.g. asking child to sit down), commands, questions

that were not disbelief statements, unfinished sentences, and non-declarative comments such as "um" or "yeah" were not coded. Videos were watched whilst coding in order to resolve potential ambiguities. Specific criteria for coding are in Appendix K. Examples of category (1) utterances from the transcripts are in Appendix L. Disbelief statements were further subdivided into information given to or requested from the children.

6.3.2. Results

When comparing the number of disbelief statements made by parents for humorous and non-humorous books, Levene's test of Equality of Variances was significant, $F=17.47$, $p<.001$. When equal variance was not assumed, parents reading the humorous book made significantly more disbelief statements than parents reading the non-humorous book, $t(24.05)=3.28$, $p=.003$. See Figure 6.4 for means.

Figure 6.4. Number of ETUs made by parents that express that they intend for their child to disbelieve a past declarative sentence.

Parents did not significantly differ in how many story content related declarative statements were made between the humorous and non-humorous books, t(39)=0.48, p=.635. See Figure 6.5 for means.
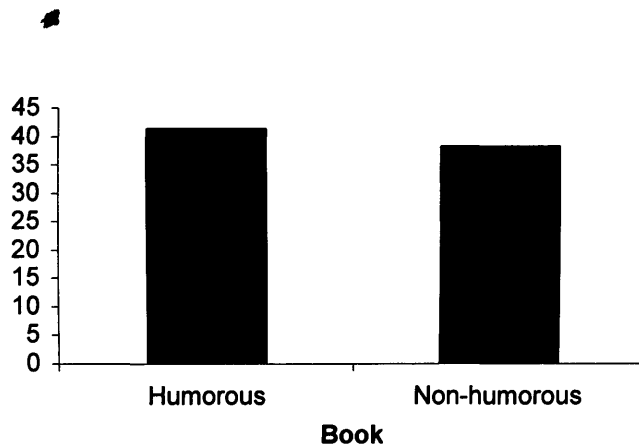
Figure 6.5. Number of story content related declaratives made by parents or toddlers not classified as ETUs made by parents that express that they intend for their child to disbelieve a past declarative sentence.

In order to ensure that the rise in disbelief statements was not due to a rise in speech by parents overall, we investigated whether parents made more disbelief statements per declarative statement when reading the humorous book. When comparing parents for number of disbelief statements made per declarative statement for humorous and non-humorous books, Levene's test of Equality of Variances was significant, F=17.38, p<.001. When equal variance was not assumed, parents reading the humorous book made significantly more disbelief statements per declarative statement than parents reading the non-humorous book, t(25.85)=3.78, p=.001. See Figure 6.6 for means.
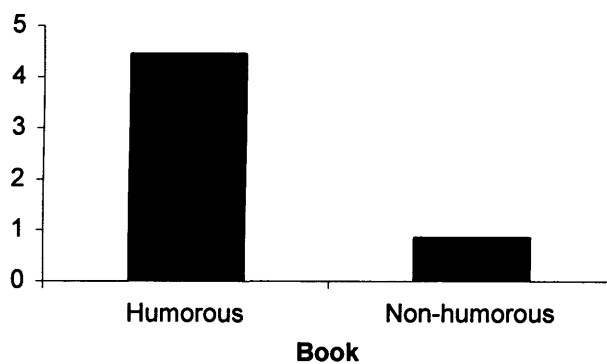
Figure 6.6. Number of (1) ETUs made by parents that express that they intend for their child to disbelieve a past declarative sentence per (2) story content related declaratives made by parents or toddlers not classified as (1).

In order to investigate whether parents were using disbelief statements simply as a means of expressing that the information was incorrect, we ran a post-hoc analysis comparing the quality of disbelief statements after jokes and spontaneous mistakes (made either by the toddler or parent). A Chi-square analysis found that a significantly higher percentage of disbelief statements requesting information from children occurred when the disbelief statements were applied to humorous sentences rather than mistakes, $\chi^2(1) = 8.34$, p<.01. See Figure 6.7 for means.

Figure 6.7. Percentage of disbelief statements that were questions and statements for jokes and mistakes.

Twenty percent of the transcripts (randomly selected) were coded by a blind-coder for reliability. Agreement between the first and second coders was good/excellent (Cohen's Kappa=0.75).

6.3.3. Discussion

The second study found that parents use significantly more disbelief statements when reading a humorous book as compared to a non-humorous book. Furthermore, parents use the same number of story-content related declaratives in both conditions. Thus parents also used significantly more disbelief statements per declarative in the humorous condition as compared to the non-humorous condition. Finally, parents differentiated their feedback between humorous sentences and mistakes as they requested proportionally more information from the children after a humorous sentence was said versus a mistake.

6.4. General Discussion

The studies in this chapter investigated how parents support humour understanding during book sharing with their toddlers. More specifically, in the first study, it was investigated whether parents would use more high abstraction language when book content was humorous. In the second study, it was investigated whether parents would increase use of a specific type of high abstraction language when book content was humorous – namely statements indicating that the toddler should disbelieve a past statement.

The first study found that when parents read humorous book pages, they used significantly more high level abstraction ETUs and significantly fewer low level abstraction ETUs. Looking at the percentage of each type of utterance, when parents read humorous book pages, they used a significantly higher percentage of high level abstract ETUs.

Torreano, Cacciari and Glucksberg (2005) reported that the level of abstraction of verbs serves as a cue to metaphor. In their study, adults were more likely to judge a sentence as metaphorical when the verb could be interpreted abstractly. Our results suggest that humour may be similar to metaphor. Parents may be using abstract language as a means of cuing toddlers to the presence of humour, much in the same way that abstraction can cue adults to the presence of metaphor.

The second study found that when parents read humorous book pages, they used significantly more ETUs that express that they intended for their toddler to disbelieve a past declarative sentence. Furthermore, parents did not differ in the number of general declarative sentences used between the different book types, showing that the increase was not due to increased talking in general. Finally, parents reading the book containing humorous sentences used significantly more ETUs that express that they intend for their child to disbelieve a past declarative sentence per declarative sentence.

Several theorists of humour have proposed that humour involves a framing effect, in which something is said, and then is placed in perspective by a subsequent comment or other cognitive adjustment (Kotthoff, 2003; Yus, 2003). A mature listener may be able to appreciate this framing, and make subsequent adjustments in meaning on their own. Our results demonstrate that parents help toddlers with this difficult framing task by making extra-textual comments that clearly communicate that an incongruous, humorous statement or situation is not meant to be believed, but should be re-labelled as humorous.

6.4.1. Humour versus Mistakes

One could argue that parents' increased use of disbelief statements was not due to the humorous nature of the sentences, but to the misinformation contained within them. However comparing humorous sentences to mistakes, another way in which to give misinformation, the chi-square analysis showed that the quality of disbelief statements was significantly different for humorous sentences and mistakes, with parents requesting proportionally more information from their

children after a humorous sentence. Thus toddlers have more opportunities to use independent divergent and convergent thinking after a humorous sentence than after a mistake. Furthermore, humour is a more naturalistic situation for which parents have an opportunity to give misinformation, as a book that simply gives wrong information without any humour would not seem an ideal, or enjoyable choice for parents to read to their children.

6.4.2. Implications

One important practical implication of these results is that book content can indeed change the way in which adults speak to their children, and more specifically that reading humorous books increases abstraction in parents' conversation with their toddlers. The results from the studies in this chapter are consistent with Martlew and Sorsby's (1991) report that parents made comments higher in abstraction in abstract tasks than in concrete tasks, but also demonstrate that increasing abstraction in conversation can also be inherently rewarding. Reading humorous books provides an important opportunity for parents to shape children's cognitive development in a context that is pleasurable and rewarding for both parents and children.

A second important implication of our results is that exposure to humorous reading materials may increase toddlers' general abstraction abilities later in life. Van Kleeck et al. (1997) found that the children of parents who used more high abstraction utterances when reading books developed better abstraction abilities later in development. This suggests that if parents were to read more humorous

books, their children would hear more high abstraction language, and would better develop their general abstraction abilities.

Furthermore, the percentage at which parents use high abstraction language in the humorous condition is ideal for bootstrapping abstract language in toddlers. Hammett et al. (2003) suggest that the ideal level at which to bootstrap abstract language is at 70% low abstraction and 30% high abstraction. The percentage of high abstract language that parents used when reading humorous pages was 38% compared to 18% for non-humorous pages. Thus humorous book reading materials create an ideal environment for toddlers to learn abstract language.

In the second study, parents bootstrapped the idea that one can intentionally say the wrong thing. Tomasello (2003) states that, "Negation... clearly reflects a speaker's attitude" (p.226). Thus by negating previous humorous sentences, parents reveal that what they said is not what they believe. Intentionally saying or doing the wrong thing is an important aspect of understanding other intentional states, such as pretending or lying (Leekam, 1991). The study in Chapter 4 of this thesis found that toddlers understand humorous intentions from 25 months, earlier than they understand intentions of pretense (Rakoczy et al., 2004), and lying (Siegal & Peterson, 1996; 1998). Parents' use of language to indicate that they intended a previous utterance to be disbelieved could be an initial cue used by toddlers to understand that others can intend to say or do the wrong thing.

Finally, in figuring out what the right scenario is after hearing a humorous sentence, toddlers can develop their creative thinking skills. For example, after hearing the humorous sentence, "The ducks say moo" and the disbelief statement, "Ducks are supposed to say quack", the toddler has an opportunity to practice divergent thinking, abstracting up to categories befitting ducks (animals) and moo (animal noises), followed by an opportunity for convergent thinking, that is, linking the correct information from the two categories, i.e. ducks say quack, allowing the toddler to reject the previous wrong statement. These are abstract thought processes linked to creative thought, also used in art and science (Koestler, 1966).

6.4.3. Future Directions

The current study tells us what extra information children gain when being read humorous books. Past research suggests that high abstraction language should increase toddlers' later abstraction abilities (Van Kleeck et al.,1997; Hammett et al, 2003), thus future research should look into a direct link between humorous contexts and later abstraction abilities. Future research should also investigate whether exposure to disbelief statements has a positive effect on toddlers' understanding of others' beliefs and intentions.

6.4.4. Conclusions

The current study found that parents use more high abstraction language when reading humorous storybook content to their toddlers. This could be an effective tool in increasing toddlers' abstraction abilities later in life. Furthermore, it was found that parents increase their use of disbelief sentences,

which could be a first step in helping toddlers to understand that others can intend

to do or say the wrong thing, and give toddlers better access to others' beliefs.

Chapter 7: General Discussion

7.1. Summary

The first study has shown that toddlers from at least 19 months copy unambiguous jokes significantly more than unambiguous mistakes and correct unambiguous mistakes significantly more than unambiguous jokes. Thus toddlers from at least 19 months can differentiate jokes and mistakes. Secondly, toddlers from 25 months copy ambiguous jokes significantly more than ambiguous mistakes and correct ambiguous mistakes significantly more than ambiguous jokes using intentional cues alone. Thus toddlers from 25 months understand that others can intend to do the wrong thing for the purpose of a joke.

Looking at how toddlers could come to understand that people can purposely do the wrong thing with the intention of joking, the second study found that parents use vocal acoustic features and specific intonation contours to indicate that what is being said is a joke as compared to normal sentences. In the first part of this study in which parents read humorous and non-humorous pages of a book, but for which sentences did not contain jokes, parents used a significantly higher mean F_0 and mean amplitude when reading the humorous pages. In the second part of this study in which parents either read a book containing jokes, or a book that did not contain jokes, parents differentiated humorous from normal speech by using a higher mean F_0, a wider F_0 range, a higher F_0 standard deviation, a higher mean amplitude, a wider amplitude range, a higher amplitude standard deviation, and a slower pace compared to parents expressing sweetness. Parents also used a distinct intonation contour to express jokes, which was rising and linear. Thus

parents use vocal acoustic cues to indicate general humour as well as jokes more

specifically when speaking to their toddlers. Thus it is possible that vocal acoustic

cues could be used by toddlers to know that a sentence is meant to be humorous or

a joke.

Finally, the third study showed that parents use verbal behaviours to

indicate that sentence content is meant to be funny. In the first part of this study

in which parents read a book that contained humorous pages that did not contain

specific jokes and non-humorous pages, parents were found to use higher

abstraction language when reading humorous pages to their toddlers. In the

second part of the study in which parents either read a book containing jokes or a

book that did not, parents who read the joke-containing book used more disbelief

statements. Thus parents give verbal cues to their toddlers to let them know that

book material is humorous, or that a joke was made.

7.2. Incongruity in Toddler Development

The first study in this thesis demonstrated that toddlers at least as young as

19 months understand that a large incongruity is the basis of a joke. They

demonstrated this by copying physical jokes with large incongruities and

correcting physical mistakes with small incongruities.

Since the 19- to 24-month-olds did not respond to intentional cues alone in

the ambiguous condition, one possibility is that they wanted to copy the joke

material because they themselves found the jokes to be funny. This gives support

to an incongruity-based theory of humour, further supporting research by Deckers

and Kizer (1975), and Deckers and Devine (1981), in whose studies it was found that adults judged unexpected outcomes to be funnier than expected outcomes.

Nineteen months is the earliest age at which an experimental study has found that toddlers can identify incongruity as humorous, earlier than the study by Shultz (1974) in which he found that six-year-olds appreciate incongruity-based humour; earlier than Pien and Rothbart (1976) who found that four-year-olds can identify incongruity in a joke, and then resolve the joke in visual, comic based jokes; and earlier than Sinnott and Ross (1976) who found that three-year-olds find incongruous scenarios funnier than neutral scenarios.

The findings in this thesis corroborate McGhee's (1979) theoretical account that toddlers find humour in incongruous actions towards objects at 18 months. This study also further extends similar findings in the case study Dubois et al. (1982) in which they found that a child, B, laughed at incongruous actions towards objects from two years.

Looking at the study on non-verbal vocal expression of humour, the intonation contours indicate that parents may have been marking incongruity. Whilst the jokes uttered by the parents were statements, and thus should have followed a lowering contour with a final lowering on the last syllable (Gussenhoven, 2004), parents instead used increasing linear contours which can denote a question, or hence that the statement was unexpected. This appears to be a good cue that the sentence was not meant to be something new to learn, but a violation of expectations, or an incongruity.

The final study in this thesis which investigated parental verbal cues support this interpretation. After using a rising linear contour to denote a joke, parents made disbelief statements. These disbelief statements contradict the content of the jokes with the parents' own knowledge, pointing out or questioning specific or general incongruities pertaining to the book. For example, "Ducks don't say moo," and, "That's not right," are a clear sign that the jokes were incongruous. Taken together with rising linear contours, parents could be first cueing their toddlers that the joke that they are currently uttering is open to interpretation, and later give specific reasons why the joke is incongruous.

Furthermore, in the first part of the study on parental verbal cues, parents used higher abstraction language when reading humorous versus non-humorous pages of a book. Torreano et al. (2005) found that abstract verbs cued adults to metaphors. As discussed in the introduction, an underlying theme between humour and metaphors is that they are both incongruous. Thus the high abstraction language used by parents could very well be expressing the incongruity in the humour of the text.

All three studies in this thesis thus give support for an incongruity-based theory of humour. First, toddlers interpret incongruity as humorous. Second, parents make reference to incongruity, both in their vocal acoustic and verbal cues that they give to their toddlers.

7.3. Incongruity and Resolution

Whilst Shultz (1976) maintains that a joke needs to have two overlapping elements which initially seem disjointed, but in fact are resolvable, Pien and Rothbart (1976) suggest that simply figuring out that one's mother is behind a chair in a game of peek-a-boo should be enough to account for resolution. Thus only figuring out how to explain a single discrepancy should be enough for incongruity and resolution in their view. Following Attardo's (1997) take on the semantic script theory of humor, if the second part of a script, at its most basic, need only not follow the first part of a script in order to create a joke, then the current study shows that toddlers can resolve a joke from 25 months. In the ambiguous portion of the imitation study in this thesis, toddlers were shown the same somewhat incongruous action accompanied either by laughter or by the experimenter saying, "Woops!". The toddlers copied the experimenter when she laughed, for example, putting a spoon into their cheek when the experimenter did so. However when the same wrong actions were cued as mistakes, 25-30 and 31-to 36-month-olds, toddlers corrected the experimenter, for example, by putting the spoon in his/her mouth, showing that they knew the original script and that it had been violated. Thus if we are to take incongruity resolution at its weakest form according to Pien and Rothbart (1976), and Attardo (1997), then 25 months is the earliest age at which an experimental study has found that toddlers can solve incongruities in humour.

As for verbal jokes, parents' vocal acoustic and verbal cues may serve to help toddlers resolve jokes. First, parents in both vocal acoustic studies used

features of infant-directed speech when reading humorous book utterances, such as a higher mean F0 and a louder mean amplitude. As these features have been found to attract and focus toddlers' attention they could help toddlers to focus on the utterances to understand their content as much as possible. Finally, parents' verbal cues in the form of disbelief statements often cue the toddler to resolve the joke themselves, for example, "What do ducks say?" or parents resolve the jokes for the toddler, e.g., "Ducks really say quack."

All three studies in this thesis thus give support for a basic incongruity and resolution theory of humour, both from the view that toddlers can resolve basic one item incongruities, e.g. that a spoon should go in one's mouth, not one's cheek, and from the view that parents make it easy for toddlers to understand the content of the joke using vocal acoustic features of speech, and then either probe a resolution from their child, or give it directly.

7.4. Theories of Humour Development

The studies in this thesis provide further insight into the current theories of humour development in infants and toddlers. First, looking at Piaget's (1962) hypothesis that humour need not be symbolic, our thesis gives this view credence as toddlers understand humorous intentions one year earlier than they understand the intention to pretend (Rakoczy et al., 2004). Rather, our data supports that whilst humour is abstract, it need not be symbolic.

Second, this thesis found that toddlers appreciate incongruous actions on objects as humorous from at least 19 months, in line with McGhee's (1979) theory

that the first step in humour development is producing incongruous actions on objects at 18 months. However, as the youngest toddler we tested were able to appreciate incongruous actions on objects as humorous, it is possible that infants and toddlers even younger than this age range could also appreciate incongruous actions on objects as humorous, lowering the age range even further.

Finally, looking at Reddy's (1991, 2001) position on humour development in infancy, she proposes that teasing, a potential form of humour, could be a precursor to the ability to pretend, as it is a proto-symbolic abstract activity. Again, as we found that toddlers understand humorous intentions one year prior to their understanding of the intention to pretend, this adds support to Reddy's framework. Furthermore, in the third study presented in this thesis, parents expressing humour to toddlers use abstract language, in line with the idea of humour or teasing as a type of proto-symbolism (Reddy, 2001).

This thesis has suggested that the first time toddlers understand that one can intentionally do the wrong thing is through humour. Understanding humorous intentions requires half the steps as needed to understand pretence as intended, which requires one to understand that one can intend to do the wrong thing, as well as represent incorrect actions or objects in certain situations as correct in one's mind.

Furthermore, the studies in this thesis give further support to Reddy et al.'s (2002) view that affect and social-cognition are important factors to consider in humour development. Laughter as a cue aided 25-30 and 31- to 36-month-olds in

Chapter 4 of this thesis to understand that an incongruous action on an object was intended as humorous. Thus others' laughter could be seen as a motivating factor to also engage in humorous behaviour. Furthermore, parents give vocal acoustic and verbal cues to their toddlers that could aid them in understanding first, that they are telling a joke, and second, what makes that joke funny.

7.5. Humour and Intentions

7.5.1. Humour and Intention Understanding

The first study in this thesis showed that 25-30 and 31- to 36-month-olds copied ambiguous jokes and corrected ambiguous mistakes based on intentional cues alone. Twenty-five months is the earliest age at which an experimental study has found that toddlers can distinguish intentionally from unintentionally wrong, or incongruous, actions. This occurs less than a year after toddlers understand that others have intentions (Meltzoff, 1995; Carpenter et. al., 1998). Toddlers' understanding of humorous intentions at 25 months occurs around a year earlier than they are able to distinguish pretending from trying (Rakoczy et al., 2004), as well as a year earlier than they are able to distinguish lies from mistakes (Siegal & Peterson, 1996, 1998). Looking at humorous forms of understanding that others can intend to do the wrong thing, toddlers can differentiate jokes from mistakes four years earlier than they can distinguish irony from lies, and three years earlier than they can distinguish jokes from lies.

Since we know that toddlers understand mistakes from 14 months (Carpenter et. al., 1998), this implies that the new cognitive skill that toddlers have developed at 25 months is not that they understand that wrongness exists, but

that people can intend to do the wrong thing, in the form of humour. Since an understanding of humorous intentions precedes other forms of understanding that others intend to do the wrong thing by at least a year, this suggests that humour may be the basis for these further developing skills.

Given that the 19- to 24-month-olds passed the unambiguous task, we might ask how they were interpreting the experimenter's intentions. The first possibility is that they interpreted the actions to be mistakes. However one would expect that they would then correct the humorous actions. One reason that 19- to 24-month-olds may have copied jokes, even if they thought them to be mistakes, is that they found the unambiguous humorous actions to be funny, and copied them because they themselves wanted to be funny, akin to clowning (Reddy, 2001).

If they do not perceive the actions as mistakes, then they must perceive them as intentional. If they do not yet understand the intention to do the wrong thing, however, they must interpret the action as both novel and correct. This would also suggest that toddlers would be using cues to interpret the novel actions as correct. However this poses a problem: if they were using cues to interpret actions as novel and correct, they should be able to do likewise in the ambiguous condition, but they do not.

It appears more likely that if they are interpreting the actions to be intentional, their understanding is driven not only by the cues, but also by the actions themselves. A more parsimonious explanation is that in the ambiguous condition, the cues do not match their understanding of what intentional joke and

mistake actions look like, leading to confusion and poor performance, whereas in

the unambiguous condition, the cues match their understanding of what

intentional joke and mistake actions, leading to good performance.

Thus the 19-month-olds most likely understand either the actions to be

accidental, but humorous, demonstrating that they appreciate humor, or they

understand the actions to be intentionally humorous, demonstrating again that they

appreciate humor.

7.5.2 Theories of Intention Understanding and Understanding the Intention to do the Wrong Thing

The results of the imitation study offer several interpretations based on the

different theories of intention understanding discussed in the introduction. First,

following Tomasello and Rakoczy (2003), 25-month-olds may have made an

additional developmental leap in which they understand that others intend to do

the wrong thing. However this interpretation does not really explain *how* they

made such a leap.

Following Baldwin and Baird (2001) and Baldwin, et al. (2001), toddlers

may have learned to understand humorous intentions through statistical

regularities. The statistical regularities could not be in the actions themselves for

two reasons. First, all of the actions were unconventional. Second, in the

ambiguous condition, intentional jokes and mistakes were based on the same

actions, and only differentiated by cues, so there were no statistical regularity

differences between actions. Instead, the statistical regularity could be manifest in

the cues themselves: toddlers could have learned that when people make statistically irregular (or novel) actions and laugh, this means a joke was intended. However this cannot explain everything as it is unlikely that toddlers had seen either the unambiguous or ambiguous joke actions before, making them all equally irregular, yet toddlers performed better on the unambiguous items. Thus it seems that statistical regularity does not make a good explanation.

Comparing the results to Meltzoff's (2007) theory, in order for toddlers to understand that others intend to joke, they must first have had experience making a joke, after which they could relate others' joking attempts as "Like Me". Given that infants clown from eight months (Reddy, 2001), this theory would predict that infants as young as eight months should be able to understand that others intend to joke, thus explaining why 19-month-olds copied the unambiguous jokes. However this does not resolve everything, since toddlers under 25 months did not infer humorous intentions for ambiguous jokes. One possibility is that toddlers do not experience making jokes that are not very funny until around 25 months. However this seems improbable as the motivation for making poor jokes after 16 months of good joking is incomprehensible.

Following Reddy (2003), another possibility follows the fact that infants are sensitive to others' attention when they clown or tease (Reddy, 1991, 2001). Following this, toddlers might be sensitive to others' attention directed to jokes created by other people. Finally, the toddler might understand that others have intentions to joke themselves. Although the leap to humorous intention understanding is not as great as that projected by following Tomasello and

Rakoczy's (2003) theory, there still seems to be some kind of leap between noticing that others attend to jokes and understanding that others intend to joke. Another problem is that this does not explain why toddlers do not understand humorous intentions in the ambiguous condition until 25 months. Again, this could be a problem of experience with successful versus unsuccessful jokes. However it is difficult to imagine that toward the end of the second year, toddlers would begin to create jokes they themselves found poor, and at which others would respond.

A final possibility is that increased verbal skills can help toddlers understand humorous intentions of ambiguous items. As demonstrated by the reading studies in this thesis, parents bootstrap toddlers' understanding of verbal humour using both vocal acoustic and verbal cues. If a parent could successfully explain a joke to a toddler that the toddler did not originally understand, then the toddler could realise that even if he or she does not initially understand an action or utterance as a joke, the action or utterance could still be intended as a joke. Indeed, a case study by Dubois, Farmer, and Farmer (1984) found that a two-year-old, B, made unsuccessful verbal jokes by copying verbal joke structures, showing that she did not understand the content of the joke, but understood that it was a joke. Thus an understanding of humorous intentions of ambiguous jokes could develop as the child's language abilities develop alongside social experience with parents or others.

7.5.3. Communication of Humorous Intentions

Looking at the vocal acoustic data, it is clear that parents communicate their intentions to be humorous with vocal acoustic features, including F0, amplitude, speech rate, and intonation contours. By expressing utterances using a higher mean F_0, louder mean amplitude, and slower speech rate, it is likely that parents intend for their toddlers to hear humorous utterances more clearly. A study by Newman (2003) found that parents used a higher mean F_0 and louder amplitude when trying to teach a word to their toddler in a noisy situation. In the case of humour, the "noise" could in essence be the extra cognitive effort required to understand the utterance. Furthermore, by using a rising linear contour to express jokes, parents clearly express that they do not intend the joke to be a statement, but to be open to interpretation (Gussenhoven, 2004). This data adds to other studies which suggest that adults use vocal acoustic features of speech to express that a situation is incongruous, for example, Anolli et al. (2000) who found that adults use distinct vocal acoustic features to express sarcastic and kind irony, as well as Reissland and Snow (1996) who found that parents adjust their vocal acoustic features to indicate pretend play.

Finally, it is clear from the data in this thesis that parents communicate their intentions to be humorous with verbal cues, including high abstraction language and disbelief statements. In using abstract language, parents may be cueing their toddlers to use abstract thought, which in turn could aid their toddlers in noticing, and possibly resolving, a joke. In using disbelief statements, parents send a clear cue that toddlers are not to believe past utterances as normal or new

information. Furthermore, they also serve to cue toddlers to resolve the inherent incongruities in the jokes.

7.5.4. Humour and Intentions Summary

All three studies in this thesis thus give support for intention as an important factor in joke appreciation and communication. First, infants can judge a joke to be a joke on intention alone, and second, parents can express that a joke is meant to be a joke, and not normal conversation, by using vocal acoustic and verbal cues.

7.6. Future Directions

Whilst the first study in this thesis tells us that toddlers from 19 months can differentiate jokes and mistakes, and toddlers from 25 months can differentiate mistakes from humorous intentions, it also brings to mind more questions about toddlers' humour development.

7.6.1. Humour Appreciation in Toddlerhood

Since the youngest children in our sample (19 months) were able to distinguish unambiguous jokes and mistakes, it would be interesting to replicate the unambiguous portion of the study with 14- to 18-month-olds, the age range during which toddlers avoid or complete mistakes (Meltzoff, 1995; Carpenter et al, 1998). This would first allow us to find out if toddlers appreciate action-based humour from an earlier age than theorized by McGhee 1979), more in line with Reddy's (1991, 2001) observation of humour production and teasing from an earlier age (eight months). This could allow us to find out whether toddlers

understand jokes before the onset of pretend play in order to get a better

understanding of humour development and humour's relationship with pretend

play in general.

Another idea is to find out whether children can tell the difference between

jokes and mistakes on abstraction of actions alone, or whether intentional cues are

still an important factor in humour appreciation. To find this out, the

unambiguous portion of the current study could be replicated without intentional

cues in 19- to 24-month-olds. Comparing how children respond in this task to

how children respond in the same task with intentional cues could tell us whether

intentional cues can make it easier to distinguish jokes from mistakes.

7.6.2. Intention Understanding and Humour

In order to ensure that 25- to 36-month-olds understand humorous

intentions rather than the less likely possibility that they are reacting to positive

and negative displays, a study could pair joking and happy displays with

conventional and unconventional actions. Toddlers could be shown two actions,

one conventional, and one wrong, both conveyed with either happy or joking

intentional cues. If the child's first action on each trial matched the intentional

cue such that the child copies the wrong action when being exposed to joking

intentional cues, and copies the normal action when being exposed to happy

intentional cues, we could rule out the unlikely possibility that children are

responding to emotion rather than intention.

7.6.3. Infants' and Toddlers' Responses to Humorous Vocal Cues

Future studies should investigate whether infants and toddlers can differentiate between two sets of positive vocal cues, e.g. humorous and sweet, whether they can use information from these two sets of vocal cues to disambiguate an ambiguous situation, and whether toddlers and children use these vocal acoustic profiles themselves to convey different mental states.

One way to find out whether infants can differentiate two positive vocal acoustic profiles would be through an habituation paradigm. One could repeatedly play, for example, sentences with humorous intonation patterns until the child became habituated, after which another positive intonation pattern, such as a sweet pattern, could be played. If the infants react to the change, it would show that they can differentiate humorous intonation patterns from other positive intonation patterns.

Next, we could investigate whether infants can match humorous intonation patterns to humorous materials. A preferential looking task could be used to do this. Two images could be shown on a screen: one humorous and one normal. Each trial's humorous or positive non-humorous intonation patterns could be played. If toddlers look longer at the humorous image when humorous intonation patterns are played, and longer at normal images when non-humorous positive intonation patterns are played, this would show that infants associate humorous images with humorous vocal expression.

Finally, to ascertain whether toddlers recognize that humorous intonation patterns indicate humorous intention, we could repeat the imitation study presented in this thesis using humorous and sweet intonation patterns rather than laughter and smiling and the word Woops! accompanied by a negative facial expression. If toddlers can disambiguate a situation as humorous based on intonation patterns, it would show that intonation pattern could be a vital cue for the recognition of humorous intentions in toddlers.

7.6.4. Distinguishing Humorous Acoustic and Verbal Cues from Other Mental State Vocal Acoustic Profiles

Whilst the second and third studies in this thesis showed that parents used different vocal acoustic and verbal cues for humorous and non-humorous mental states, it would be interesting to see if parents differentiate humorous from other forms of literally incorrect sentences. The posthoc analysis on verbal cues to mistakes and jokes in this thesis suggest a difference exists in quality. Another way to examine this would be to set up another reading study in which parents read a story from a third person point of view, with the story either about a joker, or a story about someone who makes mistakes. We could then test the vocal acoustic cues and the verbal cues given by parents in these two different scenarios to ascertain whether and how much humorous vocal and verbal cues are based on the "wrongness" factor, and how much is unique to humour.

A similar study could be set up to look at the possibility that some of the acoustic and verbal cues given by parents might have been due to the jokes offering new information. Parents could either read a humorous book, which by

its nature contains new (although wrong) information, and a book that contains new (and truthful) information on a subject about which the child does not know anything. We could then test the vocal acoustic cues and the verbal cues given by parents in these two different scenarios to ascertain whether and how much humorous vocal and verbal cues are based on the being given new information, and how much is unique to humour.

7.6.5. The Effects of Humorous Texts on Toddlers

The current study tells us what kind of extra information children gain when read humorous books, however it does not assess whether children use this information. Future studies could be conducted to find this out. A nice set-up would be experiments following Van Kleeck et al. (1997), and Peskin and Astington (2004). In the study by Peskin and Astington, they re-wrote six books in two ways. One set of books was re-written to contain a high level of mental state language. The other set of books was re-written to contain no mental state language, but required mental states to be inferred. Forty-eight four and a half-year-olds in a kindergarten classroom were given a battery of theory of mind tasks. Half the children were then read all six books containing mental state language and the other half were read all six books that did not contain mental state language over a period of four weeks. The children were then re-tested on the theory of mind tasks. Looking at the children's production of mental state terms, revealed that the children who were read books containing mental state language outperformed those who did not. The group which was not read books with mental state language surprisingly outperformed the group that had heard

mental state language on false-belief explanation, suggesting that allowing the

child to infer mental states rather than being told them directly is of benefit.

To follow up on these studies, we could test toddlers on a battery of mental

state understanding tasks, with specific measures pertaining to intending to say the

wrong thing, as well as the PLAI scale. Half the children could then be read a

series of either funny or unfunny books over a month, and we could then re-test

the children in order to find out whether children did indeed learn from parents'

scaffolding.

7.7. Conclusions

The three studies in this thesis have shown that toddlers can differentiate

mistakes from jokes, as well as humorous intentions from mistakes. This thesis

also reveals that parents use both vocal acoustic and verbal features to distinguish

humorous from normal texts. These studies together support that humour is based

on incongruity from a young age. Furthermore, at a basic level, toddlers are able

to resolve incongruities, and parents encourage them to do so.

These studies also reveal that toddlers understand that others can intend to

do the wrong thing in the form of humour. This is the earliest age at which

toddlers have been found to understand others' intentions to do the wrong thing,

including children's understanding of metaphors, irony, lying, and pretending.

Furthermore, parents clearly express humorous intentions to their toddlers by

using specific vocal acoustic characteristics and verbal cues. It is thus possible

that toddlers use these intentional cues as a basis for understanding that others

intend to be humorous. Future studies are needed to ascertain this.

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Appendix A

Normal Actions on Objects (Warm-up)

Stir spoon in cup.

Comb hair.

Stack blocks.

Move duck and say, "Quack".

Unambiguous Joke Actions

Put boot on hand.

Put toy cat on head.

Brush chin with hairbrush.

Pour tea in boot.

Unambiguous Mistake Actions

Put lid on sugar jar and slide to the side so that it is not in place.

Put glove on hand so that it falls off without completely covering hand.

Write with wrong end of a marker.

Put ring over ring stacker and let it drop next to the wring stacker rather than

on it.

Ambiguous Actions

Bring upside down cup to lips.

Put hat on head and over eyes.

Bring spoon up to face and hit into cheek.

Brush teeth with wrong end of toothbrush.

Appendix B

Coding Scheme

Boot

> *Copy.* Puts boot on own hand, parent's hand or my hand.
>
> *Correct.* Puts or tries to put boot on own foot, parent's foot or my foot.

Cat

> *Copy.* Puts cat on head.
>
> *Correct.* Moves cat like it is walking or says "meow".

Brush

> *Copy.* Brushes own chin, parent's chin or my chin.
>
> *Corrects.* Brushes own hair, my hair or parent's hair.

Teapot and Boot

> *Copy.* Pours "tea" into boot with teapot.
>
> *Correct.* Pours tea elsewhere or puts/tries to put boot on foot.

Sugar Jar

> *Copy.* Purposely misses when putting lid on jar, e.g. obviously slides or throws lid off the side of the jar.
>
> *Correct.* Puts lid on jar or tries to put lid on jar. "Trying" could be seen by putting the lid on and getting it on, but without it fitting properly (this is due to the nature of the toy's structure).

Glove

> *Copy.* Puts glove slightly on hand, but not all the way on, and lets it fall off/pulls it off, etc so that if falls on the ground.
>
> *Correct* Puts glove on so that whole hand is in glove. The fingers don't have to be on properly.

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Marker

 Copy. Writes on paper with wrong end of marker (so not actually writing).

 Correct. Writes properly so that ink goes on page.

Ring Stacker

 Copy. Holds ring to side of ring stacker and lets go so that it falls to the

ground.

 Correct. Puts ring on ring stacker and lets go so that it falls in place.

Cup

 Copy. "Drinks" out of upside down cup, or puts bottom of cup to mouth/nose

(or mine or parent).

 Correct. Drinks out of cup properly, or directs properly to my mouth or

parent's mouth.

Hat

 Copy. Puts hat on head/face so that it falls over the eyes, (or on my face or

parent's face).

 Correct. Puts hat properly on own head/parent's head, my head.

Spoon

 Copy. Puts spoon on cheek or area around there (or mine or parent).

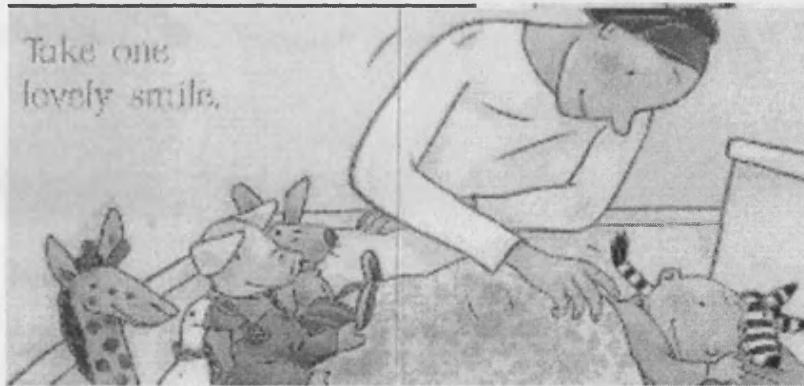 *Correct.* Puts spoon in mouth, or pretends to eat with spoon (or me or parent).

Toothbrush

 Copy. Puts wrong end of toothbrush in mouth/shakes wrong end of toothbrush

in front of mouth.

 Correct. Puts right end of toothbrush in mouth/shakes write end of toothbrush

in front of mouth.

Appendix C

One Gorgeous Baby by Ingrid Godon and Martine Oborne
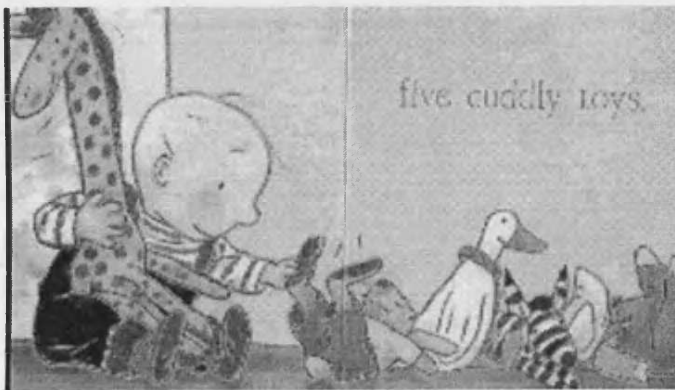*Humorous pages*

Take one lovely smile,
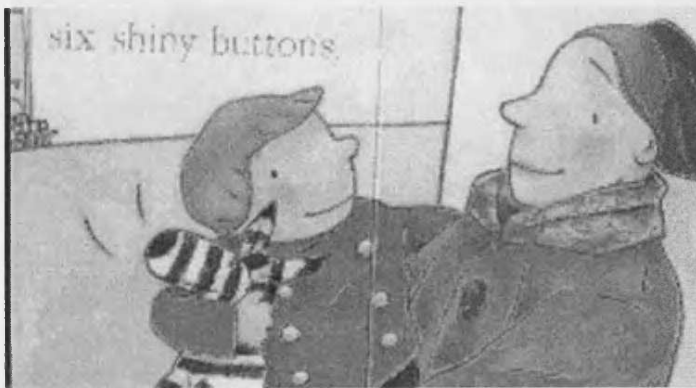

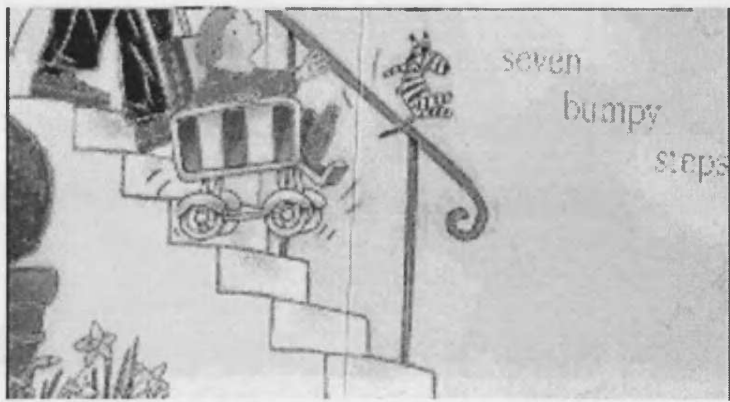two beautiful eyes,

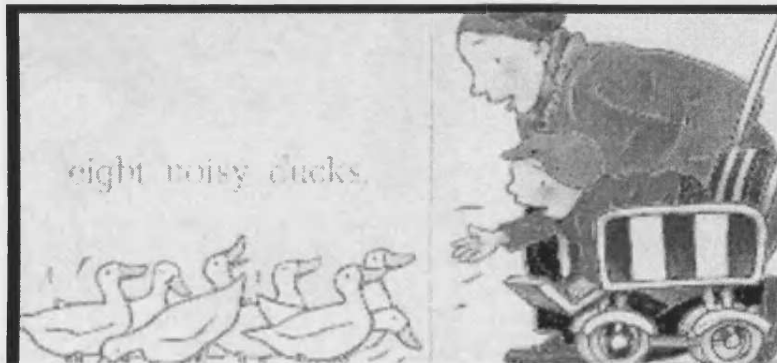

three big bananas,

four clean nappies,

five cuddly toys,

six shiny buttons,

seven bumpy steps,

eight noisy ducks,

nine juicy strawberries,

and ten sticky fingers!

Put them all together and what do you get?

One gorgeous baby!

Appendix D

Could you please indicate: a) how funny, and b) how sweet, you find each page on this scale:

Not at all				Quite				Very
0	1	2	3	4	5	6	7	8

Page number	Sweet rating	Funny rating
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

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Appendix E

Pages in Study 1

Humorous & Sweet

      10. **Ten sticky fingers**

      12. **One gorgeous baby**

Humorous

      3. **Three big** bananas

      4. **Four clean nappies**

      7. Seven **bumpy steps**

      8. **Eight noisy ducks**

Sweet

      1. **One lovely smile**

      2. **Two beautiful eyes**

      5. **Five cuddly toys**

      11. Put them all together and what do you get?

Neutral

      6. **Six Shiny Buttons**

Syllables used in intonation analyses are in bold.

Appendix F

Humor and Sweetness Ratings for Page Categories

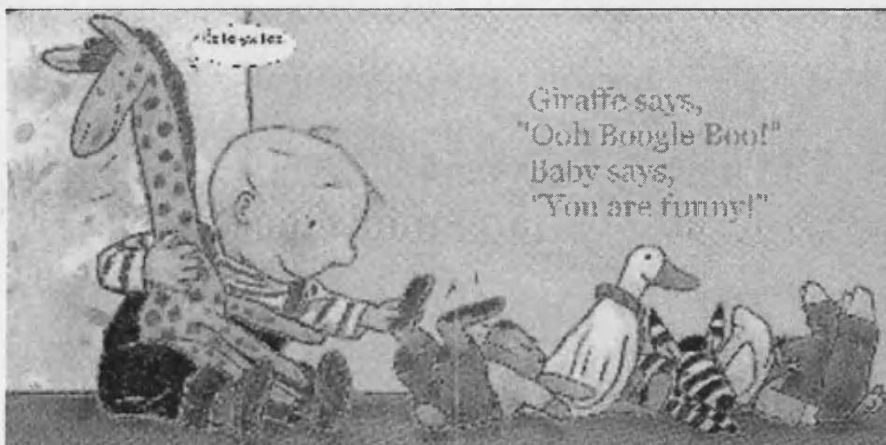|	Humorous and sweet	Humorous	Sweet	Neutral
Humorous				
Mean	4.70	4.26	2.51	2.65
SD	2.71	2.25	2.31	2.41
No. of ratings	20	20	20	20
Sweet				
Mean	6.76	4.63	6.60	4.75
SD	1.94	1.68	1.57	2.17
No. of ratings	20	20	20	20

Appendix G

Humorous Book
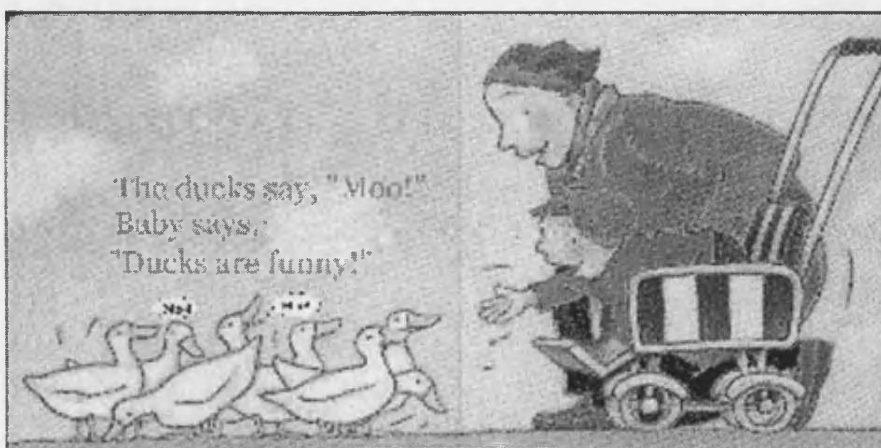

Baby wakes up one funny day.

Mummy drinks baby's bottle. Baby says, "Mum is funny!"

Daddy puts a banana on his silly baby. Baby says, "Dad is funny!"

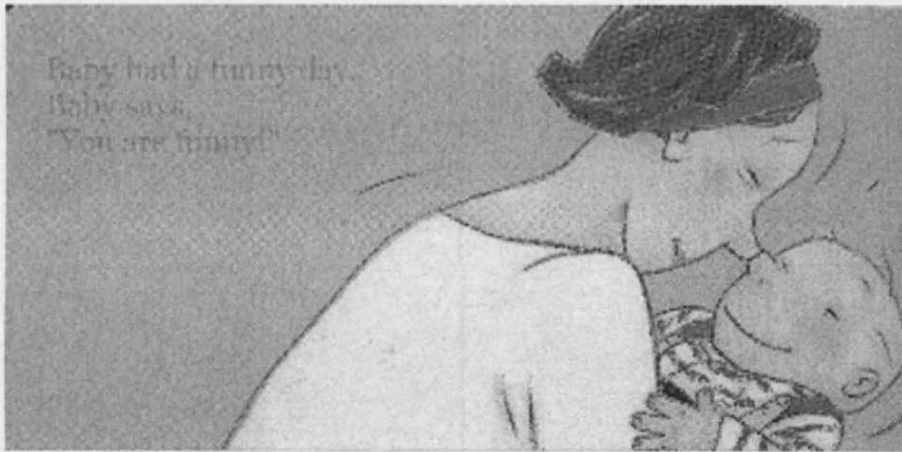

Giraffe says, "Ooh Boogle Boo!" Baby says, "You are funny!"

The ducks say, "Moo!" Baby says, "Ducks are funny!"

Mummy feeds zebra a strawberry. Baby says, "Mum is funny!"

Baby had a funny day. Baby says, "You are funny!"
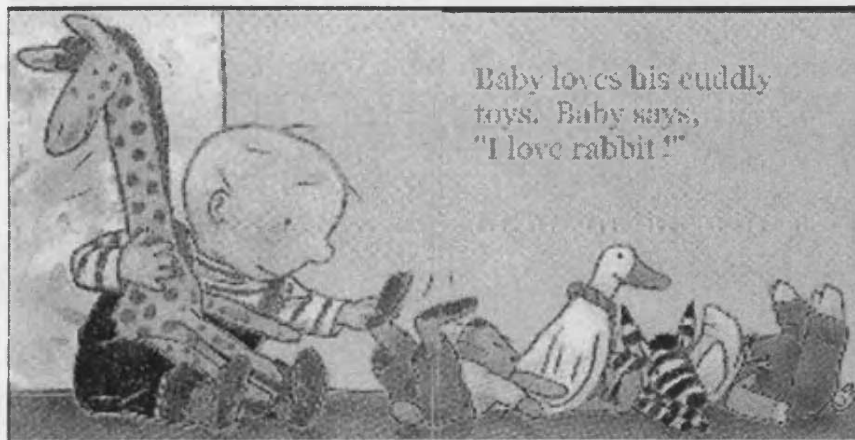
Baby wakes up one lovely day.

Baby loves mummy's cuddle. Baby says, "I love mummy!"

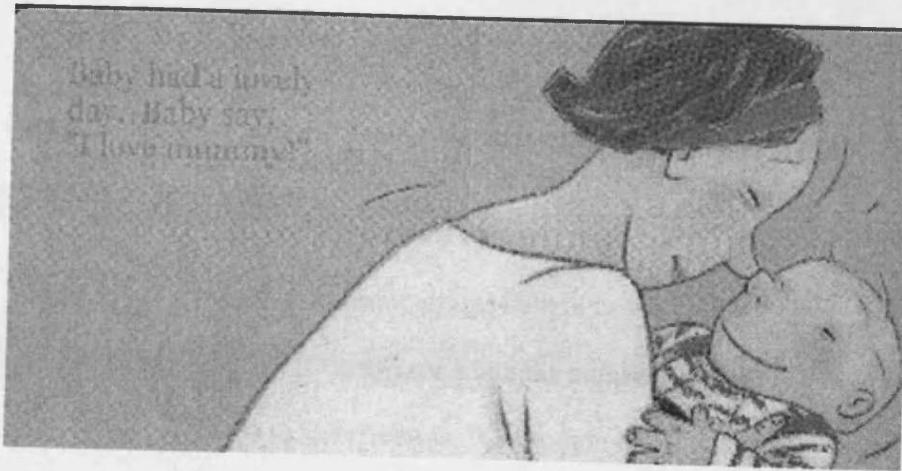Daddy peels a banana for his special baby. Baby says, "I love daddy!"

Baby loves his cuddly toys. Baby says, "I love rabbit!"

Baby feeds the cute ducks. Baby says, "I love duckies!"

Mummy feeds baby a strawberry. Baby says, "I love mummy!"

Baby had a lovely day. Baby says, "I love mummy!"

Appendix H

Pages in Study 2

Humorous

    1. *Baby wakes up one funny day*

    2. Mummy drinks baby's bottle

    3. Daddy puts a banana on his silly baby

    4. Giraffe says, "Oo boogle boo"

    5. The ducks say "moo"

    6. Mummy feeds zebra a strawberry

    7. *Baby had a funny day*

Sweet

    1. *Baby wakes up one lovely day*

    2. Baby loves mummy's cuddle

    3. Daddy peels a banana for his special baby

    4. Baby loves his cuddly toys

    5. Baby feeds the cute ducks

    6. Mummy feeds baby a strawberry

    7. *Baby had a lovely day*

Neutral pages are in italics. Page 6 was omitted from analyses. All other pages were either humorous or sweet.

Appendix I

Coding Criteria

- Mark only what the parent says (M or D), not the child (C).

- Don't mark textual utterances (lines they read from the book), or verbatim repeats of lines from the book. Only mark non-textual utterances (ETUs).

- Mark each uninterrupted utterance individually, and each sentence within each utterance individually, unless it is an exact or proximal repeat of the previous sentence.

- Mark animal noises and sound effects as level three as they involve bringing in outside knowledge about the object/s.

- Only mark parent-initiated utterances, don't mark responses to the child. However, do mark any additional comment or question added to the initial response.

   For example: C: car! Man in it.

   M: yes there is a man in it isn't there, can you see what he is doing?

   ("can you see what he is doing?" would be the only bit marked, and would be a level 2 utterance).

Appendix J

Examples of Sentences at Different Levels of Abstraction from the Transcripts

Level 1.

There's a mammy.

Who's that?

O that's a mouse is it?

Level 2.

whats the baby drinking?

Daddy's peeling it for him

Is he is he sucking his finger?

Level 3

Can you smile?

What does a duck do?

Oh we like strawberries don't we?

Level 4

Think he'll hurt his bottom if he goes down?

Does baby wanna get down

Look he needs to wipe his hands.

Appendix K

Coding System:

Code

(1) each ETU that expresses that parents intend for their child to disbelieve a past story content related declarative sentence;

(2) each story content related declarative that does not fall under category (1).

Story content related declaratives: utterances that are statements, and are either in the book or relate to the book. The declarative must relate to the content of the book, so any sentences about climbing, having a snack, etc that is not related to the book should not be included.

Types of declarative sentences:

1.Full sentences:

The cat is on the mat

I like cheese

2. Full sentences with confirmatory questions:

The cat is on the mat, is it? [welsh figure of speech]

I like cheese, don't I?

3. Incomplete sentences:

3a. References: words or incomplete sentences that refer to the pictures in the book

Dog

Quack Quack

Noisy ducks

3b. Answers to questions/incomplete statements that request an answer:

[This is a...]

Dog

[Do you like strawberries?]

Yeah

Not Declarative Sentences:

1. Questions:

What animal is that?

2. Incomplete sentences that request an answer:

This is a...

[Dog]

3. Imperatives (these are essentially orders or commands)

Look at the cat

Show mummy the carrot.

ETUs that express that parents intend for their child to disbelieve a past story

contend related declarative (disbelief statement): utterances that correct the *content*

of a declarative sentence. The person who said the declarative could be either the

parent or the child. The person saying the disbelief statement could be either the

parent or the child. The disbelief statement must relate to the content of the book, so

any sentences about climbing, having a snack, etc that is not related to the book

should not be included. Multiple disbelief statements can be made to the same

declarative, either said by the same or different people, and each is counted

separately.

Disbelief statements do not always directly follow a declarative. They can sometimes

follow a declarative after an intervening comment.

e.g   M: *Daddy sucks a dummy.*

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M; Baby says, dad is funny.

M: **Daddy's not supposed to suck a dummy.**

In the examples, the declaratives are in italics, the disbelief statement for each type in bold, and extra phrases that are neither are in normal font.

1. General corrections: Rather than correcting the specific content of a declarative, these disbelief statements could be used to correct any declarative, regardless of content. Where a general correction is an answer to a yes/no question, the question should be a general question, applicable to any declarative. A simple "no" to a declarative would also be included here as it is not content-specific.

e.g. *pigs say quack*

That's silly

Pigs say quack

Is that right?

No.

Duck

No, that's a cat.

2. Elicitation of general correction: these are general questions that could be applied to any declarative, regardless of content, that elicit a general correction (1)

e.g. *Pigs say quack*

Is that right?

No.

Daddy eats a hat

Is that silly?

That's silly.

3. Content-specific truth-value correction: parents correct the specific content of a declarative using negation and "no" answers to content-specific yes/no questions. When using negation, parents should reformulate the content of the declarative and add negation. In answering a content-specific yes/no question, the question should have been a reformulation of the content of the declarative.

e.g.　*Pigs say quack*

　　Pigs don't say quack.

　　Pigs say quack

　　Do pigs say quack?

　　No.

4. Elicitation of content-specific truth-value correction: yes/no questions that reformulate the content of the declarative that elicit a truth-value correction (3).

e.g.　*Pigs say quack*

　　Do pigs say quack?

5. Specific content correction: the parent gives a positive correction to a declarative that introduces new correct information not contained in the declarative.

e.g.　*Pigs say quack*

　　Pigs are supposed to say oink ["oink" is the new information

　　Pigs say quack

　　No, **Ducks say quack** ["ducks" is the new information]

　　Pigs say quack

　　What do pigs say?

　　Oink

6. Elicitation of specific content correction: parent directly elicits an explicit content correction (5) by asking questions or making incomplete statements which request new correct information not contained in the declarative

e.g. *Pigs say quack*

> **What do pigs say?**

> Pigs says oink.

> *Daddy sucks the dummy*

> **Who is supposed to suck the dummy?**

> Baby.

> *Pigs say quack*

> **Pigs really say...**

Trouble Shooting

Q: the child doesn't say many/any declaratives or disbelief statements

A: that's ok, they are young and may not.

Q: What if the disbelief statement isn't immediately after the declarative?

e.g. M: *Daddy sucks a dummy.*

> B: blah

> M: **Daddy's not supposed to suck a dummy.**

A: That's ok. Just copy in the disbelief statement and the declarative it corresponds to, and don't worry about what's in between:

> *"Daddy sucks a dummy."*

Disbelief statement: **"Daddy's not supposed to suck a dummy."**

Q: What if the disbelief statement corrects 2 declaratives?

e.g. M: *The pig says quack.*

> B: *quack*

M: **The pig should say oink.**

A: Assign the disbelief statement to the most complete sentence. If the two are equally complete, take the last one.

The pig says quack.

Disbelief statement: **The pig should say oink.**

Q: What if the same declarative has more than one disbelief statement?

e.g.   M: *The pig says quack*

M: **Do pigs say quack?**

B: **No.**

A: Give the declarative both disbelief statements, but on separate rows of the excel chart so that they can be counted separately.

Q: Are all negations disbelief statements?

A: no, for example, it may be correcting grammar, or something else that does not have to do with the truth value of the content.

e.g.   B: the cats is hungry

M: no, the cats *are* hungry

Q: Can a sentence contain two forms of disbelief statements?

e.g   *Duck*

No, that's a cat.

A: Yes. The first part [No] is a general correction (1), and the second part [that's a cat] is a specific content correction (5).

Duck

No, (1)

that's a cat. (5)

In the excel file, there are 6 columns:

1. video code

2. person who said the declarative sentence

3. declarative sentence

4. person who said the disbelief statement

5. disbelief statement

6. disbelief statement type

-For each declarative in the sentence, type in the video code in the code box, the person who said the sentence (parent=0, baby=1), then copy and past the declarative sentence into the declarative sentence box.

-if the content of the declarative sentence has been corrected, on the next line, type the person who said the disbelief statement (0=parent, 1=baby), copy and past the disbelief statement into the disbelief statement box, and type the disbelief statement type number in the disbelief statement type box.

-There can be multiple disbelief statements to the same sentence,

e.g.   "The strawberry is blue"

Disbelief statement 1: "Strawberries aren't blue"

Disbelief statement 2: "Strawberries are meant to be red"

e.g.

Coding Table Example

code	person	Declarative sentence	person	Corrective sentence	Correction type
7	0	The strawberry is blue			
7			0	Strawberries aren't blue	3
7			0	Strawberries are meant to be red	5
7	0	Cats have legs			0
8	0	Baby hugs his mummy			0
12	1	That's a spoon			
12			0	That's not a spoon	3
13	0	The strawberry is blue			
13			0	That's wrong.	1
25	0	The pig says quack			
25			0	What is the pig supposed to say?	6
25	0	Daddy sucks a dummy			
25			0	Should daddy suck a dummy?	4
25			1	No.	3
30	0	The strawberry is blue			
30			0	Is that right?	2
30			0	No.	1

Appendix L

Examples of Disbelief Statements

Humorous Book

M: ah! Mummy drinks baby's bottle.

M: does mummy drink your milk? [4]

M; no, I don't drink your milk. [3]

M: you drink your milk, don't you? [5]

M: oh! The ducks say moo.

M: ducks don't say moo, do they? [3]

M: what do ducks say? [6]

M: do they say quack quack quack quack? [4]

Non-humorous Book

B: apples

M: they're strawberries. [5]

B: Moo.

M: No, Piggy's don't go moo. [3]

M: That's the moo cows. [5]

Note. Declaratives are written in Italics. Disbelief stateme

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