THE ROLE OF THE OBJECT ON INFANT'S SEARCH IN AN A-NOT-B TASK

A thesis

Submitted in partial fulfilment

of

Master of Science in Psychology

in the

University of Canterbury

by

T. L. Morris

Supervisor: Dr Thomas Keenan

UNIVERSITY OF CANTERBURY

2001

ABSTRACT

Previous research on infant's development of the object concept has focussed on what environmental factors can influence search on an object permanence task. To date there has been very little focus on the object itself and the impact it may have on search accuracy. In the present study, 45 infants aged 9- and 12-months were tested on an A-not-B task. There were two conditions and infants were randomly assigned to these: familiar object and novel object. In the first condition a familiar object (played with for 7 consecutive days) and a novel object (a laboratory toy the infant had no previous experience with) were used to assess how the object could affect infant's search accuracy. Given the past literature on infant's preferences for novelty it was predicted that 1) Infants in the novel object condition would search more correctly on the B1 trial than infants in the familiar object condition; 2) That 12-month-old infants would have higher search means than the 9-month-old infants. The EASI II temperament scale was used to determine if negative affect influenced search behaviour. It was predicted that infants low on negative affect would search more accurately than infants high on this scale. Results indicated that on the B1 trial infants searched more accurately for the familiar object and that the 9-month-old infants searched more accurately than the 12-month-old infants. There was no correlation found between negative affect and search performance. Explanations for these results are discussed in relation to the optimal level of stimulation, levels of processing and dynamic systems theory.

ACKNOWLEDGEMENTS

I would like to start by thanking my supervisor, Thomas Keenan, for his time and effort throughout the year. Without his continual support, experience and expertise this quality of work could never have been achieved. It is due to his encouragement that I am able to present this thesis to such a high standard.

Thank you to all of my friends, family and flatmates, close and far, who supported me through this year. Without you I would have struggled to make it this far. Thank you to Adela and Leah for proofreading my work and teaching me what the focus in life should be. Without you all I would never have come so far.

I would like to particularly thank my parents who thought I would never leave university. Without your continual aid I would never have been able to enjoy the area I study to this degree. I appreciate all of your help. Also thank you to my work colleagues for being so supportive while I was trying to finish this year.

Thank you all for everything,
Tracey Morris

TABLE OF CONTENTS

Chapter 3

Chapter 4

LIST OF TABLES

CHAPTER 1
INTRODUCTION

Why is it that we find infants so helpless? Is it their lack of co-ordination in comparison to adults? Their inability to communicate verbally, or is it that we simply do not understand what they can do? Research to date shows that infants can actually do a lot more than psychologists have typically given them credit for (Butterworth & Harris, 1994). As adults, we are able to draw logical conclusions from events in our environment. For example, when we see an object being hidden we understand that although the object is no longer in our direct visual path it still continues to exist. This is a learned process and has taken a number of years for us to be able to say with some certainty that we are correct. If this is true then how does age influence your ability to represent new events?

1.1 OBJECT PERMANENCE

Piaget (1954) was one of the first developmental psychologists to look at cognitive development during infancy. He discovered that cognitive development appears to occur in stages where an infant sees an object and assimilates that information into its schemata. This appears to occur at different ages and it is age that is the important factor, not experience. Piaget (1954) discovered that cognitive development occurs at different stages in life. The first two years of development (which is the focus here) is entitled the sensorimotor stage. This period of time has six sub stages where an infant developmentally progresses through behavioural tasks at certain ages. While conducting this research with his own three children Piaget noticed an absence of spatial understanding at around 9 months of age. It was during this time period that he became aware that his children lacked an understanding of object permanence (i.e., the notion that a physical object is permanent and exists, independent of our actions and perceptions). The difficulties with object permanence are easily demonstrated through behavioural searching as many infants around 9-months perseveratively search for an object at an original hiding location after having seen it moved to a new location - the well known A-not-B error.

To focus back on Piaget's (1954) research there are three stages that need to develop before the infant is capable of searching for an object. Piaget (1954) describes 6 stages of development where the first two are combined. Here he describes these stages as the basic reflexes and habits that infants have when they are born. This stage of development shows little spatial organisation and no significant form of permanence. The third stage (secondary circular reactions) shows the beginning of the concept of permanence, that is the infant is able to grasp for objects but shows no systematic searching. The fourth stage of development (around 9 months of age) is defined by infants searching for hidden objects although they show no sign of regard for displaced objects. The difference between this and the fifth stage (at about 12 to 18 months of age) is that here the object is understood to be permanent, yet, the child is unable to take account of any changes in the object's position, specifically if it occurs outside their direct field of perception (Piaget, 1954). The sixth and final stage of sensorimotor development begins at 16 months and ends around 24 months. This age group shows a distinct image of absent objects and the infant is also able to represent their displacements. It is through the use of the A-not-B task that we are now able to determine when the child has fully developed a concept of object permanence. With all of these stages taken into account it is, however, this fourth stage that is most interesting. The question here is why do infant's perseveratively search for a hidden toy, when they have seen where it is actually hidden?

There are many explanations as to why perseverative search errors occur. Several researchers have attempted to explain their findings though various theories, however, very few seem to stand the test of time. Some of these theories have been well researched and have justifiable conclusions while others have not. For the purpose of this report it would be far too lengthy to discuss each one in depth, therefore this discussion is limited to the most pronounced theories which stand to date. We begin with a discussion of Wellman, Cross and Bartsch's (1987) meta-analysis of infant's difficulties with the A-not-B task, followed by Baillargeon's (1987a; 1987b; 1993) problem solving hypothesis, then Diamond's (1985; 1990a; 1990b; 1991a; 1991b) memory plus inhibition hypothesis, and finally discuss Thelen and Smith's (1994; 1995) dynamic systems approach.

To date there has been a multitude of studies completed in the area of object permanence, yet there is still not a single clear or consistent answer as to why infants differ in their search behaviour (Wellman, et al., 1987). When assessing the research in this area there have been many variations on what is described as the classic A-not-B task. From these studies there have been distinct differences in search performance, which has so far not been convincingly supported by any single explanation.

Wellman et al., (1987) completed a meta-analysis of the A-not-B literature in an attempt to reveal an underlying coherence to the mass of distorted findings. In an analysis of 30 studies it was found that no single theory could account for the findings when different variations of the A-not-B task were analysed. These variations included the age of the infants, the number of A trials, the delay between hiding the object and being allowed to search, the number of locations, the distances between locations, and the distinctiveness of the locations. Differences between these variables for each study were measured by assessing infants' search performance on the A-not-B task i.e., searching correctly at the B location, or searching perseveratively at the A location. The compilation of results for this study showed that age, delay and the number of hiding locations does influence the infants' search behaviour. Wellman et al., (1987) found that at each age (8-, 9-, and 10-month-old infants) there were above-chance A-not-B errors (perseverative search) and below-chance errors when combining delay and number of locations into the trial.

With these findings in mind Wellman et al., (1987) evaluated a number of the extant theories (Piaget, 1954; Bremner, 1982; Cummings & Bjork, 1983 a and b; Butterworth, 1975, 1977; Gratch et al., 1974; Harris, 1983, 1987; Diamond, 1985; Sophian & Wellman, 1983; Horobin & Acredolo, 1986; Butterworth, Jarrett & Hicks, 1982) and found that they all prove to be incorrect. This conclusion was made, as not one single theory could account for these pooled findings through one aspect or another. The authors (Wellman et al., 1987) proposed a new theory that was consistent with their findings. They tentatively proposed that there was a "conflict" explanation for the phenomenon of perseverative search, specifically with 9-month-olds.

Wellman et al., (1987) state that the search for hidden objects may occur through two different paths. These approaches are based on the deliberation of the relevant information about the object's location in space, with one approach being more in depth cognitively than the other is. The least complex option has been termed the "direct-finding approach" which assumes that the simplest solution to the problem is taken, that is, searching where the object disappeared (Wellman et al, 1987). The more complex approach was termed the "inferred-location approach" were the infant attempts to infer the location of the object through past experience - where they had previously seen it in space and time.

Wellman et al., (1987) claim that the A-not-B task leaves the infant with a problem, in that when solving the task, they could use either approach as the stage 4 infant is cognitively complex enough to use the direct-finding approach. It is which the approach they use that determines whether or not they make a perseverative error particularly at the B location. If the infant searches correctly then they have used the direct finding approach; if the search is incorrect then the inferred-location approach has been used.

For the 9-month-old infant there are factors in the A-not-B task that may influence which approach they use. Wellman et al., (1987) state that the direct finding approach can be inhibited by two factors, the first of which is the length of delay between hiding and finding the toy, as the longer the duration the more likely the infant will use the inferred location approach. The other factor is the distinctiveness of the containers, the closer they are in similarity the more likely the infant will use the inferred location approach, and alternatively the more different the containers the more likely they will use the direct-finding approach. In favour of the direct-finding approach Wellman et al., (1987) claim that as the number of locations increase, 9-month-olds are more likely to use the simpler approach. Both memory limitations and less mature problem solving skills are implicated as possible sources for the infant's incorrect search. It is therefore, thought that the use of the inferred location approach is the cause for perseverative searching in these 9-month-old infants. Thus, the infant suffers from confusion when attempting to apply the more mature inferential strategy, which then leads to perseverative searching.

Subsequent research has been conducted by Baillargeon and her colleagues (Baillargeon, 1987a, 1987b, 1993; Baillargeon, DeVos, & Graber, 1989; Baillargeon, Graber, DeVos, & Black, 1990; Aguiar & Baillargeon, 1998, 1999) which has examined the infant's understanding of object permanence. The authors did this through using the hidden object task but altered it by not requiring the infants to actively search for an object. The experiments instead rely on the infant's detection of apparent violations of physical reality, as opposed to the behavioural approach of searching for the object. They measured the infant's detection of these violations via their longer looking times at "impossible" events that are staged in various ways. Baillargeon et al., (1990) for example, showed that 5.5-month-old infants looked longer at "impossible" compared to possible retrieval events, which were staged in two experiments. This research strongly suggests that infants as young as this age group are able to represent hidden objects as well as identify what the necessary actions are (i.e., decide which well to search in, reach arm to the cover, lift the cover and drop it elsewhere, reach inside the well, pick up the toy, and finally pull it out of the well) to retrieve the object. The problem is that there are many stages where errors can occur so it is not just that they are physically unable to co-ordinate their body in order to execute these actions.

Baillargeon et al., (1990) put forward an alternate explanation from the one previously discussed by Wellman et al., (1987) in attempting to account for infants incorrect search behaviour. They have suggested that the young infant's deficiencies are located in their problem solving abilities rather than Wellman et al.'s (1987) proposed conceptual understanding or memory limitations. Baillargeon et al., (1990) suggest that infants are able to recognise what the actions are to reach correctly but are unable to behaviourally process the necessary means-end sequences. This inability to chain problem operations is thought to occur as in an A-not-B task the infant has to first reach for and grasp the cover, then remove the cover (before the toy is in sight), once this is achieved they then have to reach and grasp the toy which completes the process. This inability to problem solve by chaining events together is also thought to occur when tasks are known.

Baillargeon et al., (1990) have shown through their work with stage IV infants that they are able to cognitively process the means-end sequences but have difficulty

chaining the sequences together. The difficulties that infant's face in the A-B search task are that of selection (deciding upon the appropriate behavioural response) and chaining (the responses together), this occurs when there is a conflict between goals. As described above, the first goal of grasping the cover has been shown to interfere with the second goal of grasping the toy. This has been explained by Baillargeon et al., (1990) as they state that the perseverative search by infants, needs to be placed in a broader and overall developmental context as even adults may display similar difficulties when completing tasks that require generating conflicting sub-goals (Baillargeon et al., 1990).

One other theorist (Diamond, 1985, 1990a, 1990b, 1991a; Diamond, Cruttenden, & Neiderman, 1994) suggests that infants do posses a cognitive understanding of object permanence before they are able to develop both the motor skills and memory abilities to co-ordinate the correct actions required to search correctly for hidden objects. Diamond (1990a; 1991a & b) suggests that the infant's failure to search correctly in an A-not-B task is not due to memory alone but is also caused by immature brain development. Specifically before 12 months of age the dorsolateral prefrontal cortex and its neural connections have not fully developed. Diamond (1991a) suggests that one of the limitations infants show on the A-B search task may be due to their inability to inhibit behavioural responses which is similar to problems that occur in adults when damage occurs in this area (Lezak, 1995). The inability to inhibit motor responses in infants is thought to occur because of the insufficient neurological maturation as suggested by Diamond (1991a). This causes the infants to search perseveratively at the previously rewarded A location. With this in mind she suggests that coding on the A-B task may be better achieved by measuring gaze as it places less demand on the brain by requiring no means-end sequencing (Diamond, 1991a).

In a slightly more recent article Diamond et al., (1994) discuss how multiple wells relate to the previous theory. The main conclusion reached was that it supported a memory plus inhibition interpretation. The experimenters found that infant's tested, performed well on the A-not-B task, when their attention was drawn to the correct hiding well directly before the delay through recovering only that well, whereas, the infants performed poorly when they were distracted by all the wells

being covered simultaneously. They found that infants who had all the wells covered simultaneously (Condition 1) performed significantly worse on the first reverse trial and they also required more reverse trials before they were correct twice in a row. These infants also showed poorer performance overall and received less reversals than the other conditions as they were unable to reach correctly on two consecutive trials (mean number for reversals for condition 1 = 1.7, condition 2 = 3.3). Diamond et al., (1994) suggest that in other studies infant's may have performed better on the multiple well task because of greater separation between wells A and B, which may lead to easier discrimination between the wells. This has been supported by previous research (e.g. Horobin & Acredolo, 1986). The second part of this study showed that memory alone cannot be responsible for these findings; inhibition also plays a role. This study showed that previous reinforcement at the A location was also influential to where the infant searched on the B trial. The authors therefore concluded that both memory and inhibition are important determinants of success on an A-B task.

More recently Thelen and Smith (1994, 1995) have suggested an alternative means to explain the infant's acquisition of object permanence. The authors use a dynamic systems approach to the study of infant development; they argue that the main problem with previous theories on the development of object permanence and the object concept itself is that they all have the same fundamental belief. That is they all assume that there is an underlying mental structure or "concept" of the object in these infants. According to their dynamic systems approach, postulating that there is a fundamental conceptual belief that the object is a permanent entity is mistaken. They discuss that development of object permanence should be looked at through the materialising of a complex interaction of context-specific variables, which in turn progresses through to behaviour that occurs in real time. Thelen and Smith's (1994, 1995) dynamic systems perspective is that the object and the retrieval of the object are not cognitively represented before the trial, instead they appear to emerge "on-line". This emergence occurs within constraints such as limited perceptual, attentional and memory resources. Other factors include the infant's intentions or goals, and supporting cues from both the physical and social environments. With this taken into account the behavioural act of retrieving the object is thought to be an "attractor" state. This is a favoured solution to the numerous constraints, which are reinforced by the current context. Thelen and Smith's (1994, 1995) main argument is that the clue

to understanding the advancement from searching incorrectly to searching correctly for hidden objects is found within the changeability of the experimental situations which the A-B error itself occurs. In more simple terms, the production of the A-B error is dependant on the context in which it occurs as this can influence factors such as the perceptual, attentional, and memory resources available to the infant.

Smith, Thelen, Titzer, & McLin (1999) reviewed the literature and suggest that there are six factors that influence correct search behaviour. This includes the distinctiveness of the hiding wells, the amount of delay between hiding and finding the object, the physical abilities of the infants in relation to being able to reach for the object, previous experience with the A location, visual attentiveness toward the B location and the age of the infant, some of which supported Wellman et al.'s (1987) findings. The authors state that these variables are important and must be assessed when testing with the A-not-B task. They also explain that not one theory to date is able to completely explain the phenomena associated with object permanence, and how it can be influenced by the factors mentioned above.

Smith et al., (1999) attempt to approach these findings from a different focus, they suggest that this needs to be looked at in the context of what behaviour does the infant show that constitutes the error that they make. They conducted six separate studies to measure six different variables. The first was to measure the effects on search behaviour in relation to the number of A trials. For this study 57, 8- and 10-month old infants were tested under three different conditions. The first condition had no pretrials, therefore starting with the first A trial. The second condition pretrained the infants at the A location, and the third pretrained the infants at a centre location called C. The results of this study clearly show that when you measure previous experience it does influence search behaviour. The authors here clearly establish the importance of the context within the A-not-B task. In relation to the A trial, Smith et al., (1999) found that infant's pretrained at the C location were less successful at correctly searching at A than the pretrained A infants, however, both groups were more successful than the infants with no prior experience at A. Comparatively, at the first B location the infants in the pretrained A condition were significantly worse at searching correctly. This suggests that the amount of previous experience at A does influence success at B.

The second experiment conducted by Smith et al., (1999) was to determine if reaching to a location in space is a factor in this task, if so then the A-not-B error should occur whether or not the infant searches for a toy. The results showed that there were more infants than one would expect by chance searching correctly at A. In addition, they also reached back to A more than would be expected by chance on the B trial. The authors then suggest that it is the process of reaching, not memory that influences perseverative searching.

In the third study they tested preferences by infants, where in the first condition a lid was waved at the infant and in the second condition there was no waving of the lid. The results showed that infants who were biased in the first trial preferred that side on all other five trials. Infants in another condition who had the experimenter wave the lid a second time swapped preferences as though the first preference had never occurred. The data here supports the theory that visual attention and memory of prior reaches are combined and can influence direction of reach.

The fourth and fifth experiments looked at visual attention on both the A and B trials through altering the infant's direction of gaze by tapping the container with a rod. The results show that infants on the A tap side reached to the A side more than those in the B tap location. In the B trial infants showed the same behaviour. The results here suggest that visual attention does influence goal directed reaching, where an infant looks influences where they will reach, also previous reaches influences their behaviour.

The sixth and final experiment looked at posture and spatial coding in relation to the body. They state that past research (Georgopoulos, 1990, 1991) suggests that posture influences direction of reach, more specifically the information about the location of the object is coded through the current hand position. Because of this it suggests that a shift in posture, should alter the signals that code the direction of the infant's reach, just like visual attention has. In this study infants were made to stand up between the A2 and B1 trial causing the infant to reach down to the lid. Very little differences were found in the A trial, yet on the B trial there were significant differences. Infants in the experimental condition (standing) were more likely to

reach correctly than those who remained sitting. This research clearly demonstrates that reaching is posture specific and spatial encoding of the location is also important.

In forming a theory based on the findings, Smith et al., (1999) state that goal-directed reach is a complex process which involves many different areas in the brain. These areas form the function of visual input, direction of reach, posture and memory. They also included that the system used remembers previous searches and that it is biased toward the use of perseverative reaches. These multiple processes that develop are thought to explain why the infants perseveratively search on the B trial, as they have not yet fully developed and therefore, can also explain how the same infants only a few months later search correctly. Smith et al., (1999) demonstrate this explanation through the fact that infants learn to reach, crawl, and walk all within months of when this phenomenon occurs and this transition to walking gives the infant more experience and skills to allow them to overcome the incorrect searching.

Smith et al., (1999) state that these factors of both neurological development and the findings in the six conditions can only be explained through the use of a complex dynamic system. Smith et al., (1999) conclude that perseverative reaching is a product of multiple processes which include looking, discriminating locations, posture, previous search memory, and the planning of motor skills. There is input to the brain from all the above variables and infants search correctly to the B trial when the immediate perceptual input for the B location is stronger than the internal information to the A location. The A-not-B task requires the use of all of these processes. The 9-month-old infant is frequently unable to combine all this information causing perseverative reaching. However, in older, more experienced infants, the components of the system (e.g., memory, inhibition, reaching and spatial skills etc.) have developed so that they are able to search correctly in the B trial. In an overall discussion of the literature and their findings Smith et al., (1999) discuss the possibility of the A-not-B task not actually measuring object permanence due to the multiple processes involved, as this task requires the infant's memory, their motor co-ordination, spatial ability and the use of many more related areas of the brain. Also many of these processes are also influenced by context changes, which all add to support the idea that the task does not measure the infants understanding of object

permanence. Thelen and Smith have generated more work, which also supports these findings (e.g. Diedrich, Highlands, Spahr, Thelen & Smith, in press; Diedrich, Highlands, Spahr, Thelen & Smith, Unpublished).

In a recent study of the AB task Munakata (1997) tested infants to determine if search behaviour increases or decreases when searching for a toy or no hidden object. Munakata (1997) completed two separate studies both, which agree with Smith et al's (1999) conclusion that the context is important but she diverges through showing that the object is important. The first experiment was a partial replication of Smith, McLin, Titzer, & Thelen's (1995) study that found that infants still make the AB error when nothing was hidden. Smith et al., (1995) made the conclusion that the use of toys in the AB trial is not relevant to the error being produced. Munakata (1997) however, found fault with the Smith et al., (1995) study in that they did not test their claim directly. Munakata (1997) tested twenty-four 10-month-olds on the AB trial where the conclusion was made that if the object is not an important aspect of the context then searching for a toy should make no difference on the B trial. Therefore, there should be no difference between infants searching for a toy and infants searching for a visible lid. The results of this first study showed that there was a difference on the B trial, in particular the errors made and the number of B trials required differed for the two conditions. The toy condition produced significantly lower B trial errors than the lid only condition, also the lid only condition infants required more B trials than the toy condition. The results of this study clearly show that the use of toys in the A-not-B task influence search behaviour on the B trial, therefore, not confirming the Smith et al., (1995) conclusions.

The second experiment conducted by Munakata (1997) was an extension of the previously discussed study to determine if a reinforcement or novelty theory can be used to discuss the results. In order to test the reinforcement hypothesis it was determined that infants in the toy reinforcement condition would remove the A lid on the A trials more than the infants in the original study who had not been reinforced by the toy. Yet if the novelty account proves to be correct then infants in the B trial with the lid only condition should search correctly more often than the infants in the toy condition on the B trial.

The results in this second study did not support either theory as in this experiment the infants made similar A-not-B errors for both the toy and lid condition. Munakata (1997) concluded that the use of toys in the AB task does influence B trial performance, and that no one theory to date can be used to explain the results found from this research.

Much of the past research has focussed on the role of context in an infant's performance on the A-not-B task. This has included many manipulations described by both Wellman et al., (1987) and Smith et al., (1999) (the use of contrasting coloured covers, the increased salience of spatial cues (Butterworth, Jarret, & Hicks, 1982), and the number of hiding locations (Diamond et al., 1994)). As described above by Smith et al., (1999), this has aided in our understanding of how context can influence performance when searching for a hidden object. They showed that prior experience, reaching, visual attention, and spatial coding all influence performance. If this is indeed true then surely the research by Munakata (1997) shows that the object itself is just as important. To date, there is still a large gap in literature on how the object can influence performance and whether it is an important context that needs to be accounted for in testing. Hence, we must ask if there are particular properties to the object which might enhance correct searching for infants and how these may influence infants of different ages?

1.2 NOVELTY AND FAMILIARITY

There are many different facets of the object that can be assessed. One of the most commonly studied areas is novelty and familiarity, which is a main area of research on younger infants. The noted differences are the recognition and habituation of novel and familiar objects. Many studies have looked at the differences in rates of habituation in infants, predominately through preferences in paired comparison tasks assessing differences between novelty and familiarity (e.g. Hunter, Aimes, & Koopman, 1983; Eson, Cometa, Allen, & Henel, 1977; Weizmann, Cohen, & Pratt, 1971; Sophian, 1980). In all of these studies there are many different variables that are assessed and also many different time intervals that measure habituation. Most of these habituation studies test infants who are younger than those used for object permanence, yet the infant's preferences and habituation levels should

hold true for older infants. One study of importance is by Hunter & Ames, (1987) which discusses earlier research and many differences found in early infancy such as length of time for familiarisation, the effect of age, and task difficulty.

Hunter & Ames, (1987) begin their discussion with a reference to previous research. They discuss Hunt's (1970) findings that infants under 2 months had a preference for familiarity where infants older than 2 months tended to prefer novel stimulus. This finding has also been supported by Wetherford and Cohen (1973) and Weizmann, Cohen, and Pratt (1971). With this in mind Hunter & Ames, (1987) further their discussion by explaining how to date there is little coherence about age preferences for novel and familiar stimuli. In attempting to find an underlying coherence to the mass of literature they begin their discussion with the well known optimal level of stimulation theory. This is where an organism is inherently motivated to seek this optimal level of stimulation and become less interested in matters below this level (Hunter & Ames, 1987). The optimal level of stimulation is different for each individual, however, every person actively seeks novelty to reach this optimal level. If there is too much novelty available then confusion will occur until some of this information has been processed. Once enough information has been processed then one continues to seek more novelty. One of the main sources to obtain the optimal level of stimulation in infants is thought to be novelty. The authors further explain that when novelty is discussed familiarity also needs to be mentioned as this exists almost on a continuum (Hunter & Ames, 1987). It is thought that once an object ceases to be novel it then becomes familiar. In infancy this is tested through habituation. When you include the optimum level of stimulation into this continuum it becomes obvious that an object is most stimulating when it is novel and over time it becomes familiar making it less stimulating. One variable that does theoretically influence this continuum is age, as an infant becomes older the length of time between an object being novel and it becoming familiar decreases. Older infants also show greater novelty preferences than younger infants (Sophian, 1980). With all of this taken into account age preferences do not always occur as expected. Friedman (1972), and Milewski and Siqueland (1975) both found novelty preferences in infants younger than 2 months of age. As with any research on development this is not always consistent as there have also been some studies showing familiarity

preferences in older infants (e.g., Hunter, Ross & Ames, 1982; Rose, Gottfried, Melloy-Carminar, & Bridger, 1982).

Aside from this overall view of novelty and familiarity there have been a number of studies looking at individual variables in different aged infants. One example of this is Hunter, Ames and Koopman's (1983) study that looked at stimulus complexity and how it is influenced by habituation. The authors discuss how in the previous studies where they have found unexpected age preferences (i.e. infants under 2 month preferring novel toys and infants over 4 months preferring familiar toys) may be due to infants not being fully habituated to the object. Hunter et al., (1983) tested different aged infant/s with different levels of toy complexity. The main finding showed that infants in both age groups who were habituated to toys preferred novel stimuli. In comparison infants who were in the familiar condition but were interrupted before habituation could occur preferred familiar stimuli only as long as it was complex enough for their age. In conclusion Hunter et al., (1983) claim that although infants show age preferences it might be more accurate to say that this would only occur when the amount of familiarisation, the measure used to determine the preference and the stimulus complexity were all taken into account.

Other areas of research include infant's perception of texture (Stack & Tsonis, 1999; Gottfried & Rose, 1980), infant memory (Rose, Gottfried, Melloy-Carminar, & Bridger, 1982) and different levels of arousal (Geva, Gardner, & Karmel, 1999; de Haan & Nelson, 1999). Of all of these studies most use paired comparison tasks or a similar variation of this task to measure for example visual fixation. With all of this research using novelty and familiarity as a major variable there is actually very little investigation into whether this phenomenon occurs when infants are tested on a different task. Personality research (Eysenck, 1976) shows that the optimal level of stimulation occurs for children and adults, therefore, most people show preferences for novelty, so (theoretically) should older infants. One way to measure this would be to test infants of different ages on an object permanence task, which would measure differences in behavioural preferences rather than visual preferences for novelty and familiarity. One measure of behavioural preferences for object permanence would be to test two samples, one familiar with an object, the other a control (novel) sample and test group differences on search behaviour. This method of testing preferences

has been previously introduced to the literature although there has also been conflicting findings.

1.3 NOVELTY, FAMILIARITY AND OBJECT PERMANENCE

Bell (1970) was one of the original researchers who looked at the concept of the object and the influence of novelty and familiarity in relation to Piaget's (1954) sensorimotor period, Bell (1970) recognised that according to Piaget (1954), the concept of person permanence is gained ahead of other inanimate objects, as the person is the most interesting of all objects. This difference in time between the person and the object being recognised by the infant is described by Piaget (1954) as *horizontal décalage*. This horizontal nature of the décalage is thought to occur as person permanence both begins and is completed ahead of object permanence. Bell (1970) chose to look at the attachment of the child and how that influences object and person permanence. This was based on the hypothesis that both object permanence and attachment are influenced through the mother and infant interaction in early life, as how can an attachment be formed without the infant realising that the person is a permanent entity. The authors made three predictions: first, that there should be a positive décalage in the development of the permanence concept. Second that the direction of this décalage is related to the attachment behaviour of the infant, and finally that any discrepancies in responses are associated with the speed of development of the infant.

This study used 33 infants in a longitudinal within subject's design where the participants were tested at home on three separate occasions through a modified A-not-B task. The object stimuli used were small toys that were interesting to the babies. The object was hidden behind a screen and an object scale was used to determine the level of the object concept that the infant had reached. For the test of person permanence, the stimulus was the mother. Based on the infants level of understanding they were classified into three possible groups, first, positive décalage (the person's score being more advanced than the object): secondly, negative décalage (the object was more advanced than the person was): and third, no décalage (no significant discrepancies).

The findings show that most of the participants displayed some form of décalage with 23 being positive, 7 negative, and 3 with no décalage. The results also show a relationship between attachment style and type of décalage where all twenty-three of the infants in the positive décalage group were in the secure attached group. Statistical analysis showed that infants who where in the positive décalage group (more advanced in person permanence) were more advanced at every stage of both person and object permanence than other infants. In a further analysis at 13 ½ months it was suggested that infants in the positive décalage group have less difficulty or are more advanced in their ability to achieve object permanence at this age than those in the other groups.

From these results, it was concluded that person permanence has a corresponding type of structure to object permanence but differs in rate and onset with person permanence or positive décalage being more stable. By understanding how important the attachment of an infant is and how object and person permanence is connected to this concept, then surely the testing of the object is just as important as testing the person.

Jackson, Campos, & Fischer (1978) conducted a further extension of the Bell (1970) research in studying the stimuli tested in object permanence tasks. This was achieved through researching the possibility of a décalage occurring in the cognitive development of infants. In order to test this theory the authors used four different types of stimuli: an unfamiliar object, a familiar object, an unfamiliar person, and a familiar person. They proposed that due to previous research findings (Berlyne, 1960; Kagan, 1971) familiarity might be a factor when accounting for differences in cognitive development.

In order to test their predictions Jackson, Campos and Fischer (1978) conducted two experiments. The first looked at whether any differences in the infant's level of décalage between the person and object stimuli can be reduced by using the same apparatus and testing procedures which previous research had not accounted for. For the second experiment the authors looked at the task requirements and whether it has an effect on the stage of performance when the one object is hidden in two different ways.

The first experiment showed that there was only one significant effect with any relevance to décalage, this was an effect for the familiarity of the object where the familiar toy was searched for consistently earlier than the novel toys (28.95wks vs. 29.15 weeks). One other significant effect was shown and that was for stage of development. This experiment also showed that on both individual and group analysis, there was no décalage. Yet, under further analysis it appeared that the unfamiliar object produced a better response than the familiar object and that when the décalage occurred it significantly favoured toward the person rather than the object.

In study two, only two stimuli were used: the familiar person and the unfamiliar (novel) object. The results indicate that when the object remains constant but the tasks differ from the standard object apparatus to the object and person permanence apparatus, that there was a significant décalage shown. The décalage was directed toward the apparatus, which displayed a greater mean stage of search (a surpassed understanding of permanence developed at an earlier age) for the person than the object apparatus. The stimulus also showed a form of décalage where the familiar person gained a higher stage of search than the unfamiliar (novel) toy. Overall the décalage was greater for the task assessment than the object assessment.

The results of this study clearly support their three hypotheses, it also shows that practice, task, and content contributed to the décalage that was shown. The authors (Jackson, Campos, & Fischer, 1978) then go on to state that practice had the highest contribution to the décalage, followed by task and then content. In relation to the novelty and familiarity findings, the fact that unfamiliar (novel) objects elicited higher stages of search (more developed understanding of permanence) which was explained through the use of the novel toy. It was thought that this was related to the novel nature of the toy as it was changed each week, rather than any special feature of the toy. This then leads us to the conclusion that if object permanence is tested correctly then infants will show slightly more advanced search behaviour for person permanence than object permanence while novelty should be much more advanced than familiarity.

In contrast to Bell's (1970) and Jackson et al.'s (1978) work using people as objects, Lingle & Lingle (1981) decided to examine infants' search performance for familiar and novel objects. This study by Lingle and Lingle (1981) was an extension of the person permanence literature while being one of the first to research the object itself in detail. This study began by looking at the differing rate of development of object permanence in infants by separating and researching objects that are familiar, "attached", or novel through testing infants with a standard A-not-B task. The novel object was a small red cube, while the familiar object was a small plastic toy mouse, which was presented to the infant daily for one week prior to testing. The "attached" object was one of the infant's own toys which was identified by the mother as being "an object that the infant cries for or actively seeks out during times of stress and that perceptibly calms the child." This object was predominantly the child's bottle with other objects being small toys, for example a cup, rattle or pacifier. The experimenters initially explain the need for the research as previous research has had confounding measurement errors such as differential treatment of objects and, testing objects having both familiar and motivational properties.

This study tested 36 infants between 8 and 13 months of age looking at the effects of object type, age, and the examiner. The results indicate that object familiarity alone did not influence test performance, when collapsing across the age and examiner grouping variables the mean performance of the familiar group was significantly higher than that of the novel group. Other findings indicate that older infants performed better than younger ones, and that the infants tested by the first experimenter performed better than those tested by the second experimenter. When including the attached data the only significant interaction was that of the experimenter and the object. Other results show that when analysing the second experimenter's data that the attached-object condition performed better than the combined unfamiliar and familiar object group.

The author's (Lingle & Lingle, 1981) best explained the findings through a motivational interpretation of object-related performance differences i.e. infants are more motivated to search for familiar than novel or attached objects. This was concluded as one of the experimenters was thought to have caused increased feelings of uneasiness in the participants. The results show that these infants performed poorer

on the unattached objects when compared to those with the other experimenter, yet comparatively, performed better on the attached objects than the others. Due to the experimenter differences it is difficult to draw any firm conclusions from this data, however the authors do show that when all variables are accounted for that infants searched more accurately for the familiar object which contradicts both Bell (1970) and Jackson, Campos and Fischer's (1978) findings.

A number of methodological concerns of this study have become apparent. The first concern is in relation to what has previously been discussed in the results, which is the use of multiple experimenters. The results of this study showed that there were differences between the experimenters, which may have had implications in the findings for the attached objects. The second is that the experimenters only used one unfamiliar or novel object which was used for multiple testing, a further extension of this is that the object used would have maintained interest for only a limited time (Tardona & Bradley-Johnson, 1984). Another flaw that contributes to the ambiguity of the findings is that the objects in the attached object condition varied across infants. That is, some infants searched for an object such as their bottle while others searched for pacifiers or some other toy. This means that there are differences in the salience of the object within this condition (Tardona & Bradley-Johnson, 1984).

In both the Lingle and Lingle (1981) which has been discussed and the Tardona and Bradley-Johnson (1984) study (which is yet to be discussed) they describe conditions such as the attached object and a significant object where the infant is thought to have an emotional connection to the object (e.g., Winnicott, 1953), such as their bottle, pacifier or some other small object. Winnicott (1953) is one of the first to discuss the importance of such objects to infants. He begins this by introducing how infants become fond of some special object and that mothers allow this to happen. This object is described as the first *not-me possession* or a *transitional* object. The object, which has been chosen by the infant, is thought to be a defence against anxiety. Winnicott (1953) describes this object or phenomena beginning anywhere between 4- to 12-months-old, and notes that it may continue through into early childhood.

In a psychoanalytical approach Winnicott's (1953) description of how the transitional object becomes important is through the process of weaning from the breast. This process is described as the infant at the beginning of its life is thought to be under the illusion that the mothers' breast is actually part of the infant. Because of this the mother's task is the process of gradually disillusioning the infant. Winnicott claims that if this process is successful then the next stage that the infant has to deal with is the weaning process. It is during the weaning phase that the infants are thought to almost substitute the need for the breast with the transitional object. The transitional object differs between boys and girls where girls tend to choose soft toys and boys choose hard toys. Winnicott also describes the infant's relationship to the toy as an item which soothes the child and which the child can become attached to later in the process. This form of attachment is examined in the following study.

Tardona and Bradley-Johnson (1984) looked at the function of the object in relation to the testing of object permanence in infants while attempting to control for the confounds in the Lingle and Lingle (1981) study. The authors tested infants to determine if there would be differences in the stages of search for three different stimuli: novelty, familiarity, and significance (similar to Lingle and Lingle's attached objects). This was achieved through the use of data from thirteen 7-month-old bottle fed infants and through testing them with a similar apparatus as the object-person apparatus in the Jackson et al., (1978) study. For this study, the familiar object was an object, which the parent brought from home and was played with regularly, where the significant object was the baby's own bottle. The novel objects were confirmed by the mother that the child had never had contact with them prior to testing.

Tardona & Bradley-Johnson (1984) used a within subjects design where 13 infants received all three conditions and testing was conducted near feeding time. The results of this study showed that there was a significant effect for object type where the infants showed higher levels of search behaviour (more advanced in object permanence at an earlier age) in the novel object condition than in either of the other two conditions. Performance in these other conditions differed significantly from each other (post-hoc) with a higher level of search obtained in the significant group than the familiar group. This provides evidence that the infants obtained the highest

search level for the novel object, then the significant object, and the lowest search behaviour for the familiar object.

The authors state that these findings support most prior research into the novelty phenomenon and explain that due to the rewarding effects of novelty the findings are not surprising. The authors then go on to discuss the difficulties in determining the differences between properties such as novelty, familiarity and significance and how they interact. It was discussed that the babies' bottle (the significant object) may have had some of the characteristics of familiarity, which has the possibility of lessening a possible relative value in comparison to a novel toy. It is then discussed that these characteristics may also account for the novel stimuli's higher level of search behaviour

One problem with the Tardona and Bradley-Johnson study is that only thirteen participants were used. Thus, statistical power may be an issue. Ideally, a larger number of subjects should be employed. Also, the use of a within subjects design meant that infants received all three conditions leading to the suggestion that fatigue might have been a factor in their performance. Another factor that may have affected the results is related to the issue of feeding. Testing was conducted near feeding times, which may have had an effect on the infant's desire to search for the significant object (their bottle). These limitations will be accounted for in this study.

1.4 THE PRESENT STUDY

The primary objective of the present study was to build upon and further clarify the existing literatures findings on novelty and familiarity. To do this a between subjects design was chosen as it should lessen attentional problems and eliminate any possible practice effects that might occur using a within subjects design. One other difference from the previous research is that there are significantly more participants (enabling a higher level of statistical power), and a modified apparatus (to determine if there are any differences), while maintaining a similar style of object classification.

The participant's ages were chosen to be 9- and 12-months-old. This was decided upon, as these are the ages most suited to Piaget's (1954) fourth stage of development. This age group is also suited to the object permanence task (the A-B task). The A-not-B task was slightly modified from previous research in that it was a freestanding table where the experimenter, the mother, and the child are all facing the table. Also the child was sitting on the mothers lap making the hiding wells more accessible to the child. The object classification was similar to some of the previous studies in that we used both *novel* and *familiar* stimuli. The novel stimuli was used as a control group, and the familiar stimuli had been chosen, as it is the opposite of novel when looking at this on a continuum. Also, the literature is not yet clear on whether the same effects as the paired comparison tasks will be seen if a behavioural measure is used as opposed to a visual measure. Both of the novel and familiar categories have been tested in previous studies, where this study differs is that we demonstrate a more clear definition between the two constructs. This is achieved through all of the infants having the familiar toy in their homes for 7 days prior to testing. By using this criterion habituation should have most definitely occurred which should lead us to the prediction that a behavioural measure of novel and familiar preferences in infants should result with similar findings to the paired comparison tasks – that of a preference toward novelty.

Hypothesis 1: That infants in the novel object condition would search more accurately on the B1 trial than infants in the familiar object condition.

With the intention of controlling for the object variables the novel object was a toy from the laboratory. Mothers were asked to confirm that the infant had no previous experience with the specific toy (a range of toys were made available to ensure a novel toy was selected). The familiar object was a standardised toy, which was the same for each infant. This toy was delivered to the child's home one week prior to testing and the mother was asked to present this to the child daily up until the point of testing.

To account for the differences in tasks between the A-not-B task and the paired Comparison tasks, we intended to use one dependent measure. That is search success. A number of authors have shown in their research that in an A-not-B task

where the babies search manually, infants at seven months show only chance rates for passing the standard object permanence task (MacLean & Keenan, 1996). In addition, previous studies that have focused on the role of the object in A-not-B performance have examined only a restricted age range. One issue associated with this point is that the relationship between novelty and familiarity may change with age (i.e., the age preferences of 2 and 4 month olds); that is, while previous research has suggested that 7-month-old infants may prefer to search for novel objects over familiar objects, it has not been definitively tested as to whether the same preference will be obtained in older infants. It is possible that the increases in sensory-motor development associated with the transition to Stage IV object permanence at 9 months will lead to a bias in familiarity as infants consolidate their newly developed ability to mentally represent an absent object. While it is just as possible and more probable that the optimal level if stimulation theory will occur with this age group and the preferences will be toward novelty. Therefore, in the present study, we tested two groups of subjects, 9- and 12-month-old children. This allowed for a more complete picture of the relationship between novelty familiarity and infant search behaviour.

With these different age groups and the fact that the task we are using is more difficult for 9-month-olds we predicted that there will be differences in performance for the age groups.

Hypothesis 2: That the 12-month-old infants will perform better than younger 9-month-old infants on the object permanence task.

One area this research accounts for is group differences between novel and familiar stimuli. However, the area that is lacking, is a major area in developmental psychology and in infancy which is individual differences. More commonly termed temperament.

1.5 TEMPERAMENT

Temperament is thought to describe individual differences, which are stable across time and consistent across situations. The factors that are most commonly thought to be stable are emotional reaction, activity level, attentional capacities, and

emotional self-regulation (Rothbart & Bates, 1998). The major differences in individuals for these factors are the quality and intensity of a reaction to the environment. Recently personality psychologists have become interested in temperament as it is thought to have the core traits that form an adult personality. These traits are thought to be constant enough over time so that the nucleus of ones personality that exists at birth grows over time to determine some of the later personality that is formed as an adult (Rothbart & Bates, 1998).

Many researchers have studied temperament, with this as in any other topic in psychology there are many different theories as to what the main factors are that can be classified under the title temperament. Thomas, Chess, Birch, Hertzig, and Korn (1963) first published their findings from the New York Longitudinal Study (NYLS) where they concluded that there were nine dimensions. This included activity level, approach/withdrawal, adaptability, mood, threshold, intensity, distractibility, rhythmicity, and attention span/persistence (Rothbart & Bates, 1998). However, other researchers such as Buss and Plomin (1975, 1984) provide evidence that there need to only be three or four sub-factors. Their original work shows that emotionality (negative emotions only), activity, sociability and impulsivity (EASI) are the most important factors however, nine years later they dropped impulsivity and claim that it is not established as a dimension of temperament (Rothbart and Bates, 1998). While others such as Rothbart (1981) advanced from the NYLS to develop the Infant Behavior Questionnaire (IBQ) and proposed that only six categories need to be measured (activity level, smiling and laughter, fear, distress to limitations, duration of orienting, and soothability). While it is unclear as to who is correct, Rothbart and Bates (1998) discuss how although there are a number of different names for the scales many of them are actually measuring the same thing.

Many of the sub-scales of temperament have been applied to different areas of psychology to determine if there is some form of predictability of early personality to later behaviour. An example of this is emotionality and depression or activity level and behavioural adjustment (Rothbart & Bates, 1998) which has been shown to have a moderate correlation. A large amount of research has also focussed on temperament and attachment where temperament has been found to influence the measurement of attachment (Kagan, 1982). Once again however, object permanence has infrequently

been linked to temperament. One of the very few studies that has looked at this interaction is Keenan (2000). This study has focussed on negative affect and performance on an object permanence task.

Keenan (2000) argues that attention is a mediating factor toward searching correctly on an A-B task (as suggested by Thelen and Smith, 1995). While this concept is supported by research, he further explains that good emotion regulation skills (which some think of as a temperamental trait) is critical to maintaining attention in an A-not-B task. The reversal then should have a negative impact on their performance; negative affect would influence an infant's attentional capacity, which in turn would influence how well they perform on an A-not-B task. Their hypothesis was that infants who show high scores of negative affect are less likely to search correctly at the B trial than those who score low on negative affect. The results confirmed their hypothesis, as there was a significant difference on the B trial between high and low scores of negative affect where infants who had high scores performed worse than infants who had low scores. The author concluded that negative affect mediated the interaction between attention and search performance on the B trial (Keenan, 2000).

From the Keenan (2000) research it would appear that negative emotionality in infants would hinder their performance on the object permanence task.

Hypothesis 3: Infants who score high on the emotionality scale of the EASI II will show lower correct search behaviour on the object permanence task when compared to infants who have low scores on the same scale.

To measure this we propose using Buss and Plomin's (1984) EASI II scale to measure negative emotionality in infants. This scale was chosen as it focuses specifically on negative emotionality, while also being short in length which enables parents to complete the scale during the warm up phase of the experiment in a short time span.

CHAPTER 2

METHOD

2.1 PARTICIPANTS

Participants were 45 full-term infants whose parents voluntarily contacted the administrator about being participants in this study. Two groups of infants, aged 9 and 12 months were tested. The mean age of the 9-month-old infants was 9 months 12 days (SD = 7.5 days; range 8 months 3 days to 10 months 18 days), there were12 males and 11 females. The mean age of 12-month-old infants was 12 months 14 days (SD = 6.4 days with an age range of 11 months 12 days to 13 months 22 days), there were 11 males and 11 females. Socio-economic status was not formally measured however, it became apparent (by taking the familiar toy to the parents house) that the majority of participants were from middle class families. Although ethnicity was also not formally measured due to limited sample size within the Canterbury region, participants were of varying ethnicity groups including Pakeha, Maori, and Asian. An initial total of 60 infants were tested, however, 15 of these participants were excluded. Infants were excluded due to excessive fussiness (8 infants); inability to grasp the task (3 infants); attentional difficulties (2 infants); limited mobility (1 infant), and one child was not given the familiar toy by the parent for the specified duration.

The participants were obtained through a number of different forms of recruitment through the months of May to December. The first form of contact was through advertising in the local newspaper (The Christchurch Press) where the parents were asked to contact the laboratory by phone if the were interested in the study. Second, letters were also sent to the local crèches in an attempt to recruit more participants (Refer Appendix A). There were 11 crèches contacted, all of which agreed that the information sheet and consent form could be left for distribution. There were also advertisements in the local Plunket newsletters and in the local postnatal hospital newsletter. Parents were also approached in the local malls and were given a card with the title of the experiment, the ages required, and a contact number. All parents who received the pamphlets were asked to contact the experimenter at the laboratory by telephone. Finally, participants were also contacted by phone from the birth notices in 'The Christchurch Press'. All participants were

from the Christchurch regional area. The administration of the experiment was on an individual basis and all data collected was kept confidential.

2.2 MATERIALS

For the purpose of this study, an arched, white table was designed (Appendix A). The top of the table was wooden and contained two hiding wells. The measurements of the table made it 74 cm tall and 34cm wide. The wooden surface was semicircular in shape with an interior segment measuring 76 cm, and an exterior segment of 96 cm. Both round hiding wells were 10 cm in diameter and had a 10 cm deep, fabric pocket beneath, which was used to hide the toy being tested. The two wells were 37 cm apart and were approximately 30 cm from the infants' seated location. The hiding covers measured 16 cm by 16 cm, and were placed over the wells during testing such that they completely covered the wells. The material used was pale blue in colour and of a soft texture.

The toys used for the two conditions were kept separate. In the familiar condition each participant was given a Playskool Attach 'n Go Bright Pet in the shape of a butterfly. The butterfly's body has a pocket to hide items in, crinkle wings, a rattle head with a squeeze and squeak option and a teething attachment. The toy had a green head and face, a yellow body, a purple teething attachment with a blue ribbon, and predominately white wings with black and pink dots.

There were nine different options for the novel toy. The mother was shown the novel stimuli prior to participating in the study and was asked if the infant had any experience with these toys. If the infant had previously played with any of the stimuli they were discarded for that participant. Of the nine stimuli, four were bath toy animals, which included a yellow plastic duck; a red tortoise; a green alligator; and a blue hippopotamus, each measuring about seven by four centimetres. One of the toys used was a pyramid ring that included six different rings that progressively decrease in size. The colours vary from the largest being red, through to orange, yellow, green, blue and the top ring being purple. If the participant showed a particular interest in one of the rings then that ring was used as one of the novel stimuli. Other novel stimuli includes a child's red cup, a squeaking bath toy in the shape of a diving dog,

and a soft small smiling flower rattle. The final novel stimuli were musical teething keys, which had a white ring with red, yellow and green keys.

Each session was recorded by two Sony CCD-TR420E video cameras set up at 45-degree angles to the left and right of the table (and infant) in the testing room to record the entire session. Video input from these cameras was fed into a Panasonic WJ-AVE55 audio-visual mixer, which enabled a split screen image to record of both sides of the infant's face and hands during testing. This split screen image was replayed immediately (and at a later date) through a 27-inch Sony Trinitron colour video monitor. This image was recorded on a Panasonic AG7700 videocassette recorder to enable coding of the infant's facial, gestural, and gaze direction at a later stage.

2.2a EASI II Temperament Form

The Buss and Plomin (1984) EASI II questionnaire was used for the purpose of this study (Refer Appendix A). The EASI II is a twenty-point questionnaire that measures emotionality, activity, sociability, and shyness. Although some of the questions appear to be orientated toward children who are walking and talking, parents were asked to adjust the questions for children of the appropriate age. In an overall approach to using this measure, the EASI II is appropriate and accepted for use with this age group (Rothbart & Mauro, 1990). The rating scale is a twenty-point questionnaire with some reverse coded questions where the parent circles the most appropriate number. The rating for each item is on a 1 to 5 scale where 1 is 'not characteristic or typical' and 5 is 'very characteristic or typical'. An example of the type of questions asked is "Child tends to be shy" and "Child cries easily".

According to Rothbart & Mauro (1990) there are a number of strengths and weaknesses associated with using parent reports measures as a method for assessing temperament. This includes variables such as the caregivers' understanding of the questions, problems with memory, social desirability, acquiescence and reference to events. The EASI II does attempt to take these issues into account by using reverse coding and the structure of the questions. The limitations are that there may be some socially desirable responding for questions such as "Child tends to be shy" and

"Child is always on the go". One other factor is the reference point for the parent. When answering questions like the ones described above parents may refer to their infant's most recent behaviour instead of generalising from their normal behaviour. Issues such as these are not only problems for the EASI II, as this is common for all forms of parental ratings. The EASI II parent report was chosen because of its ease of administration, low cost and minimal time for completion.

2.3 PROCEDURE

Parent's response to the forms of advertising was to contact the experimenter who described what the study involved. During this initial contact the experimenter also discussed with the caregiver the birth of the child and if there were any complications such as premature birth, birth weight, health of child at birth and any other medical problems that might have occurred. One day prior to testing the experimenter contacted the parent to ensure that there were no problems and that they would be able to make their appointment. The experiment was conducted at a research laboratory on university campus.

2.3a Novel Condition

When the primary caregiver and the infant arrived, they were taken into a waiting room area where the caregiver was asked to complete the consent form (Appendix A) and the EASI II temperament form. While the caregiver was completing the forms the infant was placed in the warm up area (on a rug with all of the novel toys). In this stage the experimenter played with the infant until they were comfortable (as decided by the parent). During this time period the experimenter placed five different novel toys, one at a time, on the infant's midline and recorded which hand the infant used to collect the toys. This procedure was used to determine handedness, which is discussed below. It is also during this part of the procedure that the novel toy was chosen through the infant's behavioural preference (which toy they spent the most time with). When it was agreed upon, by the caregiver and experimenter that the infant was in a quiet alert state (paying attention and looking at the toys), the testing began.

The caregiver was asked to sit at a seat in the interior part of the table and place the infant on their lap. At this point the experimenter reminded the caregiver of what was about to take place and that they needed to restrain the infant during the distraction task (clapping and counting aloud to five) by either holding their hands or by hugging them. The caregiver was also asked not to instigate any interaction with the infant while they were searching and that they were instead to focus on the experimenter.

The well that the infant searched for at the B1 trial was counterbalanced across participants. When the experiment began the infant was shown the toy and when his/her attention was focussed the investigator slid the table out of reach from the infant, then bounced the toy across the table surface to the first hiding well (A). The well was left uncovered and the table was then pushed back to the infant where searching was allowed to begin, this was to allow the participant to familiarise themselves with the game being played. Once the infant had obtained the toy they were asked to hand it back to the experimenter. If this did not occur the caregiver was then asked to gently obtain the toy from the infant. In the second trial to enable familiarisation at the table, the toy was hidden in the A location again, but this time before the table was pushed back to the infant both wells were partially covered by the cloth material. When the infant searched correctly for the stimuli they were asked to hand back the item. This then concluded the familiarisation with the trials.

In total the infant was given 4 procedural trials, 3 at A and 1 at B. For the first A trial the toy was again hidden in the A location where both wells were fully covered simultaneously with the cloth covers. The experimenter then counted aloud to five, clapping their hands as each second passed to deter the infant's visual attention away from the toy. Once the distraction duration was completed, the table was then pushed toward the infant where they were asked to search for the toy ("*Name of infant,* where is the toy"). This process was repeated a further four times. The only variation was that on the fourth trial the object was hidden in the alternate well (B). After each trial the infants were given one minute to search for the toy, if it was not retrieved the toy was then uncovered and placed on the table. After a successful search the infant was allowed to play with the toy for a short duration (20 to 25 seconds) before moving to the next trial.

At the completion of the study the experimenter discussed any queries with the caregiver and explained the purpose of the experiment. The caregiver and participant were then thanked for their time and given a $5 petrol voucher to reimburse any costs for travel to the laboratory.

2.3b Familiar Condition

Parents contacted the experimenter and were informed that they would be in the familiar condition, then a date was set for testing the infant. At this point the caregiver was informed that the familiar toy need to be taken to the child's home seven days before testing. The mother was asked to present the toy to the child every day for those seven days and for the duration of about 30 minutes.

The procedure for this condition was identical to that of the novel condition except for the following difference with the toy. The toy chosen for testing in this condition was the one, which the child had been familiarised to over the previous seven days. In this condition the well that the infant searched for at the B trial was also counterbalanced across participants. The actual experimental procedure for the A-not-B trial was identical to the novel condition.

2.4 CODING PROCEDURE

2.4a Handedness

Each infant was measured for handedness. This was achieved during the warm-up phase of the experiment. Here each child had one toy placed 5 times in front of its midline. The infant was then coded depending on how many times they reached with their right hand. If the child reached 5 times with their right hand they had a score of 5; if they reached 2 times with their right hand and 3 with their left hand then they scored 2. This was then re-coded so that each infant was either, determined to be right handed, no preference, or left handed. If the infant had an original score of 4 or 5 they were determined to be 'right handed'. If they had a score

of 2 or 3 they were coded as 'no preference', and if they had a score of 1 or 2 they were coded to be 'left handed'.

2.4b B Location

Each infant was also assessed on which side the B1 trial was on the search table. This was to ensure that search location was counterbalanced across the groups. From this analysis we are able to determine that there was no experimenter bias and that the B location was not influenced by handedness.

2.4c Search Performance

The videotapes were coded for correct search on the B1 trial. For the purpose of this study, a correct search for the infant occurred when the infant removed the cover from the correct hiding location on their first attempt and showed evidence of recognition that the object is hidden in that well, or actually removed the object from the well.

CHAPTER 3

RESULTS

3.1 HANDEDNESS AND SIDE OF SEARCH

The first analysis conducted examined the possible influence of handedness on search at trial B1. Of the 40 infants who were coded for handedness, 9 were predominately right handed, 27 showed no preference, and 4 were coded as predominantly left-handed. A one way ANOVA using handedness as the independent variable and search at B1 as the dependent measure was conducted. There were no significant differences of handedness for this analysis.

3.2 INITIAL SEARCH ON B1 TRIAL

Table 1. presents the means and standard deviations for infant's initial search behaviour on trial B1 as a function of age, sex, and condition. An inspection of Table 1. suggests the puzzling finding that 9-month-old infants search correctly more often (on trial B1) than do their 12-month-old counterparts. Interestingly, this performance difference holds across both conditions. There appears to be no consistent effects for sex. However, in regard to condition type, it is apparent from Table 1. that for trial B1, infants appear to be more likely to search correctly in the familiar toy condition than they are in the novel condition.

In order to examine search performance on the B1 trial, a 3 way ANOVA with age (9-month-olds and 12-month-olds), sex, and condition (familiar toy vs. novel toy) as the independent variables and search on the B1 trial as the dependent variable was conducted. There were significant main effects of age [$F(1, 45) = 4.56, p < .05$] and condition [$F(1, 45) = 5.67, p < .05$]. Infants in the familiar toy condition were more likely to search correctly (X = 0.59, SD = 0.50) than infants in the novel toy condition (X = 0.26, SD = 0.45) and 9-month-old infants (X = 0.57, SD = 0.51) searched correctly more often than 12-month-old infants (X = 0.27, SD = 0.46). There was no significant effect of sex nor any significant interactions.

Table 1.

Group Means and Standard Deviations for Search on the B1 Trial.

		CONDITION TYPE	
AGE GROUP	**SEX**	**NOVEL TOY**	**FAMILIAR TOY**
9-month-old	**Males**	0.50	0.60
		(0.54)	(0.55)
	Females	0.17	1.00
		(0.41)	(0.00)
	All	0.34	0.80
		(0.48)	(0.28
12-month-old	**Males**	0.20	0.33
		(0.45)	(0.52)
	Females	0.17	0.40
		(0.41)	(0.55)
	All	0.19	0.37
		(0.43)	(0.54)
All Subjects		0.26	0.58
		(0.45)	(0.40)

Note. Standard deviations are given in parentheses.

3.3 TEMPERAMENT ANALYSIS

Table 2. presents the means and standard deviations for the four subscales of the EASI II, broken down by age and sex. In comparing the means it appears that for emotionality 9-month-olds score higher than 12-month-olds. A series of two way ANOVA's was conducted using age and sex as between groups measures and the four subscale scores as the dependent measures. These analyses revealed no significant effects of sex, age or the two way interaction term.

In order to determine whether individual differences in temperament impacted on search performance, correlation's between the EASI II scales and search on the B1 trial were computed. The correlation's are presented in Table 3. In contrast to Hypothesis 3, negative emotionality was not significantly correlated with search performance on trial B1. In addition, there were no significant correlation's found between the search measures and any of the other temperament scales.

Table 2.

Mean Scores and Standard Deviations for 9-month-old and 12-month-old Male and Female Infants of the Temperament Sub-Scales from the EASI II.

		Emotionality	Activity	Sociability	Shyness
9-month-olds	**Males**	2.26	4.03	3.66	2.23
		(0.93)	(0.44)	(0.55)	(0.58)
	Females	2.51	3.90	3.46	2.18
		(0.91)	(0.65)	(0.54)	(0.68)
	All	2.39	3.97	3.56	2.21
		(0.92)	(0.55)	(0.55)	(0.63)
12-month-olds	**Males**	2.14	3.81	3.75	2.54
		(0.45)	(0.66)	(0.52)	(0.69)
	Females	1.75	3.63	3.32	2.59
		(0.53)	(0.91)	(0.68)	(0.69)
	All	1.95	3.72	3.54	2.57
		(0.49)	(0.79)	(0.60)	(0.69)
All Subjects		2.17	3.84	3.55	2.39
		(0.71)	(0.67)	(0.57)	(0.66)

Note. Standard deviations are given in parentheses.

Table 3.

Correlation's of the EASI II Subgroups of Temperament Compared to Search Performance as Measured by Initial Search on the B1 Trial.

	1.	2.	3.	4.	5.
1. B1	1.00				
2. EMOTIONALITY	0.11	1.00			
3. ACTIVITY	0.10	-0.06	1.00		
4. SOCIABILITY	-0.01	0.16	0.26	1.00	
5. SHYNESS	-0.13	-0.09	0.19	-0.02	1.00

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

CHAPTER 4

GENERAL DISCUSSION

4.1 THE HYPOTHESES

Recall that there were three hypotheses. The first was that infants in the novel object condition would search more accurately on the B1 trial than infants in the familiar object condition. The second was that the 12-month-old infants would perform better than the younger 9-month-old infants on the object permanence task. The third hypothesis was that infants who score high on the emotionality scale of the EASI II would show lower correct search behaviour on the object permanence task when compared to infants who had low scores on the same scale.

4.2 RELATION OF THE FINDINGS TO THE HYPOTHESIS

The first hypothesis that infants in the novel object condition would search more accurately on the B1 trial than infants in the familiar object condition was not supported. In fact the opposite was found to be true. The most stringent test of the hypothesis (initial search on the B1 trial) showed that infants of both age groups searched more accurately for the familiar object than the novel object.

The second hypothesis, namely, that 12-month-old infants will perform better than younger 9-month-old infants on the object permanence task was not supported. In fact, the opposite result was found. Analysis revealed that the 9-month-old infants on the B1 trial searched more accurately than their older counterparts. For initial search on the B1 trial it was the 9-month-old infants in the familiar condition that had the highest accuracy of search followed by the 12-month-old infants in the same condition. The 9-month-old infants in the novel condition were less accurate than the previous groups with the 12-month-old infants in this condition being the least accurate. Not surprisingly, these findings do not indicate a clear developmental progression in young infants' acquisition of the object concept. In fact, the results

indicate that the search behaviour of the 9-month-olds was significantly more accurate than that of the 12-month-olds.

The third hypothesis was that infants who score high on the negative affect scale of the EASI II will show less accuracy for search behaviour on the A-not-B task when compared to infants who have low scores (low measures of negative emotion) on the same scale. The temperament analysis of the EASI II showed that there was no significant correlation between negative affect and search behaviour. An explanation of why there was no correlation found between negative affect and search is discussed in the limitations section.

4.3 THE EFFECT OF FAMILIARITY

The most stringent criteria for search accuracy is that of initial search at the B1 location. Here it was found that infants searched more accurately for the familiar object than the novel object. This result has only been found in two other studies of object permanence. The first and most recent is the Lingle and Lingle (1981) study where it was found that the mean for the familiar group was higher than the novel group when collapsing across examiners and age groups, however, this difference was not significant. The problem with this study was that there were two different experimenters. Infants tested by the first experimenter did better than those tested by the second. The second problem was that with other variables taken into account (the experimenter differences), the authors found that the third group (the attached object group) performed better than both the novel and familiar groups combined. Although the study by Lingle and Lingle (1981) did have similar findings (though not significant) to the present study, the two limitations, mentioned above suggests that we cannot take their results of familiarity out performing novelty as a consistent behaviour.

The second study, which found similar results, was the Jackson, Campos and Fischer (1978) study. This research found that infants were more likely to search for the familiar object earlier than the novel object. The methodological difference between this study and the current one is that Jackson et al., (1978) measured search

through stages of development by testing infants periodically across time. In the current study each infant was tested only once at either 9 or 12 months of age.

The other main difference was that these authors tested novelty and familiarity using both objects and people to measure décalage. This current study did not test for décalage nor did it test people. Aside from the main finding of familiarity and novelty in objects there were also two interactions found: that of familiarity and stimulus, and age. These interactions showed that the familiar person and the novel object in the 8.25-month-old infants had the highest level of search for these stimuli. In this interaction they found that the novel object had a higher score than the familiar object. It appears that in this study the familiar object was searched for more accurately in the younger infants (32 weeks and under, excluding week 30-31), while the older infants (32 weeks and older and week 30-31) have a higher search level for the novel object. This finding conflicts with the results in the present study in that the older group in the Jackson, et al., (1978) study is approximately the same age as our younger group. When the weeks of testing were accounted for, both age groups searched more accurately for the novel object than the familiar object.

The problem with linking this to the current study is that these infants were tested with both objects and people. The Jackson et al., (1978) study did not specifically measure the object, which is what was tested here. Instead the previous research measured décalage between the object and the person. Any findings, which were obtained in the Jackson et al., (1978) study in regards to the object stimuli, are restricted by the use of testing with people. Therefore the comparability of the present study to the results found here cannot be assumed to be consistent.

The fact that there was a significant difference between novelty and familiarity in the current study, where the familiar infants searched more accurately, suggest that the optimal level of stimulation theory does not always apply, as suggested by Hunt (1970) and Hunter & Aimes (1987). The optimal level of stimulation theory suggests that each individual has a preferred level of stimulation. This level is normally maintained by novelty in one's environment. If we do not obtain enough novel stimulation from our environment we will actively seek it. However, if there is too much novelty, then we need time to process this information (through making it

familiar or less novel). We will begin actively seeking more novelty when we are again under our optimal level of stimulation.

With this theory in mind, there can be two possible suggestions as to why these results show that the infants search more accurately for the familiar object. The first consideration is the age groups tested. Literature from the novelty and familiarity research on younger infants suggests that there is an early transition from a preference for familiarity up to 2-months of age which switches to a novelty preference after 2-months (Hunt, 1970). Based on these findings one could suggest that there is the possibility of a similar transition occurring between 9- and 12-months of age. However, there is currently no literature to support this idea. If anything, the findings from the literature that have been obtained about the object would suggest that infants are more capable of searching for novel objects at these ages (e.g., Bell, 1970; Tardona & Bradley-Johnson, 1984).

The second possibility is that when you take into account the environment in which the infant was tested, there can in fact be some support of this theory. Each infant was tested in a completely new environment, with new surroundings and with an experimenter with whom they had no previous interaction. Even the table that the infant was tested on was novel, without taking into account the new game they were playing. With all of this environmental stimulation accounted for it would be easy to suggest that most infants would be at their optimal level of stimulation prior to testing with the object. The logic connected to the second explanation is that the infants who have a continuous input of novel stimuli may have reached their optimal level of stimulation. If this occurred then most infants would look for, and try to obtain, something familiar as a form of comfort, which would enhance their ability to adjust to the new level of novelty. In this environment, the only participants who could obtain this comfort while being tested was the familiar group, who had previously played with the toy in their home. This object had been played with for a reasonable amount of time and the infant also had an interaction with the mother during that time. This in turn suggests that the infant could form a connection between the toy and the mother. As the infants in the familiar group searched more correctly for the familiar object (than the infants in the novel group) they possibly found a comfort in the toy, while they were surrounded by the novel environment. The familiar object could

then potentially become a comforter to the infant in the new environment. Winnicott's (1953) work on transitional objects supports this theory through his suggestion that a familiar object can become a defence against anxiety (in this case, anxiety created by the novel testing situation). In this situation, if the familiar object did become a form of comfort, the infant would then become more motivated to find this object. In doing so they would tend to search more accurately for the familiar object than those in the novel condition. This is one potential explanation for a familiar object being searched for more accurately than a novel object, which supports the present results.

One other possible explanation for the findings that has not previously been mentioned is from the cognitive literature. This is in relation to the main and most stringent finding which is that infants of both age groups search more accurately for the familiar object. In the memory literature, one major area of research is the level of processing theory (Craik & Lockhart, 1972). It is theorised that there are different levels of processing information. That is information can be processed at a shallow level or it can be processed at a deeper level. Shallow processing occurs when information is coded in terms of its physical or sensory characteristics, while the deep level of processing is linked to meanings and other associations such as past experiences, which are related to the stimulus. An example of shallow processing would be processing a word by the colour it is printed in, whereas when deep processing the same word it could be linked to a previous experience. It is more likely that the connections to past experience would facilitate recall of that word. According to the literature, the deep processing of information produces better recall than when shallow processing is used (e.g., Lockhart & Craik, 1990).

With this information taken into account it could, therefore, be assumed that the infants in the familiar group encoded the toy at a deeper level than infants in the novel condition. This could be assumed, as the toy was played with daily in the infant's home while interacting with the mother. The novel toy, however, had not previously been played with and had no association with the infant's home or mother. This could, therefore, suggest that infants in the familiar condition had encoded more in depth, the information about the toy, than infants in the novel toy condition and in turn, could demonstrate more accurate recall. This could then potentially make it

easier for the familiar group to find the hidden toy on the B1 location as the majority of information about the toy was previously encoded, making recall about the object easier. This would suggest that it would be easier for the familiar infants to search correctly when the object was hidden.

Information that counteracts this theory is a meta-analysis on the exposure-affect theory conducted by Bornstein (1989). Although the focus of this study was not on infants alone (they also tested children and adults) there was an age effect found. The research here (although conflicting) shows that adults rate familiar stimuli as preferred over novel stimuli, however, in young children and infants the result is the opposite, with a preference for the novel stimuli. This was found in a comparison on the mean effect size in studies of young children and adults. It appears that the younger population (until about 8-years of age) prefer novel stimuli to familiar stimuli. As stated before, this finding has conflicting results, as many studies have found that young children and infants will prefer the familiar stimuli (e.g., Heingartner & Hall, 1974; Sluckin, Miller & Franklin, 1973; Busse & Seraydarian, 1978) or toy (Jenrenaud & Linford, 1960).

It is the previous findings of familiarity preferences, which inform us that young children can prefer both novel and familiar objects. If this is true, then it can be said that familiar objects (like the familiar toy in the present study) are capable of being more deeply processed when there is an emotional or environmental connection made. For example, in the studies explained above, infants can prefer familiar stimuli and toys. Presumably these would be more interesting to children and infants than words which are commonly used. Infants and young people would easily make connections between a toy they were playing with in a lab and a toy they played with at home, while interacting with their parents. This would suggest that these infants are able to make safe connections between the toy and their parents, and the toy and their environment. From this it could be suggested that because infants have made these connections, they are more able to deeply process these cues, which should make it easier for recall to occur, when having to find the toy at a hidden location. Consequently, this could support the present findings of familiarity on the B1 trial.

4.4 THE EFFECT OF AGE

The unusual difference of 9-month-olds performing more accurately than the 12-month-olds can be linked to the task itself. The obvious explanation for this finding is that the 12-month-olds find this task easy and so they become bored. Though boredom was not coded, many of the older infants showed behaviour typical of this (such as fighting with their parent to get down from the chair). This tended to occur on the B1 trial. Thus, 9-month-olds searched more accurately than the 12-month-olds. The task itself and the theoretical understanding of object permanence is that perseverative search occurs with 9-month-olds and by 12-months of age most infants are able to search more accurately than they were able to at 9-months. This could then explain the attentional difficulties the older group showed.

Though the 12-month-olds did show some boredom with the task, there were still a number of infants in this age group who perseveratively searched on the B1 trial which this explanation does not account for. One possible suggestion for this is that the level of motivation required by the infant to reach and find the hidden object during the B1 trial differs for the age groups. It could easily be assumed that 12-month-old infants would have more experience with the world than 9-month-old infants. When previous experience is combined with the level of novel stimulation infants have during this task, it could be argued that the 12-month-old infants might not need to seek the same level of comfort that the 9-month old infants require. If less comfort was required then the 9-month-olds would be more motivated to find the familiar object than the 12-month-olds. In doing so they are more likely to remember where the object was hidden and therefore search correctly. In comparison, the 12-month-olds would also seek some level of comfort from the object and would therefore search for the familiar object, but perhaps not to the same level as the 9-month-olds. Different levels of comfort required could be explained as the 12-month-olds have more experience with the world and are more capable of coping with the amount of novel stimulation than the younger group. These infants are not as motivated as the younger group to search correctly, therefore being less accurate in search behaviour and consequently having lower mean scores.

Though there are two possible suggestions given for why the younger infants out performed the older infants, this result did come as a surprise as much of the literature states that the older infants should be more accurate then their younger counterparts. This result is also surprising when you look at the methodology of this study. The task used here was designed to be difficult for the 9-month-old infants. First, there was the more difficult 5-second delay used, which is thought to be age appropriate for 12-month-old infants. In addition to this, the table designed for this study, had only two hiding wells, which has been shown to be more difficult for both age groups than multiple hiding wells (Wellman, et al., 1987). With delay and number of hiding wells taken into account it is even more surprising that the younger infants obtained a higher search accurately than the older infants. The previous explanations given for this finding, though possible, are not completely satisfactory. Ultimately, the age effect observed in this study is perhaps best thought of as a problem which requires research on further work to resolve. A replication of this study with a larger sample size may change this result.

4.5 LINKS BETWEEN THE PRESENT FINDINGS AND PREVIOUS RESEARCH

One of the most discussed areas of object permanence is which theory ultimately provides the best explanation of infant's developing knowledge. In the section that follows, the fit of the data from the present study to the theories of object concept development discussed in the introduction, is examined.

Wellman, Cross and Bartsch (1987) offered a 'conflict' explanation for search performance. As previously explained Wellman et al., (1987) state that an infant has two options. The first is a "direct-finding approach" and the second is a more complex "inferred location approach". When applied to the current findings, it is possible that infant's who deeply coded the information about the toys (the familiar group) used a "direct finding approach" as these infant's obtained higher search means than the novel group, suggesting they searched correctly most of the time. Correct search is typical behaviour of the direct finding approach. Alternatively, the infants in the novel group who had only shallowly processed the novel information

used an "inferred location approach" (this is suggested through search means) and consequently searched less accurately which is typical of this type of approach.

Though this theory can explain some of the infants' behaviour, it is limited in its ability to explain all of the present studies findings. Wellman, et al.'s (1987) meta analysis suggested there was no role for the nature of the object to influence search behaviour. Though it is possible to incorporate condition group differences to their theoretical approaches for infants, this analysis does not account for why the familiar group would use the direct finding approach over the inferred location approach. The Wellman, et al., (1987) analysis also does not allow for the current age group findings. In fact, they suggest that infants improve steadily with age, which is not a reflection of what occurred here. In an overall view, this theory does allow for the difficulties of a 5-second delay and 2 hiding wells (as used in the present study), but does not allow for the focus on the object itself and how this could produce differences in performance, nor does it allow for the current age finding. Therefore the theory as a whole, although it does explain some results, it cannot comprehensively explain all the results found in the present study, which in turn suggests that this theory is not the most applicable explanation of these findings.

The next theory to be discussed is Baillargeon, Graber, DeVos & Black's (1990) theory that infants are unable to compute means ends sequences. The difficulty that infants have in trying to complete this task is that they do not have the problem solving capacities required to chain together the various subgoals such as removing the cloth cover, reaching inside the hiding well and removing the hidden object. The authors suggest that the infant understands what is required to complete the task but are unable to chain together a sequence of behaviours to reach their goal. According to this theory, if all the other variables are accounted for such as delay time and number of locations, there should be differences found between the age groups (favouring the 12-month-olds). According to Baillargeon et al., (1990) the younger infants have difficulties with this task because they are not as able to cohesively chain together the behaviours required to search correctly. In the current study the opposite was found to occur, the younger infants' out performed the older infants' consequently this is a limitation of the Baillargeon et al., (1990) theory.

There is also one other area that is outside the scope of this theory. This is that it does not allow for findings in relation to the object. The Baillargeon et al., (1990) theory does not allow for contextual differences or that the object itself may influence search which has been shown in this study. One possibility in favour of Baillargeon, et al., (1990) is that infants in the familiar condition may search correctly more often due to their previous exposure with the object. This previous exposure may make it easier to chain together sub goals and search correctly. Although it was not measured, it is possible that parents may have played hiding or retrieval games with the familiar toy while it was in their home, if this occurred then the infant may have learnt how to chain together behaviours to reach their goal of searching correctly. As the infant became more familiar with the object and began acting on that object they may have obtained a mental image of it, which could suggest that this may make it easier to cognitively represent the object. To determine if this did occur and if it could support Baillargeon, et al's (1990) theory further research would be needed. Due to this theory's current inability to explain the familiarity and age finding's in the present study it therefore has many of the same limitations as Wellman et al., (1987) which suggests it may not be the most applicable theory for this research.

Diamond (1991a) suggests that the difficulties infants' have with this task are due to immature neurological maturation of the prefrontal cortex. This is supported by her later research (Diamond, Cruttenden and Neiderman, 1994) which suggests that this immature neurological maturation is reflected in the infants' memory and inhibition. Though this theory does support the level of perseveration (reverse of correct search) on the B1 trial, it does not account for the differences found between the novel and familiar condition or the 9- and 12-month-old infants. Diamond's (1991a; Diamond, et al., 1994) theory was designed to explain how perseveration may occur and why infants have difficulties with this task, it was not designed to explain how environmental factors such as the object may influence performance. The current study found that infant's searched more accurately for the familiar object, which suggests that they are able to remember where the object was hidden. With this theory in mind, any manipulation which enhances the infant's ability to encode the information about the object is probably able to fit into this theory. The main limitation with this research is the present study's finding that the 9-month-olds out performed the 12-month-olds. According to Diamond et al., (1994) older infants

should outperform younger infants which contradicts the age group data found in this study. This theory's main limitation is that they cannot account for the age group finding, however, it is able to explain the finding of familiarity. This suggests that Diamond, et al.'s (1994) ability to explain the current findings is limited by the age factor.

The next research that is to be discussed is Thelen and Smith's (1994, 1995) approach to object permanence which suggests that the infant is tested in a dynamic system where multiple skills are required to complete the task accurately. These authors suggest that the change between searching incorrectly to searching correctly is due to the changeability of the experimental situation in which the error itself occurs. Smith, Thelen, Titzer and McLin (1999) suggest that there are six factors, which can influence correct search. These factors are distinctiveness of the hiding wells, the length of delay between hiding and finding the object, the physical abilities of the infant, previous experience with the A location, visual attentiveness toward the B location and age of the infant. Many of these variables were controlled for in the present study. Smith et al., (1999) differ from other authors as they suggest that the task needs to be looked at a dynamic system, there are multiple influences on the infant, which can effect their accuracy. According to these authors, an infant chooses a favoured solution to the numerous constraints, which are reinforced by the current context. This therefore, has the capacity to change and influence their behaviour. As mentioned above these theorists currently state that there are a number of contextual influences on behaviour, it has already been discovered that variables such as delay and number of hiding wells can influence behaviour, with the current study in mind it now appears that the familiar object is able to achieve the same results. The fact that the familiar object leads to more accurate search can be explained in many different forms from a dynamic systems view. One possible explanation is that the infant finds it easier to encode the object as residing in a particular location, which can be linked to a memory explanation. Alternatively, the familiar object may increase an infant's motivation to search correctly as has been suggested through the motivation and optimal level of stimulation theory. Either way the dynamic system framework best explains the condition effect.

This dynamic systems theory also has the potential to explain the age effect. It could be suggested that there was something in the context or procedure that helped the younger infant's search more correctly than their older counterparts. One possible environmental explanation is that the interaction style of the experimenter was better suited to the younger infants. They may have been less distracted and felt like playing the game.

There is, however, one main limitation for this theory, which was discussed by Munakata (1997). This is that these authors (Smith, et al., 1999) suggest that the object is not important, and, therefore, cannot influence search, the present study has proven that that can. Munakata (1997), however, does suggest and support these findings – the object is important. Though this research is important, it is not a theory in itself. Munakata (1997) merely reflects on Thelen and Smith's (1994, 1995) theoretical work. In order to comprehensively explain these findings an eclectic approach has been taken. The dynamic systems theory (Smith, 1994, 1995; Smith, et al., 1999; Munakata, 1997) can be used as a whole to explain all of the current results. This would therefore show that the context is important but the object is also while potentially explaining the age effect.

One possible area for future research would be to expand on Thelen and Smith's (1995) theoretical work by including the object as a factor, which is able to influence search behaviour. This also opens a number of other possibilities such as the environment that the infant is tested in. Due to the amount of novelty in the infants' environment and the possible implications it had on the group search performance, this could be an area of future research. One way to achieve this would be to test the infants in a familiar environment. This could be best achieved through testing the infants in their home. By allowing this to occur the infant would when be able to achieve the familiarisation phase by becoming familiar with the testing room, the experimenter and the table. This could also allow the infant to make the connection with the mother while still habituating with the toy. The implications of using a procedure like this would be that the infant would potentially have eliminated the environmental effects of novelty and may be more likely to search for the novel object as the literature would predict. This environmental variable may also be able to influence search accuracy.

4.6 LIMITATIONS AND FURTHER FUTURE RESEARCH

One main limitation of the present study was small sample size. Due to the limited number of responses to the study it became very difficult to recruit participants. In total there were only 45 participants with data that could have been used. Though there were significant differences found on the B1 trial in relation to age and condition type, there were no significant correlation's found for negative emotionality from the EASI II. The correlation that was found was low but it was positive and in the predicted direction. Had there been more participants, which in turn would produce a stronger power, there could have been a significant correlation. As suggested by most power tables in order to find a weak effect size you would need to approximately 100 participants (Aron & Aron, 1994). Given that the current study had half this number, it was unlikely to have sufficient power to detect a small effect.

One possible explanation of the temperament finding is the inadequate measures parents may have used when answering the questionnaire. Though sibling order was not formally measured, a large number of the parents informed the experimenter that this was their first child. If the infant's were primarily the first child, then the majority of parents would have nothing to compare their infant's behaviour to (e.g. an older sibling). They could then easily assume that their infant was highly sociable and active. However, if the infants measured did have older siblings, the same parent may have reported that their child showed average ratings of sociability and activity level.

In the future, one way to overcome this limitation could be to use behavioural measures of temperament (e.g., Rothbart & Bates, 1998). If the experimenter was able to measure temperament in all of the infants behaviourally it would overcome the problem with socially desirable responding on questionnaires. It would also be recommended that a larger sample size would be needed to gain significant results.

4.7 CONCLUSION

The present study's results that the infant's in the familiar object condition searched more accurately than the infant's in the novel condition clearly demonstrates that the nature of the object does influence performance on the A-not-B task. This in turn suggests that the object may be able to effect memory ability in the infant through processes like encoding, retrieval, or motivation. In either case the object clearly has an impact.

It has become apparent that more research needs to be conducted on novelty and familiarity outside the preferential looking paradigm and habituation paradigm. Past research has studied this novelty phenomenon in a particular kind of context, the present research has extended from that into a different context, that of object permanence. Given that these findings differ from what the literature states should happen, it makes sense to further explore the present study's results. This could be achieved through a replication of this study or by testing infants on other tasks.

REFERENCES

Aguiar, A., & Baillargeon, R. (1998). Eight-and-a-half-month-old infants' reasoning about containment events. *Child Development, 69*(3), 636-653.

Aguiar, A., & Baillargeon, R. (1999). 2.5-month-old infant's reasoning about when objects should and should not be occluded. *Cognitive Psychology, 39*(2),166-167.

Aron, A., & Aron, E.N. (1994). *Statistics for Psychology.* New Jersey; Prentice Hall.

Baillargeon, R. (1987a). Object permanence in 3.5- and 4.5-month-old infants. *Developmental Psychology, 23*, 655-664.

Baillargeon, R. (1987b). Young infants reasoning about the physical and spatial properties of a hidden object. *Cognitive Development, 2,* 179-200.

Baillargeon, R. (1993). The object concept revisited: New directions in the investigation of the infant's physical knowledge. In C.E. Grandrud (Ed.), *Visual perception and cognition in infancy* (pp. 216-315). London: Erlbaum.

Baillargeon, R., DeVos, J., & Graber, M. (1989). Location memory in 8-month-old infants in a nonsearch AB task: Further evidence. *Cognitive Development, 4,* 345-367.

Baillargeon, R., Graber, M., DeVos, J., & Black, J. (1990). Why do young infants fail to search for hidden objects? *Cognition, 36*, 255-284.

Bell, S. M. (1970). The development of the concept of object as related to infant-mother attachment. *Child Development, 41*(2), 292-311.

Berlyne, D. (1960). *Conflict, arousal, and curiosity.* New York: McGraw-Hill.

Bornstein, R. (1989). Exposure and affect: Overview and meta-analysis of research, 1968-1987. *Psychological Bulletin, 106*(2), 265-289.

Bremner, J. G. (1982). Object localisation in infancy. In M. Potegal (Ed.). *Spatial abilities: Developmental and physiological foundations* (pp. 76-106). New York: Academic Press.

Buss, A. H., & Plomin, R. (1975*). A Temperament Theory of Personality Development*. New York: Wiley.

Buss, A. H., & Plomin, R. (1984). *Temperament: Early developing personality traits.* Hillsdale, NJ: Erlbaum.

Busse, T. V., & Seraydarian, L. (1978). Frequency and desirability of first names. *Journal of Social Psychology, 104,* 143-144.

Butterworth, G. (1975). Object identity in infancy: The interaction of spatial codes in determining search errors. *Child Development, 46*, 866-870.

Butterworth, G. (1977). Object disappearance and error in Piaget's stage IV task. *Journal of Experimental Child Psychology, 23*, 391-401.

Butterworth, G., & Harris, M. (1994). *Principles of Developmental Psychology.* East Sussex: Lawrence Erlbaum Associates.

Butterworth, G., Jarret, N., & Hicks, L. (1982). Spatiotemporal identity in infancy: Perceptual competence or conceptual deficit? *Developmental Psychology, 18*(3), 435-449.

Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior, 11,* 671-684.

Cummings, E. M., & Bjork, E. L. (1983a). Perseveration and search on a five-choice visible displacement hiding task. *Journal of Genetic Psychology, 142,* 283-291.

Cummings, E. M., & Bjork, E. L. (1983b). Search behavior on multi-choice hiding tasks: Evidence for an objective conception of space in infancy. *International Journal of Behavioral Development, 6,* 71-87.

de Haan, M., & Nelson, C. A. (1999). Brain activity differentiates face and object processing in 6-month-old infants. *Developmental Psychology, 35*(4), 1113-1121.

Diamond, A. (1985). Development of the ability to use recall to guide action, as indicated by infants' performance on AB. *Child Development, 56,* 868-883.

Diamond, A. (1990a). The development and neural bases of memory functions as indexed by the AB and delayed response tasks in human infants and infant monkeys. *Annals of the New York Academy of Sciences, 608,* 267-317.

Diamond, A. (1990b). Developmental time course in human infants and infant monkeys, and the neural bases of, inhibitory control in reaching. *Annals of the New York Academy of Sciences, 608,* 637-676.

Diamond, A. (1991a). Neuropsychological insights into the meaning of object concept development. In S. Carey & R. Gelman (Eds.), *The Epigenesis of Mind: Essays on biology and cognition. The Jean Piaget symposium series.* (pp. 66-110). Hillsdale; Lawrence Erlbaum Associates.

Diamond, A. (1991b). Frontal lobe involvement in cognitive changes during the first year of life. In K. Gibson & A. Petersen (Eds.), *Brain Maturation and Cognitive Development: Comparative and cross-cultural perspectives. Foundations of human behavior.* (pp. 127-180). New York; Aldine de Gruyter.

Diamond, A., Cruttenden, L., & Neiderman, D. (1994). A-B with multiple wells: 1. Why are multiple wells sometimes easier than two wells? 2. Memory or memory + inhibition? *Developmental Psychology, 30,* 192-205.

Diedrich, F. J., Highlands, T. M., Spahr, K. A., Thelen, E., & Smith, L. B. (in press). The role of target distinctiveness in infant perseverative reaching. *Journal of Experimental Child Psychology.*

Diedrich, F. J., Highlands, T. M., Spahr, K. A., Thelen, E., & Smith, L. B. (Unpublished). Motor memory is a factor in infant perseverative errors. Manuscript in review.

Eson, M. E., Cometa, M. S., Allen D. A. & Henel, P. A. (1997). Preference for novelty–familiarity and activity-passivity in a free choice situation. *The Journal of Genetic Psychology, 131,* 3-11.

Eysenck, H. J. (1976). *Sex and Personality.* Austin: University of Texas Press.

Friedman, S. (1972). Habituation and recovery of visual response in the alert human newborn. *Journal of Experimental Child Psychology, 13,* 339-349.

Georgopoulos, A. P. (1990). Neurophysiology of reaching. In M. Jeanerod (Ed.), *Attention and performance X111* (pp. 227-263). Hillsdale, NJ: Erlbaum.

Georgopoulos, A. P. (1991). Higher order motor control. *Annual Review of Neurosciences, 14, 361-377*

Geva, R., Gardner, J. M., & Karmel, B. Z. (1999). Feeding-based arousal effects on visual recognition memory in early infancy. *Developmental Psychology, 35*(3), 640-650.

Gottfried, A. W., & Rose, S. A. (1980). Tactile recognition memory in infants. *Child Development, 51,* 69-74.

Gratch, G., Appel, K. J., Evans, W. F., LeCompte, G. K., & Wright, N. A. (1974). Piaget's stage IV object concept error: Evidence of forgetting or object conception. *Child Development, 45*, 71-77.

Harris, P. L. (1983). Infant Cognition. In M. M. Haith & J. J. Campos (Eds.), *Handbook of child psychology; Vol. 2. Infant developmental psychobiology* (pp. 689-782). New York: Wiley.

Harris, P. L. (1987). The development of search. In P. Salapatek & L. B. Cohen (Eds.), *Handbook of infant perception* (Vol. 2). New York: Academic Press.

Heingartner, A., & Hall, J. V. (1974). Affective consequences in adults and children of repeated exposure to auditory stimuli. *Journal of Personality and Social Psychology, 29*, 719-723.

Horobin, K. M., & Acredolo, L. P. (1986). The role of attentiveness, mobility history, and separation of hiding sites on stage IV search behavior. *Journal of Experimental Child Psychology, 41,* 114-127.

Hunt, J. M. (1970). Attentional preference and experience: I. Introduction. *Journal of Genetic Psychology, 117*, 99-107.

Hunter, M. A., & Aimes, E. W. (1987). A multifactor model of infant preferences for novel and familiar stimuli. *Advances in Infancy Research, 5,* 69-95.

Hunter, M. A., Aimes, E. W., & Koopman, R. (1983). Effects of stimulus complexity and familiarisation time on infant preferences for novel and familiar stimuli. *Developmental Psychology, 19*(3), 338-352.

Hunter, M. A., Ross, H. S., & Aimes, E. W. (1982). Preferences for familiar or novel toys: Effects of familiarization time in 1-year-olds. *Developmental Psychology, 18*(4), 519-529.

Jackson, E., Campos, J. J., & Fischer, K. W. (1978). The question of décalage between object permanence and person permanence. *Developmental Psychology, 14*(1), 1-10.

Jenrenaud, C. Y., & Linford, A. G. (1960). Effects of perceived novelty on approach-avoidance behavior in young children. *Perceptual and Motor Skills, 29,* 491-494.

Kagan, J. (1971). *Change and Continuity in Infancy.* New York: Wiley.

Kagan, J. (1982). *Psychological Research on the Human Infant: An evaluative Summary.* New York: W. T. Grant Foundation.

Keenan, T. R. (2000). Negative Affect Predicts Performance on an Object Permanence Task. Manuscript under review. *Developmental Science.*

Lezak, M. D. (1995). *Neuropsychological Assessment. (*3rd ed.). Oxford: Oxford University Press.

Lingle, K. M., & Lingle, J. H. (1981). Effects of selected object characteristics on object-permanence test performance. *Child Development, 43*, 858-868.

Lockhart, R. S., & Craik, F. I. M. (1990). Levels of Processing: A retrospective commentary on a framework for memory research. *Canadian Journal of Psychology, 44,* 87-112.

MacLean, D. J., & Keenan, T. R. (Unpublished). Development of the Object Concept: Integrating context and content. Manuscript in review.

Milewski, A. E., & Siqueland, E. R. (1975). Discrimination of color and pattern novelty in one-month human infants. *Journal of Experimental Child Psychology, 19*, 122-136.

Munakata, Y. (1997). Rethinking infant knowledge: Toward an adaptive process account of success and failures in object permanence tasks. *Psychological Review, 104,* 686-613.

Piaget, J. (1954). *The construction of reality in the child.* New York: Basic Books.

Rader, N., Spiro, J., & Firestone, P.B. (1979). Performance on a stage IV object-permanence task with standard and non-standard covers. *Child Development, 50,* 908-910.

Rose, S. A., Gottfried, A.W., Melloy-Carminar, P., & Bridger, W. H. (1982). Familiarity and novelty preferences in infant recognition memory: Implications for information processing. *Developmental Psychology, 18* (5), 704-713.

Rothbart, M. K. (1981). Measurement of temperament in infancy. *Child Development, 52,*569-578.

Rothbart, M. K., & Bates, J. E. (1998). Temperament. In W. Damon & N. Eisenberg (Eds.), *Handbook of Child Psychology* (5th Ed) (Vol. 3, pp. 105-176). New York: John Wiley & Sons.

Rothbart, M. K., & Mauro, J. A. (1990). Questionnaire approaches to the study of infant temperament. In J. Colombo & J. Fagan (Eds.), *Individual Differences in Infancy: Reliability, stability, prediction* (pp. 411-430). Hillsdale; Lawrence Erlbaum Associates.

Sluckin, W., Miller, L. B., & Franklin, H. (1973). The influence of stimulus familiarity/novelty on children's expressed preferences. *British Journal of Psychology, 64,* 563-567.

Smith, L. B., McLin, D., Titzer, B., & Thelen, E. (1995). The task dynamics of the A-not-B error. In L. B. Smith (Chair), *Tests of a dynamic systems theory: The object concept.* Symposium at the meeting of the Society for Research in Child Development, Indianapolis. In Y. Munakata. (1997). Rethinking infant

knowledge: Toward an adaptive process account of success and failures in object permanence tasks. *Psychological Review, 104,* 686-613.

Smith, L. B., Thelen, E., Titzer, R., & McLin, D. (1999). Knowing in the context of acting: The task dynamics of the A-not-B error. *Psychological Review, 106*(2), 235-260.

Sophian, C. (1980). Habituation is not enough: Novelty preferences, search, and memory in infancy. *Merril-Palmer Quarterly, 26*(3), 239-257.

Sophian, C., & Wellman, H. M. (1983). Selective information use and perseveration in the search behavior of infants and young children. *Journal of Experimental Child Psychology, 35,* 369-390.

Stack, D. M. & Tsonis, M. (1999). Infants' haptic perception of texture in the Presence and absence of visual cues. *British Journal of Developmental Psychology, 17*(1), 97-110.

Tardona, D. R., & Bradley-Johnson, S. (1984). Novelty, familiarity, and significance of object in the assessment of object permanence. *Journal of Psychoeducational Assessment, 2*(2), 109-116.

Thelen, E., & Smith, L. B. (1994). *A Dynamic Systems Approach to the Development of Cognition and Action.* Cambridge: Bradford/MIT Press.

Thelen, E., & Smith, L. B. (1995, March). *A Dynamic Systems Approach to the Object Concept: Theory.* Paper presented at the biennial meeting of the Society for Research in Child Development, Indianapolis.

Thomas, A., Chess, S., Birch, H. G., Hertzig, M. E., & Korn, S. (1963). *Behavioral Individuality in Early Childhood.* New York: New York University Press.

Weizman, F., Cohen, L. B., & Pratt, J. (1971). Novelty, familiarity, and the development of infant attention. *Developmental Psychology, 4,* 149-154.

Wellman, H. R., Cross, D., & Bartsch, K. (1987). A meta-analysis of research on Stage 4 object permanence: The A-not-B error. *Monographs of the Society of Research in Child Development, 51*(3), 1-51.

Wetherford, M. J., & Cohen, L. B. (1973). Developmental changes in infant visual preferences for novelty and familiarity. *Child Development, 44,* 416-424.

Winnicott, D. W. (1953). Transitional objects and transitional phenomena: A study of the first not-me possession. *International Journal of Psycho Analysis, 34,* 89-97.

APPENDIX A.

- INFORMATION SHEET FOR PARENTS
- HINDING TABLE DIMENSIONS
- EASI II
- CONSENT FORM

Department of Psychology

University of Canterbury
Private Bag 4800
Christchurch
New Zealand

Telephone: +64-3-366 7001
Facsimile: +64-3-364 2181
Email: office@psyc.canterbury.ac.nz
Website: www.psyc.canterbury.ac.nz

Child Development Research Lab
Department of Psychology
University of Canterbury
Private Bag 4800
Christchurch

29/09/00

Dear Parent,

We are conducting a research project at the Child Development Research Lab, University of Canterbury, looking at the development of infants' memory skills. In particular, we are interested in when infants recognize that a hidden toy has not 'disappeared', assessed by watching how infants search for a hidden toy in the context of a short game. One question which is currently of interest is whether the familiarity of the toy plays a role in the development of infants' memory. Simply put, are infants more likely to search for and find a hidden toy that they are familiar with? We are currently running a study examining this question and we understand that you might have an infant within the 8- to 18-month-old age range.

You and your child will be seen individually by a female experimenter who has had a great deal of experience working with infants and young children. This study will take part in the Child Development Research Lab at the University of Canterbury (43 Creyke Road). The study involves a one time, 30-minute period of testing, where infants are invited to play a simple hiding game with the experimenter while seated on your lap. Our experience is that most infants enjoy this game, but of course, not all children are built the same way; if your child does not enjoy this game, we would not continue with the testing and could either book an alternative appointment for you or you could withdraw from the project.

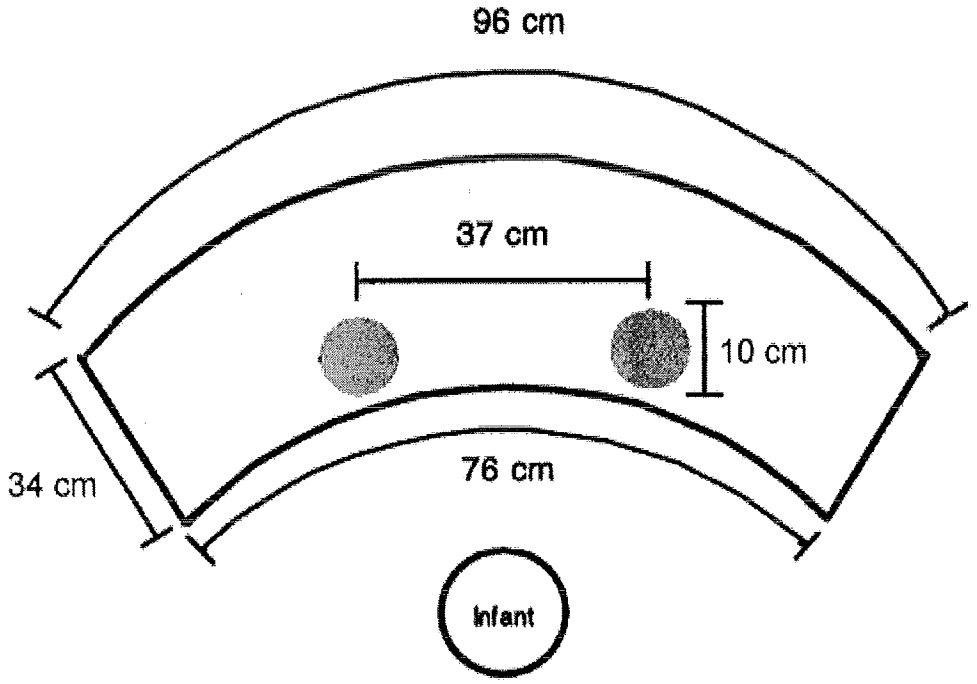
This project has been reviewed by the University of Canterbury's Human Ethics Committee and poses no threat to your child. All information gathered will be kept confidential and no names or individual identifications will be used in any publications that may arise as a result of this research.

If you would be interested in participating in this project, please contact Tracey Morris on 364-2987, extension 7099. We would be very happy to book an appointment at a time which is convenient for you. If you have any questions about the study, please do not hesitate to contact me. Thank you for your time.

Yours sincerely,

Tracey Morris
(Phone: 364 2987, ext. 7099)

Thomas Keenan, Ph.D.
(Phone: 364-2169)


96 cm
37 cm
10 cm
34 cm
76 cm
Infant

EAS CHILD BEHAVIOUR QUESTIONNAIRE

Rate each of the items for your child on a scale of **1** (not characteristic or typical of your child) to **5** (very characteristic or typical of your child).

		Circle One Not characteristic or typical				very characteristic or typical
1	Child tends to be shy.	1	2	3	4	5
2	Child cries easily.	1	2	3	4	5
3	Child likes to be with people.	1	2	3	4	5
4	Child is always on the go.	1	2	3	4	5
5	Child prefers playing with others rather than alone.	1	2	3	4	5
6	Child tends to be somewhat emotional.	1	2	3	4	5
7	When child moves about, he/she usually moves slowly.	1	2	3	4	5
8	Child makes friends easily.	1	2	3	4	5
9	Child is off and running as soon as he/she wakes up. ..... in the morning.	1	2	3	4	5
10	Child finds people more stimulating than anything else.	1	2	3	4	5
11	Child often fusses and cries.	1	2	3	4	5
12	Child is very sociable.	1	2	3	4	5
13	Child is very energetic.	1	2	3	4	5
14	Child takes a long time to warm up to strangers.	1	2	3	4	5
15	Child gets upset easily.	1	2	3	4	5
16	Child is something of a loner.	1	2	3	4	5
17	Child prefers quiet, inactive games to more active ones.	1	2	3	4	5
18	When alone, child feels isolated.	1	2	3	4	5
19	Child reacts intensely when upset.	1	2	3	4	5
20	Child is very friendly with strangers.	1	2	3	4	5

I have read and understood the description of the above-named project. On this basis, I agree to allow my child to participate as a subject in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved. I also understand that at any time I may withdraw my child from the project, including the withdrawal of any information provided.

I agree to allow my child, _____ to participate in the study described above.

Signed: _____ **Date:** _____

Phone Number: _____

Please Print.

Child's full name: _____

Child's Birth Date: _____

I would be interested in receiving a copy of the written report when completed. (Please provide your postal address in the space below)

Address: _____

_____

_____