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“The assessment of preference with children:
The effects of pre-exposure”.

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Abstract

This research examined the effects of relative degree of exposure (a possible establishing operation) to potential reinforcers that were non-edible (i.e., toys) on the preferences of four children who have a developmental disability. The children, ranged from eight to twelve years of age and the experiment was conducted in each of their homes after school. Parents helped select six toys that were small and easily handled for each child and that they thought the child enjoyed. The children had access the toys only in the experimental sessions. Multiple stimulus without replacement (MSWO) preference assessments were conducted with each child to identify a preference ranking for each toy. The four bottom ranking toys were used in alternating control and test sessions. In the control sessions, participants were given 5 min of free access to each of the four toys prior to a MSWO preference assessment in each session. In the first eight test sessions, called deprivation sessions, the participants were given 5 min of free access to all but their lowest preferred toy before the MSWO assessment. The four highest ranked of the six toys were used for the second series of control and test sessions. Control sessions continued as before using these highest ranked toys. In the eight test sessions, called habituation sessions, participants were given 5 min of free access to only the most preferred toy. There were no consistent effects on preferences for the toys in the deprivation sessions, whereas the most preferred toy was selected less often in the in the habituation sessions. These results suggest that prior exposure to toys reduces the value of the toys.

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Ethical Considerations

Formal approval for this research was granted by the Research Committee of the Psychology Department of the University of Waikato. Consent to work with the children was given by the children's parents.

Table of Contents

Abstract	ii
Acknowledgments	iii
Table of Contents	iv
List of Figures	vi
List of Tables	vii
Introduction	1
Method	18
Participants and Setting	18
Materials	19
Procedure	19
MSWO Preference Assessment	20
Control Session	23
Deprivation Session	24
Habituation Session	26
Results	27
Toy Selection	27
Initial Preference Assessments	27
Deprivation Condition	31
Habituation Condition	38
Discussion	46
Deprivation Condition	46
Habituation Condition	49
General Issues	50
References	54

List of Figures

Figure 1:	Initial Preference Assessment Results for Charlie	30
Figure 2:	Initial Preference Assessment Results for Michael	30
Figure 3:	Initial Preference Assessment Results for Jenna	30
Figure 4:	Initial Preference Assessment Results for Alex	30
Figure 5:	Deprivation Results for Charlie	35
Figure 6:	Deprivation Results for Michael	36
Figure 7:	Deprivation Results for Jenna	37
Figure 8:	Habituation Results for Michael	42
Figure 9:	Habituation Results for Alex	43
Figure 10:	Habituation Results for Jenna	44

List of Tables

Table 1:	The starting location (1-6) of each item (A-F) in the line-up in each consecutive MSWO assessment	22
Table 2:	MSWO data sheet for recording selected items and the position that item had been presented	22
Table 3:	MSWO preference assessment data sheet used for recording the total number of times each item was selected and what trial it was selected on over all six assessments	23
Table 4:	The order of control sessions (C1-C16) and of test sessions (D1-D8 – Deprivation sessions and H1-H8 – Habituation sessions) and the order of exposure to the items (left to right) in the control, deprivation and habituation sessions	25
Table 5:	The average scores and ranks from the initial preference assessment	28
Table 6:	Recalculated average scores and the new rank order from the initial preference assessment data for four toys used in the deprivation condition. Also given are the average scores and rank order for the same toys in the control and deprivation sessions. The toys are listed in the table in their rank order based on the initial preference assessment	32
Table 7:	Recalculated average scores and the new rank order from the initial preference assessment data for four toys used in the habituation condition. Also given are the average scores and rank order for the same toys in the control and habituation sessions. The toys are listed in the table in their rank order based on the initial preference assessment	39

Behaviour Analysis has a long tradition of implementing interventions using the principle of positive reinforcement to bring about desirable changes in behaviour. Positive reinforcement is a very important component of any behavioural and academic program for teaching children with autism and other developmental disabilities a wide range of skills including self-help, communication social, vocational and community survival skills among others (Leslie & O'Reilly, 1999). Positive reinforcement occurs when an individual is provided with a desirable outcome after they have performed a correct or appropriate response or behaviour, that leads to a higher likelihood of a repetition of that behaviour in the future. As an example, a child's independent play is said to be reinforced when it increases as a result of being given a sweet for playing (Cooper, Heron & Heward, 1987). For reinforcers to be effective they must be desirable to a child, therefore it is important to identify consequences which the child desires before attempting to use these as a reinforcer when working with the autistic child.

There are many different types of reinforcers that can be used to teach children new behaviours. For example many parents praise their child for eating all of their dinner. Some parents may give their child extra attention for completing their homework. However, parents who have a child with a developmental disability often discover that their child does not have a natural interest in the same kinds of reinforcers that a normal developing child has and as a result they find it difficult to find items or activities that their child enjoys (Leaf & McEachin, 1999). Therefore, in order to be able to teach a child with a developmental disability a new behaviour, it is essential to take the time to find out what items and activities are attractive to that child (Leaf & McEachin, 1999) if reinforcement is to be part of the teaching process.

There are many assessment approaches that can be used to identify reinforcers (Leslie & O'Reilly, 1999). Reinforcer assessment procedures differ in terms of their empirical rigour. When dealing with verbal humans, one of the easiest and probably least rigorous procedures is a Reinforcement Survey Schedule which is a written questionnaire that asks the individual whether they like or dislike a series of things. Normally items that might serve as reinforcers for individuals are divided into categories such as activities, edibles, and tangible. They are useful in finding out what people say they like. The advantage of using a Reinforcement Survey Schedule is that it gives a more comprehensive coverage, so items a parent or caregiver selecting the reinforcer might not think of are included.

However, there are problems with using a Reinforcement Survey Schedule for individuals who have a developmental disability, who have little in the way of communication skills and who cannot be asked what they would like. In this case, the caregivers or parents are frequently the sources of information about what the individual likes and dislikes. Unfortunately the validity of information from asking caregivers is not good (Leslie & O'Reilly, 1999). For example, Northup, George, Jones, Broussard, and Vollmer (1996) and Northup, (2000) reported caregiver accuracy to be approximately 57% for individuals with a developmental disability. This comes about because parents often assume that other people, especially children, like the same things that they like. Clearly identifying reinforcers is hindered by this process if it makes invalid conclusion. A more systematic approach to reinforcer selection is to observe the individual in their natural environment to find out what items and activities they find reinforcing. The problem with this approach, however, is that the observations made are subjective and might take a long time. To overcome these difficulties a number of experimental procedures have been developed. One of

these procedures is the Single Stimulus (SS) procedure developed by Pace, Ivancic, Edwards, Iwata, and Page (1985). It involves placing an item in front of the individual and recording whether or not they approach the item and, if they do, the latency to that approach. What constitutes approach must be carefully defined as the individuals being studied often have very limited behavioural repertoires. Approach can be as subtle as directing eyes in the direction of the particular stimulus, orienting towards the item or manipulating the item. The frequency of these approaches can be used to measure an individual's preference for particular items. This assessment procedure is validated by demonstrating that those items that were approached more often acted as more powerful reinforcers than those items that were not approached very often (Leslie & O'Reilly, 1999). The procedure is therefore useful for identifying preferences for individuals with severe developmental disabilities who are not able to verbally say which item they prefer or for individuals who are unable to make a selection from a broad range of items simultaneously for whatever reason. It is also a quick and easy assessment to administer and has been found to be more accurate to caregiver opinion in terms of identifying potential reinforcers. The disadvantage of the SS procedure is that it does not provide a relative rank value of each of the items.

In the Pace, Ivancic, Edwards, Iwata, and Page (1985) study, 16 stimuli were presented to six individuals who had severe developmental disabilities. The stimuli used were a mirror, held at a 45 degree tilt raised toward the child, an inactive light box placed 20 cm in front of the child, a song, a beep, coffee, flower, juice, a graham cracker, vibrator, a fan, a heat pad, a cool block, a swing rock, a clap, and a hug. The assessments began with presenting each of the 16 items to the individual and then recording whether they approached or avoided the items. If an individual approached an item they were given 5 s of access to that item. If the individual did not approach

the item, it was removed. The experimenter then prompted and encouraged the individual to play with the item for 5 s to make sure that they knew what to do with the item before placing it in front of them again. If the individual approached the item after sampling it, they were allowed to interact with it for 5 s. If the individual did not approach the item after 5 s, then it was removed and another item was presented to the individual. The results of this study demonstrate that all of the participants preferred some items more than others which suggests that the SS procedure is a suitable procedure for identifying reinforcers for individuals with developmental disabilities.

While preference assessments are useful for identifying potential reinforcers, they do not tell us how effective a reinforcer is (e.g., how much work an individual will do to get a reinforcer). Therefore Pace et al. (1985) conducted a second study to find out just how efficient the preferred and non-preferred items functioned as reinforcers by asking the individuals to respond to various requests. The results of this study showed that the individual's rate of responding increased when they were working for preferred items and decreased when they were working for less preferred items compared to the baseline where no systematic consequences were given to the individuals for complying with the requests. These results suggest that reinforcement assessments are useful for assessing how effective preferred and non-preferred items are as reinforcers for individuals with developmental disabilities.

Another procedure for measuring preferences is the Paired Stimulus (PS) procedure developed by Fisher et al. (1992). This procedure involves repeatedly presenting two items simultaneously to an individual and allowing them to choose one of the items. The measure of preference for an item is taken from the number of times that item is chosen over all presentations. The item which is chosen the most has been shown to serve as the most powerful reinforcer. The advantage of this procedure

is that it allows a comparison of reinforcer items that cannot be accomplished in a procedure in which items are evaluated at different points in time as in the SS procedure. The disadvantage of the PS procedure is that it can be very time consuming to administer.

Fisher et al. (1992) conducted a study which compared the SS assessment to the PS assessment. The items used were the same items that were used in the Pace et al. (1985) study in both the SS and the PS procedures. The SS procedure was conducted in the same manner as described previously. The items were presented 10 times over eight sessions. Within each session, four items were presented five times in a counterbalanced order for item and position. The PS procedure was conducted in the same manner as described previously. There were a total of 120 stimulus-pair presentations which were arranged in a counterbalanced order of item and position. The assessment continued until each item was paired with every other item. The results of this study demonstrate that the PS procedure produced greater differentiation of the rankings of the preference items compared to the SS procedure and therefore better predicted which items would function effectively as reinforcers. This is because in the PS procedure, the individual has to choose between two less preferred items which results in a more sensitive ranking of the items, whereas in the SS procedure only one item is presented at a time therefore individuals are able to keep approaching most or all of the items on each presentation, which makes it difficult to differentiate their reinforcing value. As a result the SS procedure tends to identify items as preferred when they are not.

The researchers then compared the results of a SS and PS procedure using a reinforcer assessment. This involved asking the individuals to respond to a request and then giving them access to a reinforcer when they displayed the correct response.

The results of this study demonstrate that the PS assessment better predicted items that resulted in higher levels of responding when presented in a concurrent operants procedure. This seems to suggest that when preferences are assessed by allowing participants to choose between two items, a more sensitive ranking of the items is produced. These results have been further supported by other research (eg., Paclawskyj & Vollmer, 1995).

Windsor, Piche, and Locke (1994) developed a preference assessment called the Multiple Stimulus with Replacement (MSW) procedure. The MSW preference assessment was designed to be an improvement on the SS and the PS assessments. It involves individuals choosing an item from a large selection of available items. The chosen item is then replaced back into the selection on the next trial. The advantage of the MSW procedure is that it is quick and easy to administer and often evokes fewer problem behaviours from individuals than the SS or PS procedures. However, the disadvantage is that individuals continue to choose their preferred item on every trial and therefore less distinct rankings of the preference items are produced.

Windsor et al. (1994) compared the MSW procedure to the Fisher et al. (1992) PS procedure using food and drink items. Before the study was conducted, staff who worked with the individuals provided a list of six food and drink items that they believed the individuals liked. The PS assessment was conducted in the same manner as described previously. The MSW assessment began by placing portions of the six food items on a tray and presenting the tray to the individual. The procedure consisted of 10 trials where the items were arranged on the tray in a different order on each trial and then presented to the individual. As a result each food item appeared equally often on the left and right side of the tray. After each presentation, the experimenter asked the individual the question “which one do you want?”. On the

first presentations, the food and drink items were labelled so that the participants learnt to reliably label the items.

The results of this study found that both the PS and MSW procedures identified the same most preferred item for each of the participants. The MSW procedure was much quicker to conduct than the PS procedure, but the PS procedure produced a larger number of unique rankings of the preference items compared to the MSW assessment. This is because in the PS procedure, the most preferred item is consistently removed from the presentation so that the individual is forced to choose between two less preferred items, thus producing a greater variety of unique rankings of the preference items. This is in contrast to the MSW procedure where the most preferred items are presented on every trial which allows individuals to keep selecting their most preferred items, thus producing a smaller variety of unique rankings of the items. For this reason it is assumed that the less preferred items chosen in the MSW assessment will not work effectively as reinforcers, when in fact they do, if tested directly, thus the MSW procedure produces false negatives (DeLeon & Iwata, 1996).

Windsor et al. (1994) demonstrated that of the 48 items assessed for 8 participants, eight (16.7%) items were never selected in the MSW procedure, even though all the items were previously identified as “liked items” by caregivers. In sum, it therefore appears that the PS procedure is a more preferable procedure of assessing an individual’s preference for one reinforcer over another compared to the MSW procedure.

DeLeon and Iwata (1996) wanted to improve on the PS and the MSW procedures, so they developed the MSWO preference assessment. This procedure involves individuals choosing from a large array of items, however, unlike the MS procedure, the chosen items are not returned back into the array. DeLeon and Iwata

(1996) compared the MSWO and MSW procedures to the PS procedure. Their study involved seven adults with profound developmental disabilities. The items used in the study were arbitrary selected apart from a few items that were chosen from casual observations and caregiver opinions. The items included food and drink items, (e.g., cookie, kit kat, pretzel, m&m, cracker, pudding, beet, gum, apple, coffee, spree, and sprite), and tangible items (e.g., vibrator, bumble, music, koosh, horn, icepack, skittle, ball, towel, beads, buzzball, cloth, dino). Prior to the beginning of the first session, individuals were given a sample of each of the food items and were given 30 s of access to each of the tangible items to ensure that the individuals were familiar with the items. Each session began with the items being placed in a line on a table in front of the individual. The individual was seated at the table approximately 0.3 m from the items, the experimenter then instructed the participant to select one item. After an item was selected, it was either removed from the immediate area (tangible item) or was not replaced (food item). The item at the left end was taken and moved to the right end of the line and all the items were shifted so that they were equally spaced on the table again. The next trial was then conducted. This procedure continued until all items had been selected or until a 30 s period had elapsed between the participant's previous selection and their next selection and all the remaining items were recorded as "not selected". The MSW procedure was conducted in a manner identical to the MSWO assessment except after each trial, the item just selected was returned to the array. The PS procedure was conducted in the same manner as described previously with two items being presented during each trial. The results of the study demonstrated that both the PS and the MSWO procedures produced a greater variety in the rankings of the items compared to the MSW procedure. They also produced more consistent data compared to the MSW assessment. The PS procedure however

took more time to conduct than the MSWO and the MSW procedures. The results of this study therefore suggest that the MSWO procedure is the best assessment to implement when trying to identify potential reinforcer items.

DeLeon and Iwata (1996) conducted a second experiment to verify predictions about items that were never selected in the MSW procedure. This experiment included four participants from the first experiment. Each participant had selected an item during the MSWO and PS procedures that was not selected in the MSW procedure. The items tested were fruit juice, beets, peanut m&m candy and chewing gum. All four items had been selected some of the time in the PS and the MSWO procedures. To determine how effectively the preferred items functioned as reinforcers, the experimenters presented the individuals with their preferred items each time they produced the correct response on a task. They then evaluated whether the items still worked as reinforcers when the schedule requirements increased or the required response became harder. Using this procedure, if the individual's rate of responding on the task did not increase over the baseline, the PS and the MSWO procedures would be identifying items as potential reinforcers when in fact they are not, thus producing false positives. However, if the individual's rate of responding increased on the task, the PS and the MSWO procedures would be accurately identifying items that could function as effective reinforcers. The results of the study showed that items that had never been chosen by the individuals in the MSW procedure but had been chosen some of the time during the MSWO and PS procedures produced increases in the individual's responding to the task. Therefore, it appears that in some cases, items that are not identified as potential reinforcers in the MSW procedure may in fact still function very well as reinforcers. These results

suggest that the MSWO and the PS procedures are more able to identify reinforcers more accurately than does the MSW procedure.

In sum, researchers have developed a number of procedures for establishing preferences for individuals with developmental disorders which include the SS, PS, MSW, and the MSWO procedures. Furthermore, previous research has demonstrated that the MSWO procedure produces more consistent rankings of reinforcer items compared to the SS and the MSW procedure. Finally, the MSWO procedure has been demonstrated to be more time efficient than the PS procedure. Therefore, the MSWO procedure is the most practical and efficient procedure for identifying potential reinforcer items for individuals with a developmental disability.

As well as being able to measure the relative preference for reinforcers it is also possible to be able to change the relative preference for these reinforcers. One way of doing this is by a mechanism called an Establishing Operation (EO). Michael (2000) describes EO's as variables that change both the reinforcing value of an event and as a consequence change the relationship between the reinforcer and its associated behaviour. He suggests that EO's can be classified as either Establishing Operations (which increase the associated behaviour) and Abolishing Operations (AO) (which decrease the associated behaviour). The terms deprivation and satiation are sometimes used as general descriptions of establishing operations and abolishing operations. Satiation is the process by which a reinforcer loses its effectiveness by exposure to that reinforcer. For example, a child who has eaten a lot of potato chips will eventually come to a point where they have had their fill of potato chips and as a result potato chips will no longer function as a reinforcer. Deprivation is the process by which a reinforcer becomes more effective by making that reinforcer unavailable

for a period of time. For example, a child will find potato chips more reinforcing if they have not eaten them for a while.

Although the effects of satiation and deprivation have been reliably observed with animals using food as a reinforcer, (e.g., Pierce, Epling, and Boer, (1986) and De Marse, Killen and Baker, (1999)), there is not much research demonstrating this relationship with children using food as a reinforcer. This is in part due to the ethical constraints that limit the extent to which researchers can deprive children of food. In one study Gottschalk, Libby, and Graff (2000) demonstrated that food items can be made more effective if they have been withheld from the child for a period of time. They conducted a preference assessment for edible items using the PS format with four individuals with developmental disabilities. They presented eight food items in pairs to the individuals and the percentage of approach responses (e.g., reaching forward and picking up an item) was recorded. Any attempts to pick up two items were immediately blocked by the experimenter. Once an individual had chosen a food item, they were allowed to eat it. To ensure that the individuals did not continue to keep choosing their most preferred food items, the experimenter removed the two highest and two lowest items for each individual leaving the four medium preferred food items to be included into the study. The food items in this study included, oyster cracker, graham cookie, gummi candy, twinkie, jellybean, popcorn, cheese-it, cracker, skittles, licorice, reeses pieces, and necco wafers. The PS preference assessment was conducted with the four food items identified for each individual. The study consisted of a control condition, a satiation condition and a deprivation condition. In the control condition the individuals were given access to each of the food items at three planned times during the day 24 hr prior to the preference assessment. The satiation condition was the same as the control condition except individuals were given a 10 min period

of free access to one of the food items prior to the preference assessment. In the deprivation condition, individuals were given access to three of the four food items prior to the preference assessment. The fourth food item was made unavailable for a period of 48 hrs prior to this preference assessment. The results demonstrated that the percentage of approach responses was higher for four stimuli after deprivation with each for two of the participants. For the other two participants the percentage of approach responses was higher for three of the four stimuli after they had been deprived of each. Following satiation with each stimulus, the percentage of approach response was lower for all four stimuli for three of the individuals. For one participant the percentage of approach responses was lower for three of four stimuli following satiation with each.

The results of this study demonstrate that by either withholding a food item from an individual for a period of time or by providing prior access to the food item, it is possible to change their preference for that item compared to the other items. Thus, suggesting that satiation and deprivation function to change preferences and so may be functioning as EO's. Although preference assessments were conducted there was no reinforcer assessment to determine how effective the food items functioned as reinforcers. Given that the above study demonstrated that satiation and deprivation changed the value of food reinforcers, it is unknown if satiation and deprivation also applies to tangible reinforcers.

One study that did examine both food and tangible items was a study conducted by Bojak and Carr (1999). They conducted MSWO preference assessments to see if administering preference assessments both before and after a meal would decrease participant's preferences for food items when offered in the MSWO assessment after the meal. Although it is not made clear in the study, it appears the food items in the

preference assessment differed from those in the meal. Four adults who had been diagnosed with severe mental retardation participated in the study.

In the first part of the study the researchers conducted two MSWO assessments, one with eight food items and the other with eight tangible items. The tangible items were objects that the participants could select and interact with for a short period, but it was not reported what these items were. From these two assessments, the four most preferred food and tangible items were identified and combined into a third MSWO assessment. All of these assessments were conducted between mealtimes so the individuals would not become satiated with food prior to the preference assessments. The results of the first part of the study demonstrated that all the individuals chose the food items before the tangible items. Food was ranked first through fourth and the tangible items were ranked fifth through eighth. These results are consistent with the results of the study conducted by DeLeon et al. (1997).

In the second part of the study ten combined food and tangible MSWO preference assessments were conducted in succession over the next five days immediately before and after the evening meal. The results of this part of the study demonstrated no significant changes in the individual's preference for the items after the evening meal for any of the individuals. Hence, the food items were not ranked lower than the tangible items following the evening meal. However, there are difficulties with interpreting these data. It is possible that food decreased in value as a result of the meal but still stayed preferred to tangible items and this change was not detected in the preference assessment. The researchers were examining satiation and expected the preference for food to decrease as a result of the meal. However there is another phenomenon that might be relevant here – habituation. Habituation refers to a decrease in responsiveness to a stimulus when that stimulus has been presented

repeatedly or for a prolonged time (e.g., Groves & Thompson, 1970; Thompson & Spencer, 1966). Dishabituation refers to either a new stimulus or some kind of change in the environment causing an individual's responding to increase (McSweeney & Murphy, 2000). There are many studies showing both habituation and dishabituation to food types with animals, e.g., Aoyama and McSweeney (2001) and with humans, e.g., Temple, Kent, Giacomelli, Paluch, Roemmich and Epstein (2006). So if the food that was used in the preference assessments was also in the meal then it might be expected to see habituation and so a decrease in preference in the following preference assessments. However, if the food in the preference assessments was not in the meal, it might be expected that there was dishabituation on its presentation in the preference assessments and so there maybe no change in preference as a result of the meal. Since it is not clear if the food was in the meal or not it is not possible to see which of these might apply here. It is possible the individuals' preferences stayed high if the food items offered in the preference assessments were novel (i.e., not in the meal). The results of this study simply show food is more preferred than tangible items, as shown by others. Bojak and Carr (1999) did not manipulate access to the tangible items to see if they could change the individuals' preference for these items.

Rincover, Newsom, Lovaas, and Koegel (1977) have pointed out that tangible items have many benefits as reinforcers compared to non-food items. For example, they suggested tangible items promote interaction between the child and its environment which food does not. Such interaction can improve an individual's social skills as well as teach them how to play appropriately (Rincover & Newsome, 1985). Another benefit of using tangible items as reinforcers is that they often provide a natural sensory consequence (for example, sound from turning on a tape recorder).

Data (e.g., Koegel & Williams, 1980) showing faster acquisition for behaviours reinforced by natural events, are consistent with this view. Tangible reinforcers may also be used in preference to food reinforcers with some individuals with a developmental disability if they are not very motivated by food, even when they have been food deprived to a level that is both ethical and practical (e.g., Fineman and Ferjo, 1969). Therefore using food is not an effective reinforcer for these individuals. On the other hand, most individuals with a developmental disability readily interact with tangible items or events of one kind or another and if they do not interact with one type they may with another. An individual who doesn't enjoy doing jigsaw puzzles may work for longer periods just so they can listen to a favourite music video (Rincover & Newsom, 1985). Rincover et al. (1977) pointed out that food is not often used as a reinforcer in naturalistic situations as it is less practical than non-food items. There is also a problem of individuals satiating much more quickly on food compared to non-food items making food less effective as reinforcers compared to non-food items (Rincover and Newsom (1985). However, it must be recognized that satiation does pass and the child will become hungry again.

Rincover et al. (1977) also state that there are ethical and legal standards when using food as a reinforcer which could limit the degree to which individuals may be food deprived while trying to enhance the effects of food as a reinforcer. Thus for this reason food as a reinforcer is not desirable to use with individuals.

Rincover and Newsom (1985) also point out that some foods, particularly highly preferred foods, may contain large amounts of fat and sugar and excessive use of these foods can be detrimental to an individual's health and should therefore be kept to a minimum. However, this doesn't exclude the use of food, but practitioners

must be careful about what foods they select. Therefore in many instances it is really more practical to use tangible items as reinforcers than food items.

DeLeon, Anders, Rodriguez-Catter, and Neidert (2000) highlighted the importance of using several reinforcer items to prevent an individual from becoming habituated to one item. The items they used were crayons and a colouring book or dolls as reinforcers. They put the highly preferred toys into rotation with the other less preferred toys. They found that an 11-year old girl's self-injurious behaviour decreased more when several toys were rotated as reinforcers than when just one toy was used as a reinforcer. It is possible that the use of one toy resulted in habituation and that the value of the toys was maintained when several toys were rotated as this prevented habituation. The study did not examine this hypothesis directly.

McAdam, Klatt, Koffarnus, Dicesare, Solberg, Welch, and Murphy (2005) did examine the effects of satiation and deprivation with tangible items. It is possible that what they term satiation with tangible items may be better thought of as habituation. McAdam et al. (2005) first conducted preference assessments with tangible items using the PS format with three individuals with developmental disabilities and three typically developing preschool children. The items included; stuffed animal, colouring, playing cards, guitar, lincoln logs, keyboard, magna doodle, bratz doll, car, legos, slinky, magazine, powerpuff stamps, spider, dump truck, potato head, paddle ball, phone, xylophone, barbie book, fire truck, foam puzzles, stamps. Three to four preference assessments were conducted to identify high and medium preferred items for each individual. From these preference assessments four preferred items (two high and two medium) for each individual were selected and used in a control condition, a deprivation condition and a satiation condition. In the control condition individuals with a developmental disability received 10 min of free access to each of

the four items prior to the preference assessment, whereas individuals without a disability received 20 min of free access to each of the four items prior to the preference assessment. In the deprivation condition, individuals with a developmental disability received 10 min of free access to three of the four items prior to the preference assessment. They were deprived of the fourth item for 24-48 hrs prior to the assessment. Individuals without a disability received 20 min of free access to three of the four items prior to the preference assessment. They were deprived of the fourth item for 24-144 hrs prior to the assessment. In the satiation condition, individuals with a developmental disability were given a 10 min period of free access to one of the four items prior to conducting the preference assessment. Individuals without a disability were given a 20 min period of free access to one of the four items prior to the preference assessment.

The results of this study demonstrated that access to three items and deprivation of one item resulted in increased selection of the item that the participants were not exposed to prior to the preference assessment for all of the participants and for at least three of the items for four of the participants. For two of the participants not having access to an item resulted in the selection of that item even though it had never been chosen during the control or satiation conditions. For each participant, at least two items were chosen less frequently after the satiation condition compared to the control condition. Furthermore, at least one item that was either highly or moderately preferred based on the results of the initial preference assessments was never selected following the satiation condition in which they had access to only that item prior to the preference assessment. Although there were differences in the degree of effect over individuals, these data suggest that whether or not the child had prior access to tangible items influenced the outcome of preference assessments.

In summary, the Gottschalk et al. (2000) study clearly demonstrated the effects of deprivation and satiation with food on preferences and they used the PS procedure to assess preferences. The McAdam et al. (2005) study also used the PS procedure to assess preferences and clearly showed the effects of deprivation and satiation (or habituation) with tangible items. The Bojak and Carr (1999) study used both food and tangible items and they used the MSWO procedure, however their results were not interpretable.

At the time of writing the McAdam et al. (2005) study was the only one found that attempted to examine the effects of EO's on preferences for tangible (or leisure) items with children. Bojak and Carr (2000) did not address this issue. Thus there is little research in this area. Therefore, the aim of the present study was to add to this research literature. It was decided to partially replicate the McAdam et al. (2005) study procedure as tangible items are so important for using with children. The review of preference assessments given previously, concluded that the PS and MSWO procedures produce similar results, but that the MSWO procedure was quicker to administer. Hence, it was decided to carry out the preference assessments using the MSWO procedure rather than the PS to see if the McAdam et al. (2005) findings could be replicated with this procedure.

METHOD

Participants and Setting

Four individuals with developmental disabilities participated in the study. Charlie, Michael, Alex and Jenna were 12, 9, 9 and 8 years of age, respectively, at the beginning of the study. Charlie's mother reported that Charlie has traumatic brain injury resulting from a fall. Charlie attended a satellite unit at the local intermediate

school. Michael's mother reported that Michael has global developmental delay, autism and hypotonia. Michael attended a mainstream school and had one-on-one assistance from a teacher aide. Alex's mother reported Alex to have an Autistic Spectrum Disorder (ASD). Alex attended a mainstream school in Te Puke. Jenna's mother reported Jenna to have a chromosome disorder called Mosaic Trisomy 15 and global developmental delay. Jenna attended a satellite unit within the local mainstream school. All sessions were conducted in a room at the participant's home. The participants were recruited for the study through local agencies such as CCS Disability Action, Child & Adolescent Mental Health Service (CAMHS) and Te Whanau Kotahi.

Materials

Different toy items were selected for each participant. For example items for Charlie were jigsaw puzzles, playdoh, bubbles, a toy computer, a magic toy, and lego. Items for Michael included a thimbles memory toy, an old mcdonald music book, a toy guitar, a snow toy, a toy sheep, and a book. Items for Alex included a ball, some toy animals, a magnet set, bob-the-builder toys, a book and toy cars. Items for Jenna included a jigsaw, a popup toy, feathers, a bead toy, bubbles, and a cd walkman. All the items used in the study were the actual items and not pictures representing the items and either belonged to the participant or to the researcher.

Procedure

At the beginning of the study, the parents were asked to identify six toys or objects that their child seemed to enjoy interacting with. The items were selected for

inclusion on the basis that they were small and easily handled. The participants could be given immediate access to each of the items (e.g., they could be handed the item to play with). Before any preference assessments were conducted, the participants were given access to each of the toy items for 1 min to ensure that they actually interacted with the item. This involved the researcher giving the participant the item and walking away to allow the participant to interact with the item on their own. During this time the researcher observed the participant and collected data on the length of time that the participant played with the item. If the participant did not play with the item, the researcher demonstrated to the participant how to play with the toy before giving it back to them for another minute. If the participant still did not interact with the item, the researcher discarded it from the experiment and after consultation with the parents, replaced it with another toy item.

MSWO Preference Assessment

In order to identify the preference rankings of the six items selected for each person, the researcher conducted a Multiple Stimulus without Replacement (MSWO) Preference Assessment (DeLeon and Iwata, 1996). The six items for each child were arbitrarily assigned a label from A-F. At the beginning of each MSWO assessment the researcher brought the six items into the experimental room and placed them in a line in the order of A to F from the researcher's left to right side. The items were spaced approximately 0.7 m apart from each other and 0.3 m in front of the participant in the order shown in Table 1. The researcher then asked the participant to choose one of the items. The participant either reached for that item or signalled which item they wanted. In the latter case the researcher handed the item to the participant. The participant was allowed to have access to that item for 30 s. While the participant

played with the item, the researcher put up a visual barrier around the remaining items in the line up to distract the participant from watching or grabbing the other items. Once the 30 s was up the researcher asked the participant to give the item back. If the participant did not hand the item over, the researcher told the participant that they would count to ten and then ask for the item. If after the count of ten the participant still did not hand the item over, the researcher distracted the participant in such a way that allowed the researcher to be able to remove the item from the participant's hands quickly. The selected item and the position that item had been presented in were recorded on the MSWO data sheet as shown in Table 2 but the item was not returned back into the line up.

For the next trial the item at the left end of the line was taken and moved to the right end of the line and all the items were shifted so that they were equally spaced again (0.7 m apart). This rearrangement of the items was to ensure that each item was placed in a different position on the table. The session continued until all the items were selected or a 30-s period had elapsed between the participant's previous selected item and their next selection in which case the remaining item(s) were removed and the next session began immediately. This procedure was conducted three times on two separate occasions with an initial order of items on each new session as shown in Table 1.

Once these assessments were completed each item was assigned a score based on the order in which it had been selected. For example, if an item was selected on the first choice it was assigned six points for that session and so on through to the sixth choice of which was assigned one point as shown in Table 3. The scores across each item were added up to get a total preference score (e.g., a high preference item had a total score of 36 points). This procedure gave a preference ranking for each toy

Table 1. The starting location (1-6) of each item (A-F) in the line-up in each consecutive MSWO assessment.

Assessment Sessions	Starting Location of each item					
	1	2	3	4	5	6
1	A	B	C	D	E	F
2	B	C	D	E	F	A
3	C	D	E	F	A	B
4	D	E	F	A	B	C
5	E	F	A	B	C	D
6	F	A	B	C	D	E

Table 2. MSWO data sheet for recording selected items and the position that item had been presented.

Session 1.	Date:	Researcher:	Initial Order? A-B-C-D-E-F
Circle item position	Item Selected	Trial Order?	Y/N
Choice 1. XXXXXX	Item A	Initial Order Correct?	Y
Choice 2. XXXXX	Item B	Rotation Correct?	Y
Choice 3. XXXX	Item C	Rotation Correct?	Y
Choice 4. XXX	Item D	Rotation Correct?	Y
Choice 5. XX	Item E	Rotation Correct?	Y
Choice 6. X	Item F	Rotation Correct?	Y

Table 3. MSWO preference assessment data sheet used for recording the total number of times each item was selected and what trial it was selected on over all six assessments.

<p># of times Stimulus 1.</p> <p>Set 1 selected by trial #</p> <p>1. _____ x 6 pts</p> <p>2. _____ x 5 pts</p> <p>3. _____ x 4 pts</p> <p>4. _____ x 3 pts</p> <p>5. _____ x 2 pts</p> <p>6. _____ x 1 pt</p> <p>Total Score _____</p>	<p># of times Stimulus 2.</p> <p>Set 1 selected by trial #</p> <p>1. _____ x 6 pts</p> <p>2. _____ x 5 pts</p> <p>3. _____ x 4 pts</p> <p>4. _____ x 3 pts</p> <p>5. _____ x 2 pts</p> <p>6. _____ x 1 pt</p> <p>Total Score _____</p>	<p># of times Stimulus 3.</p> <p>Set 1 selected by trial #</p> <p>1. _____ x 6 pts</p> <p>2. _____ x 5 pts</p> <p>3. _____ x 4 pts</p> <p>4. _____ x 3 pts</p> <p>5. _____ x 2 pts</p> <p>6. _____ x 1 pt</p> <p>Total Score _____</p>
<p># of times Stimulus 4.</p> <p>Set 1 selected by trial #</p> <p>1. _____ x 6 pts</p> <p>2. _____ x 5 pts</p> <p>3. _____ x 4 pts</p> <p>4. _____ x 3 pts</p> <p>5. _____ x 2 pts</p> <p>6. _____ x 1 pt</p> <p>Total Score _____</p>	<p># of times Stimulus 5.</p> <p>Set 1 selected by trial #</p> <p>1. _____ x 6 pts</p> <p>2. _____ x 5 pts</p> <p>3. _____ x 4 pts</p> <p>4. _____ x 3 pts</p> <p>5. _____ x 2 pts</p> <p>6. _____ x 1 pt</p> <p>Total Score _____</p>	<p># of times Stimulus 6.</p> <p>Set 1 selected by trial #</p> <p>1. _____ x 6 pts</p> <p>2. _____ x 5 pts</p> <p>3. _____ x 4 pts</p> <p>4. _____ x 3 pts</p> <p>5. _____ x 2 pts</p> <p>6. _____ x 1 pt</p> <p>Total Score _____</p>

item. From this point on one preference assessment session was conducted per visit and the procedure varied across visits. On alternate visits there were control sessions and between these were test sessions. There were two types of test sessions. The first eight were deprivation sessions and the second series of eight were habituation sessions. All four children completed this phase.

Control Session

For the first eight control sessions the most preferred items of the six were discarded and the middle and low preference items were selected for inclusion. For

the second series of eight control sessions the least preferred items were discarded and the high and middle preference items were selected for inclusion. The participant had no access to any of the items for 24 hrs prior to a control session. At the start of a control session the participants were given 5 min of free access to each of the four items one after the other and in a different order for each session as shown in Table 4. During the free access period the researcher played with the child to encourage the child to keep playing with the item throughout the full 5 minutes. Once all toys had been played with there was a MSWO preference assessment, as described previously using all four items. The items were initially placed in the same order (left to right) as they had been presented over the free access period as shown in Table 4. Throughout these sessions the researcher made casual observations of a participant's behaviour while they interacted with the toys.

Test Sessions

Deprivation Session

The first eight test sessions were deprivation sessions. For these sessions the most preferred items were discarded and the middle (M1 and M2) and low (M1 and L2) preference items were selected for inclusion. Access to all of the items was limited prior to a deprivation session. The child had no access to any of the items for at least 24 hrs. Prior to the session the child was given 5 minutes of free access to each of the three items (M1, M2 and L1) one after the other in a different order for each session as shown in Table 4. L2 was not presented. As in the control session, during the free access period the researcher played with the child to encourage the child to keep playing with the item throughout the full 5 min. After the free access period, a MSWO preference assessment was conducted with all four items. The items

Table 4.

The order of control sessions (C1-C16) and of test sessions (D1-D8 – Deprivation sessions and H1-H8 – Habituation sessions) and the order of exposure to the items (left to right) in the control, deprivation and habituation sessions. Each control session was followed by a test session using the same order.

During the deprivation and associated control sessions the two lowest preferred items (L1 and L2) and the two medium preferred items (M1 and M2) from the initial preference assessment were used and in each MSWO assessment they were presented in the order shown in the table. During the habituation and associated control sessions the two highest preferred items (H1 and H2) and the two medium preferred items (M1 and M2) were used and on each MSWO assessment they were presented in the order shown in the table.

Session Type		Order of Exposure			
Control	Test	1	2	3	4
C1	D1	M1	M2	L1	L2
C2	D2	L2	M1	M2	L1
C3	D3	L1	L2	M1	M2
C4	D4	M2	L1	L2	M1
C5	D5	M1	L1	M2	L2
C6	D6	L2	M1	L1	M2
C7	D7	M2	L2	M1	L1
C8	D8	L1	M2	L2	M1
C9	H1	H1	H2	M1	M2
C10	H2	M2	H1	H2	M1
C11	H3	M1	M2	H1	H2
C12	H4	H2	M1	M2	H1
C13	H5	H1	H2	M1	M2
C14	H6	M2	H1	H2	M1
C15	H7	M1	M2	H1	H2
C16	H8	H2	M1	M2	H1

were initially placed in the order (left to right) as shown in Table 4. Throughout these sessions the researcher made casual observations of a participant's behaviour while they interacted with the toys. Charlie, Michael and Jenna completed this phase.

Habituation Session

The second series of eight sessions were habituation sessions. For these sessions the least preferred items were discarded and the high (H1 and H2) and middle (M1 and M2) preference items were selected for inclusion. The participants had no access to the items for 24 hrs prior to these sessions. They were given 5 min of free access to the most preferred item (H1) prior to a session. They had no access to the other three items (H2, M1 and M2). During the free access period the researcher played with the child to encourage the child to keep playing with the item throughout the full 5 min. In the following preference assessments the items were arranged in a different order of exposure on each new trial as shown in Table 4 and the MSWO preference assessments were conducted as previously described with all four items. Throughout these sessions the researcher made casual observations of a participant's behaviour while they interacted with the toys. Michael, Jenna and Alex completed this phase. During this session, Jenna had a little accident and chipped one of her front teeth. As a result she did not participate in the study for four days.

RESULTS

Toy Selection

The mothers of Charlie, Michael and Alex selected toys that they thought their children would enjoy playing with during the initial preference assessment. For Jenna, novel toys were brought in by the researcher for inclusion in the preference assessment. All of the individuals interacted with the toys chosen for them during the initial 1 min assessment with the exception of Michael.

Charlie interacted with the magic toy, bubbles, legos, play doh, lap top and puzzle. Jenna interacted with a walkman, bubbles, feathers, a popup toy, puzzle and bead toy. Alex interacted with the ball, animals, magnet set, bob-the-builder toys, a book and toy cars. Michael interacted with the thimbles memory toy, old McDonald, snow toy and sheep. He did not interact with a ball and a Barney toy and they were replaced with the snow toy and a book. Subsequently he interacted with the snow toy and book.

Initial Preference Assessments

MSWO preference assessments were conducted to identify a preference ranking for each of the six toys selected for each individual. The toys were assigned a number from 6 to 1. Six was assigned if a toy was selected first and one was assigned if a toy was selected last as outlined in the method section. The assigned numbers were then added up to get a total score. The results of the initial preference assessment for each of the individuals are shown in Table 5. The data for the toys are presented in the order of their final preference rankings.

Table 5

The Average Scores and Ranks from the Initial Preference Assessment

	Toys	Rank	Assessment Score
Charlie	Magic Toy	1st	5.0
	Bubbles	2nd	4.8
	Lego	3rd	3.7
	Play Doh	4th	2.8
	Lap Top	5th	2.7
	Jigsaw	6th	2.0
Michael	Thimbles Memory Game	1st	5.5
	Old McDonald Music Toy	2nd	4.3
	Guitar	3rd	4.2
	Sheep	4th	3.2
	Snow Toy	5th	2.0
	Book	6th	1.8
Alex	Ball	1st	5.2
	Animals	2nd	4.7
	Magnet Set	3rd	4.2
	Bob-the-Builder Toys	4th	3.2
	Book	5th	2.0
	Cars	6th	1.8
Jenna	Walkman	1st	5.2
	Bubbles	2nd	4.7
	Feathers	3rd	3.7
	Pop-up-Toy	4th	3.0
	Jigsaw	5th	2.7
	Bead Toy	6th	1.8

Table 5 shows that Charlie chose the magic toy first and the jigsaw last. The magic toy, ranked at number one and the bubbles, ranked at number two, have quite close average scores. The scores of the play doh, ranked at number four, and the lap top, ranked at number five, are also close. There is a large difference in the average scores for the two bottom ranked toys and the two top ranked toys.

Table 5 shows that Michael tended to choose the thimbles memory game first and the book last. The old mcdonald music toy, ranked at number two, and the guitar, ranked at number three, have close average scores, as do the snow toy and the book. There is a clear difference in the average scores for the two bottom ranked toys and the two top ranked toys as was also seen in Charlie's results.

Table 5 shows that Alex had a tendency to choose the ball first and the cars last. Some of the average scores are quite close. However, there is a large difference in the average scores for the two bottom ranked toys and the two top ranked toys as was seen for the other children's data.

Jenna's data are similar to all the others. Table 5 shows she tended to choose the walkman first and the bead toy last. The pop-up toy, ranked at number four, and the jigsaw ranked at number five, are quite close in average scores and there is a large difference in the average scores between the two bottom ranked toys and the two top ranked toys.

The orders in which each toy was selected over the six preference assessments for each child are presented in Figures 1-4. The X axis shows the preference assessment number and the Y axis shows the order in which the item was selected in each assessment. It can be seen that the items which recorded high average scores in Table 5 tended to be selected early in a session while those which recorded low average scores in Table 5 tended to be selected fourth or fifth for all children. Thus

Figure 1.



Figure 2.

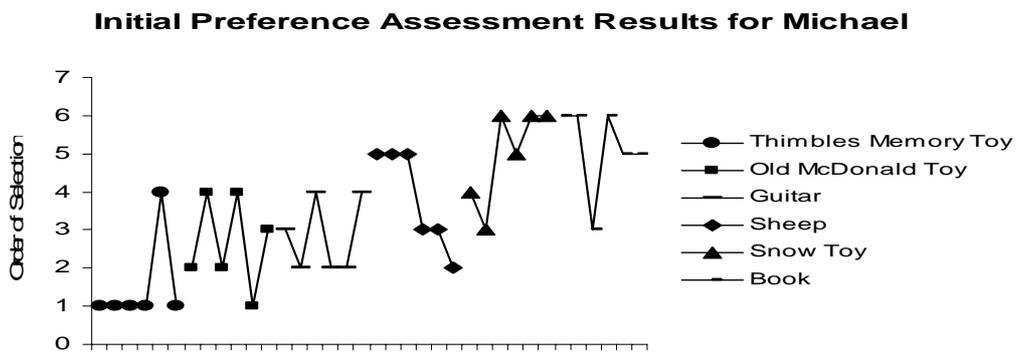


Figure 3.

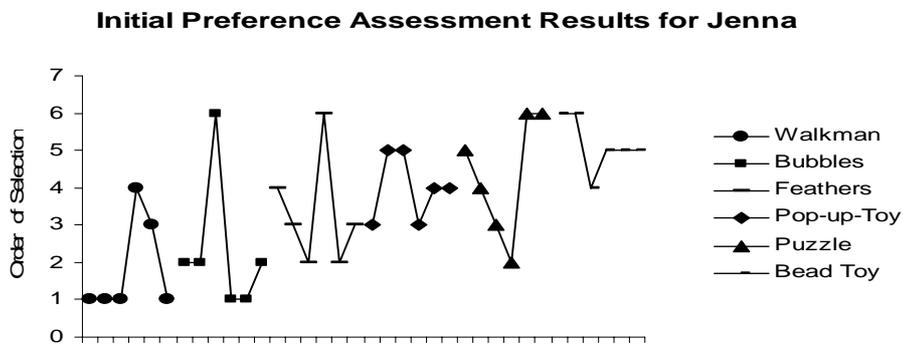
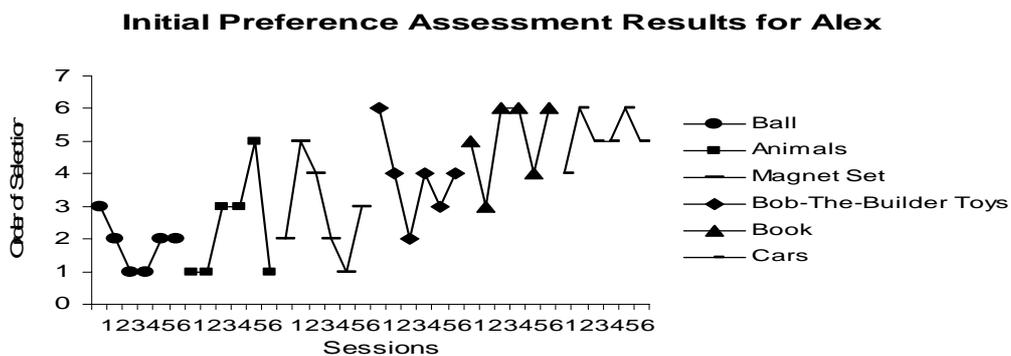


Figure 4.



the overall rankings reflected the selection order. One point to note is that the order of selection of the middle ranked items, where average scores were similar (Table 5), tended to vary.

Deprivation Condition

In the deprivation sessions and their accompanying control sessions, the two highest ranked items were not used. Thus the initial preference assessment ranking for the four remaining items were recalculated, excluding the two highest ranked items. For example, for Michael, the thimbles memory toy and the old mcDonald music toy were dropped out. The guitar became the highest ranked toy. It was selected first out of the four remaining toys on four of the six trials. The new rankings were calculated for all four remaining toys and are presented in the first section of Table 6. Only Charlie, Michael and Jenna participated in the deprivation condition.

Initial Preference Assessment Session Rank Order. Table 6 shows that for Charlie, the recalculated rank order changed from Table 5 with the lap top moving to second from third, making it second equal with the play doh. The rank order also changed for Michael, with the book moving from fourth to third, making it third equal with the snow toy. The rank order for Jenna stayed the same as in Table 5. The average scores over the initial preference assessments for all three children cover similar ranges (1 – 3).

Initial Preference Session Rank Order Versus Control Session Rank Order. The average scores and the rank order of each toy for the eight control sessions during the deprivation condition are shown in Table 6. For Charlie the average scores over the control session are all around 2 and do not cover the range seen in the initial

Table 6

Recalculated average scores and the new rank order from the initial preference assessment data for four toys used in the deprivation condition. Also given are the average scores and rank order for the same toys in the control and deprivation sessions. The toys are listed in the table in their rank order based on the initial preference assessment.

Participants	Toys	Initial Preference Assessment		Control		Deprivation	
		Rank	Average Score	Rank	Average Score	Rank	Average Score
Charlie	Lego	1	3.33	2	2.63	3	2.38
	Play Doh	2=	2.50	1	2.75	4	2.00
	Lap Top	2=	2.50	4	2.25	1	2.88
	Jigsaw	4	1.67	3	2.38	2	2.75
Michael	Guitar	1	3.67	2	3.00	2	3.25
	Sheep	2	2.67	1	4.00	1	3.88
	Snow Toy	3=	1.83	3	1.63	3	1.63
	Book	3=	1.83	4	1.38	4	1.38
Jenna	Feathers	1	3.33	2	2.75	1=	2.63
	Pop-up-Toy	2	2.67	1	3.75	1=	2.63
	Jigsaw	3	2.33	3	2.13	3	2.50
	Bead Toy	4	1.67	4	1.38	4	2.25

preference assessment. The rank order also changed with the lego moving to second from first, the play doh moving to first from second, the lap top moving to fourth from second and the jigsaw moving to third from fourth. The average scores in the control session for Michael are similar to his initial preference data. The guitar and sheep changed their rank order with the guitar moving to second from first and the sheep moving to first from second. The book also moved to fourth from third. Jenna's average scores for the control session are similar to her initial preference data. The two top ranked of her four toys change places with the feathers moving to second from first and the pop-up toy moving to first from second.

Initial Preference Session Rank Order and Control Session Rank Order Versus Deprivation Session Rank Order. Table 6 shows the average scores and rank order over the eight deprivation sessions for each child. For Charlie the jigsaw was the toy that he was not exposed to prior to these preference assessments. The average scores in the deprivation session cover a similar range to the control session, but cover a smaller range compared to the initial preference assessment. The rank order for the toys also change with the lego moving to third from second, the play doh moving to fourth from first, the lap top moving to first from fourth and the jigsaw moving to second from third.

For Michael, the book was the toy that was removed prior to a deprivation preference assessment. Michael's average scores over the deprivation session cover a slightly smaller range than in his control sessions. The ranks of the toys did not change from the control session.

Jenna was not given access to the bead toy prior to a deprivation preference assessment average. Like Charlie, her average scores cover a smaller range compared to the data in the control sessions and the initial preference assessment. Only the rank order of the feathers changed, moving from second to first equal with the pop-up toy.

Figures 5 - 7 illustrate the order of selection of each of the four toy items for each of the three participants for each preference assessment. The graph shows the order of selection of a toy across successive sessions. The diamonds on the graph represents order of selection in the initial assessment sessions with the data from the two highest-ranked items removed. The squares represent the order of selection in the preference assessment in the control condition, where the participants were given 5 min of access to each of the four toy items. The triangles represent the order of

selection in the preference assessments in the deprivation condition, where the participants were given 5 min of access to three of the four toys while the least preferred toy was withheld. Note that the x-axis shows the number of the session of that type and does not represent the order of the sessions. So although the initial assessment sessions were consecutive the control and deprivation assessment sessions alternated. The data are shown in this way for ease of viewing.

Initial Preference Assessments. Figure 5 illustrates that on most occasions Charlie selected the lego first while he selected the jigsaw last. The two middle ranked toys show more variation in their order of selection across sessions. Figure 6 show Michael selected the guitar either first or second during the initial preference assessment. Figure 7 shows that for Jenna, the bead toy was selected third or fourth during the initial preference assessment, but the order of selection of the other toys varied across assessments.

Initial Preference Assessments Versus Control Assessments. Figure 5 for Charlie and Figure 7 for Jenna show that there was a wide variation in the order the toys were selected over the control assessments. In contrast, for Michael there was very little variation of the order of selection of the toys over the control assessments. He chose the sheep first over all of the eight control sessions and the guitar second over all eight control sessions. He also selected the snow toy and the book either third or fourth in each session. While Michael's data are more stable than in the initial preference assessment data, the data of the other two vary similarly to the initial preference assessment.

Deprivation Results for Charlie

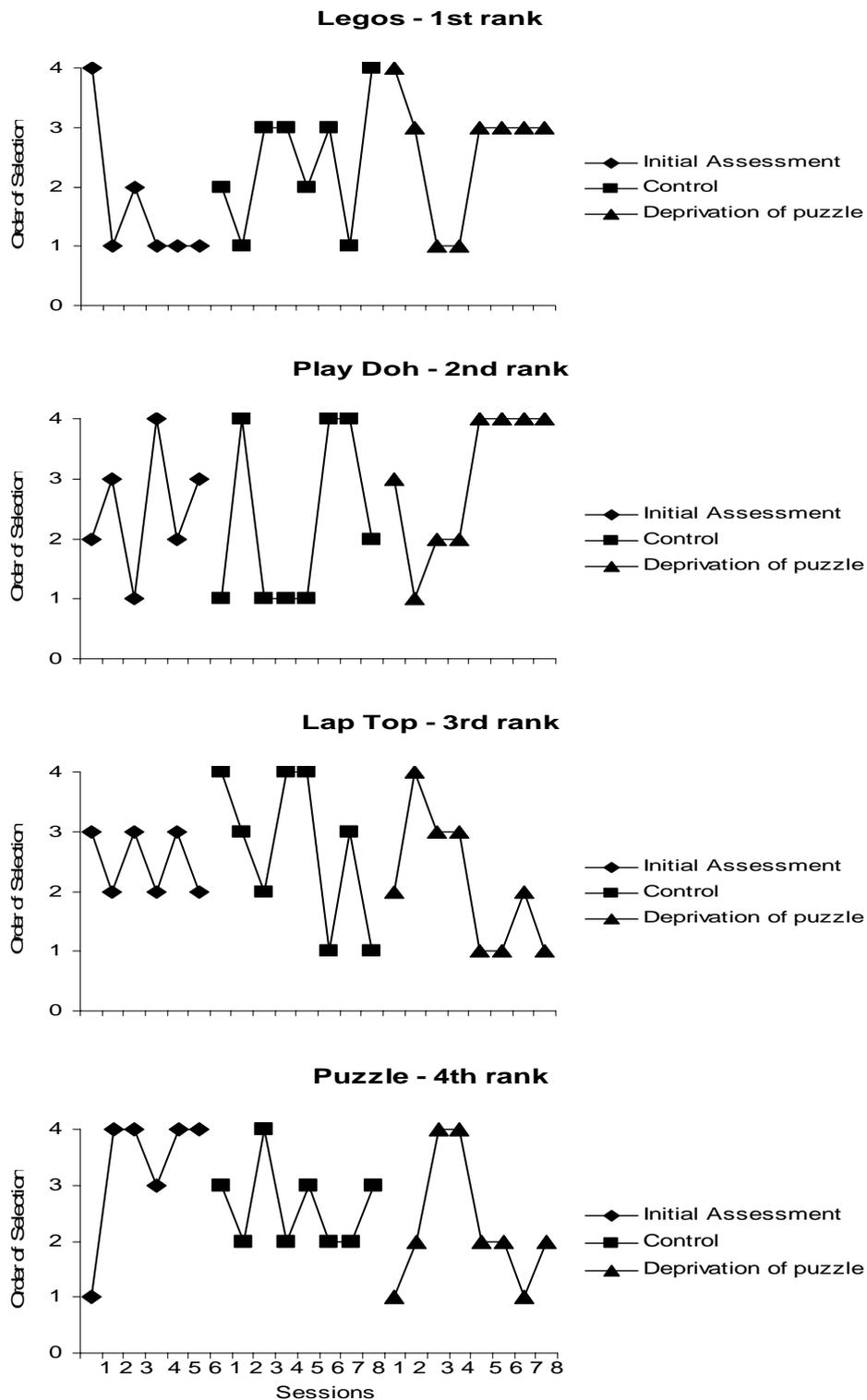
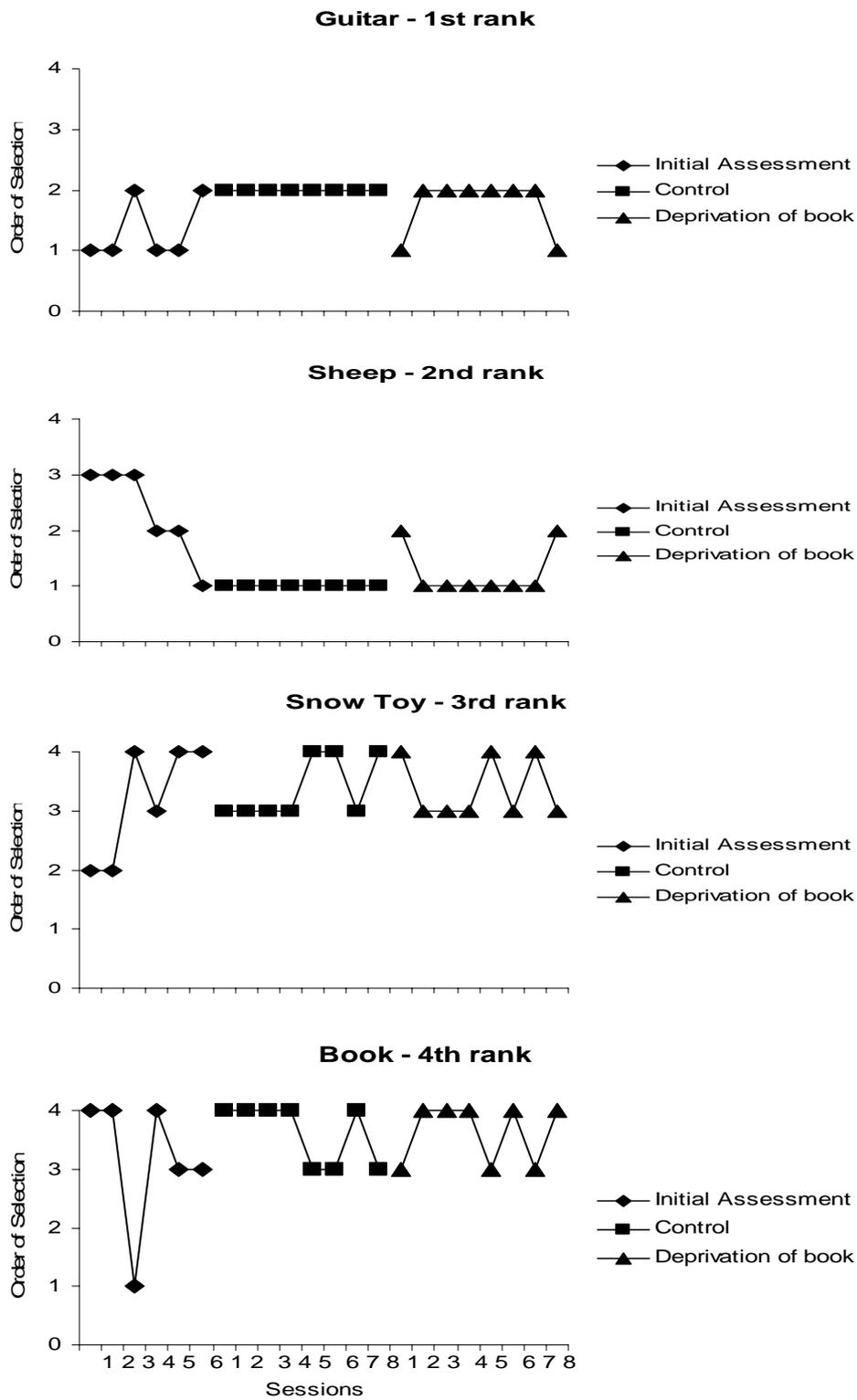


Figure 5. The order of selection of a toy across successive sessions with data from the two highest ranked items removed. The diamonds represent the initial preference assessment, the squares represent the control condition and the triangles represent the deprivation condition.

Deprivation Results for Michael



Deprivation Results for Jenna

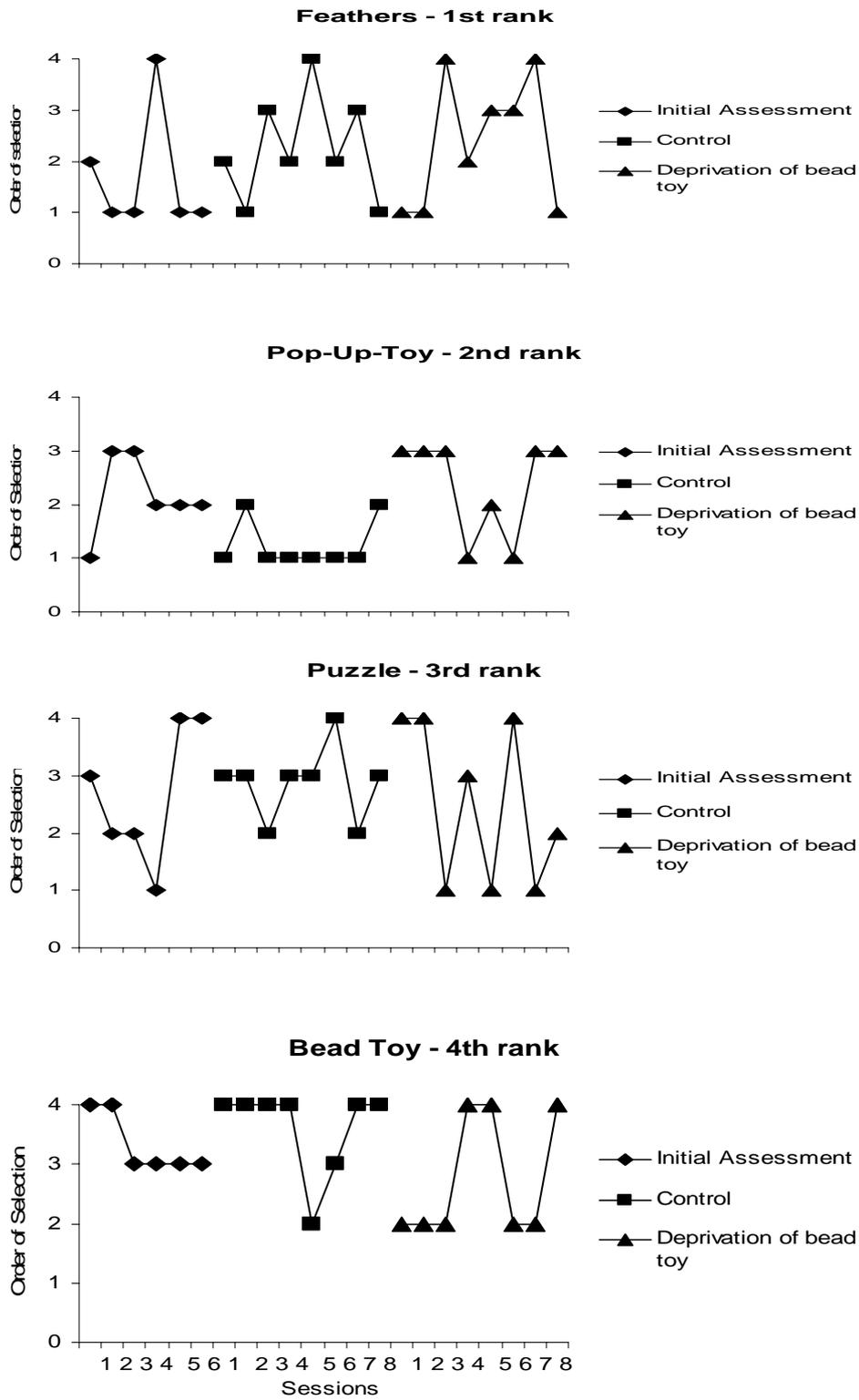


Figure 7. The order of selection of a toy across successive sessions with data from the two highest ranked items removed. The diamonds represent the initial preference assessment, the squares represent the control condition and the triangles represent the deprivation condition.

Initial Preference Assessment Versus Control and Deprivation Conditions.

Figure 5 for Charlie shows there was a wide variation of the order of selection of the toys as in the control sessions. Although the jigsaw was never selected first in the control session, it was selected first on two occasions in the deprivation session. These results show that temporarily removing access to the jigsaw for Charlie had little effect on the order of selection for the jigsaw or for any of the other toys compared to the control condition. Figure 6 for Michael shows there was a little bit more variation in the order of selection of the toys than the control sessions control session and perhaps not quite as much variation in the order of selection as there was in the initial preference sessions. It can be seen that not providing prior access to the book for Michael, did not have a large effect on the order of selection for the book or for any of the other toys compared to the control condition. Like Charlie, Jenna (Figure 7), shows a wide variation of the order of selection of the toys in the deprivation condition, which is similar to her control and initial preference assessment data. It can be seen that although the bead toy was selected earlier on some occasions, not providing prior access to the bead toy for Jenna did not have a big effect on the order of selection of the bead toy or for any of the other toys compared to the control condition.

Habituation Condition

In the habituation sessions and their accompanying control sessions, the two lowest ranked items were not used. Thus the initial preference assessment ranking for the four remaining items were recalculated, excluding the two lowest ranked items. For example, for Charlie, the lap top and the jigsaw were dropped out and the Play

Table 7

Recalculated average scores and the new rank order from the initial preference assessment data for four toys used in the habituation condition. Also given are the average scores and rank order for the same toys in the control and habituation sessions. The toys are listed in the table in their rank order based on the initial preference assessment.

	Toys	Initial Preference Assessment		Control		Habituation	
		Rank	Average Score	Rank	Average Score	Rank	Average Score
Alex	Ball	1	3.17	1	3.37	3 =	2.12
	Animals	2	2.84	2	2.62	3 =	2.12
	Magnet Set	3	2.33	3	2.50	2	2.25
	Bob-the-Builder Toys	4	1.67	4	1.50	1	3.50
Michael	Thimbles Memory Game	1	3.50	1	3.37	3	2.25
	Old McDonald Music Toy	2	2.50	2	3.12	2	2.87
	Guitar	3	2.33	4	1.37	4	1.37
	Sheep	4	1.67	3	2.12	1	3.50
Jenna	Walkman	1	3.33	2=	2.75	4	1.50
	Bubbles	2	3.00	2=	2.75	2	3.25
	Feathers	3	2.00	4	1.50	3	1.75
	Pop-up-Toy	4	1.67	1	3.00	1	3.50

Doh became the lowest ranked toy. It was selected last out of the four remaining toys on four of the six trials. The new rankings were calculated for all four remaining toys and are presented in the first section of Table 7. Only Alex, Michael and Jenna participated in the habituation condition.

Initial Preference Assessment Session Rank Order. Table 7 shows that the recalculations of the rank order of the toys are the same as in Table 5 for all children. The average scores for all three children cover a similar range to each other (1 – 3).

Initial Preference Session Rank Order Versus Control Session Rank Order. The average scores and the rank order for the eight control sessions during the habituation condition are shown in Table 7. It can be seen that for all children the average scores for the control sessions cover a similar range to their initial preference assessment scores and to each other. For Alex, the rank order of the toys stayed the same. For Michael, the rank order changed with the guitar moving to fourth from third and the sheep moving to third from fourth. Jenna's rank order also changed with the walkman moving to second equal with the bubbles, the feathers moving to fourth from third and the pop-up toy moving to first from fourth.

Initial Preference Session Rank Order and Control Session Rank Order Versus Habituation Session Rank Order. Table 7 shows the average scores and rank order over the eight habituation sessions for each child. For Alex the ball was the toy that he was exposed to for 5 min prior to these preference assessments. The average scores cover a slightly smaller range to the control sessions and to the initial preference assessments (2.0 -3.0). The order of selection of a toy changed with the ball moving from first to third, the animals moving from second to third equal with the ball, the magnet set moving from third to second and the bob-the-builder toys moving from fourth to first rank. For Michael, the thimbles memory toy was the toy that he was exposed to for 5 min prior to a habituation preference assessment. His order of selection of the toys changed with the thimbles memory game moving to third from first and the sheep moving from third to first. For Jenna, the walkman was the toy that she was exposed to for 5 min prior to a habituation assessment. The average scores cover a similar range to her control session. The rank order for the

toys changed with the walkman moving to fourth from second and the feathers moving to third from fourth.

Figures 8 – 10 illustrate the order of selection of toys for each participant.

Initial Preference Assessments. Figure 8 illustrates that Michael chose the thimbles memory toy on five out of six occasions. The other three toys are quite variable in their order of selection. As can be seen in Figure 9, Alex's order of selection for the toys in his initial preference assessment was variable. This is also the case for Jenna as shown in Figure 10.

Initial Preference Assessments Versus Control Assessments. Figure 8 shows that Michael did not select any toy consistently first in the control sessions. The guitar on the other hand was chosen last on seven out of eight occasions. Alex, in the control sessions selected the ball first five out of eight occasions and he chose the bob-the-builder toys last on five out of eight occasions. Data in Figure 10 show no consistent order of selection for any of the four toys. For Jenna and Alex, the order of selection varied similarly to the initial preference assessments, while Michael's data tended to be more consistent in the control session compared to the initial assessments.

Initial Preference Assessments Versus Control and Habituation Conditions. As seen in Figure 8, for Michael, in the habituation session, the thimbles memory toy moved from being selected either first or second in the control sessions to being selected either third or fourth on several occasions, while the sheep moved from being selected either third or fourth to being selected either first or second.

Habituation Results for Michael

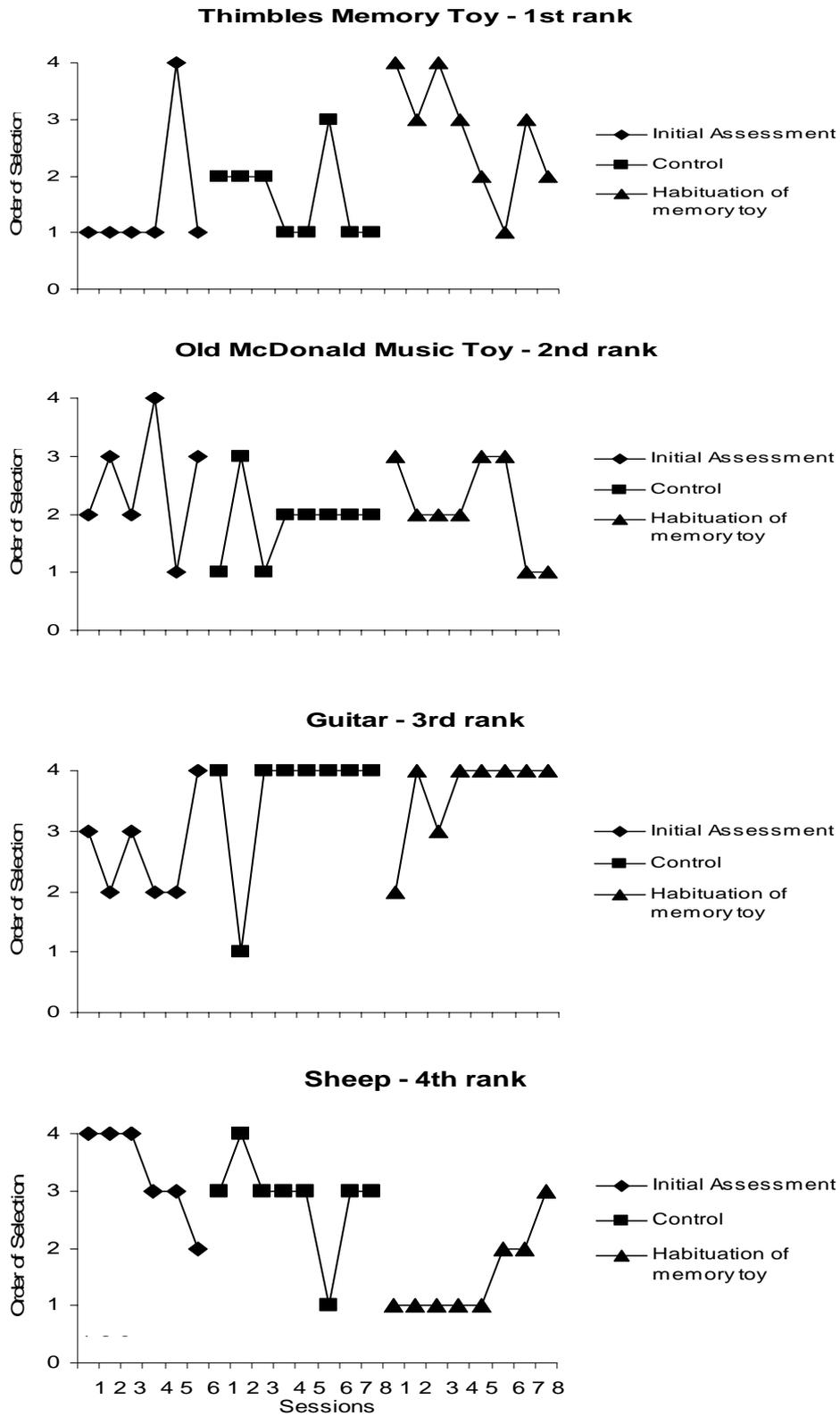
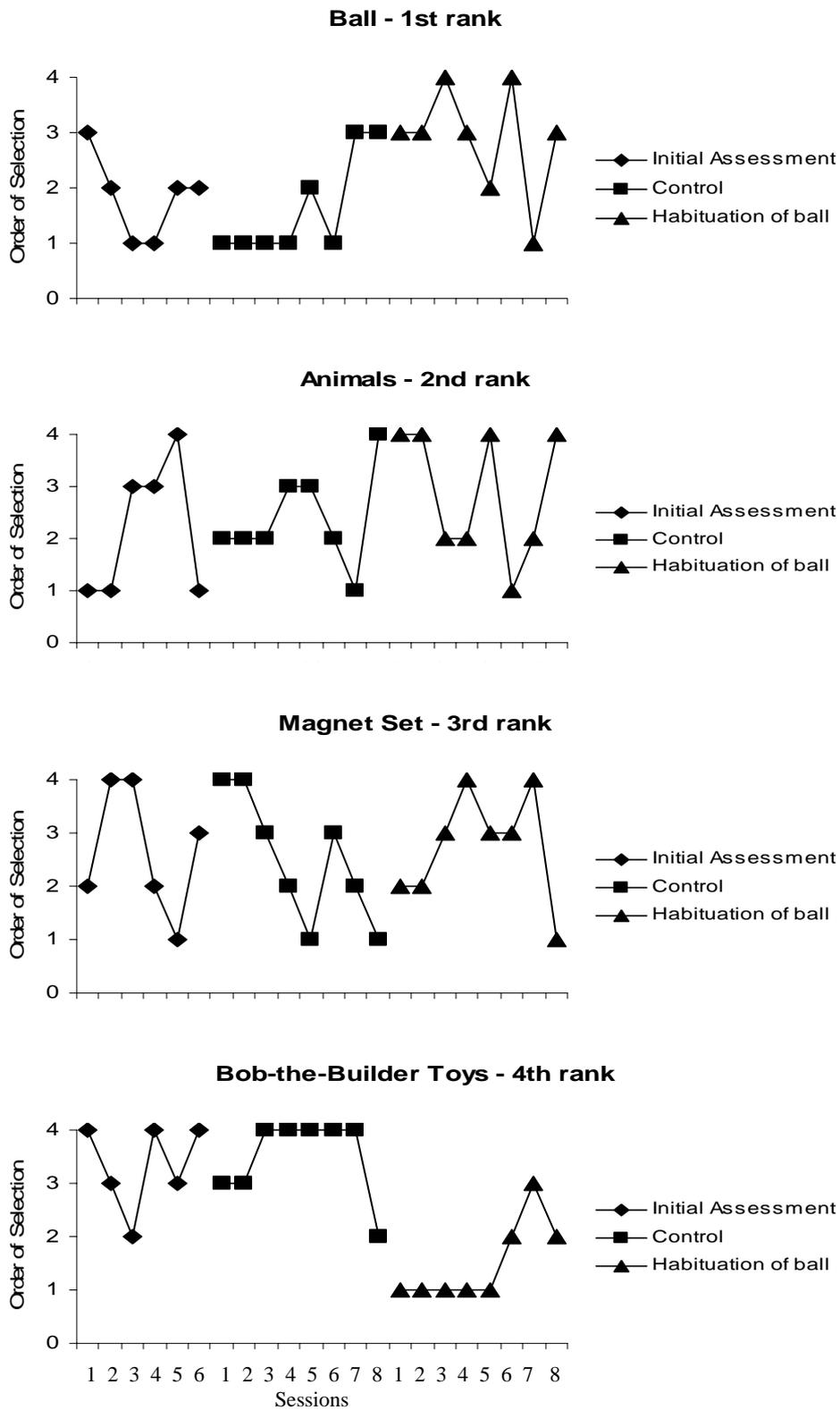


Figure 8. The order of selection of a toy across successive sessions with data from the two lowest ranked items removed. The diamonds represent the initial preference assessment, the squares represent the control condition and the triangles represent the habituation condition.

Habituation Results for Alex



Habituation Results for Jenna

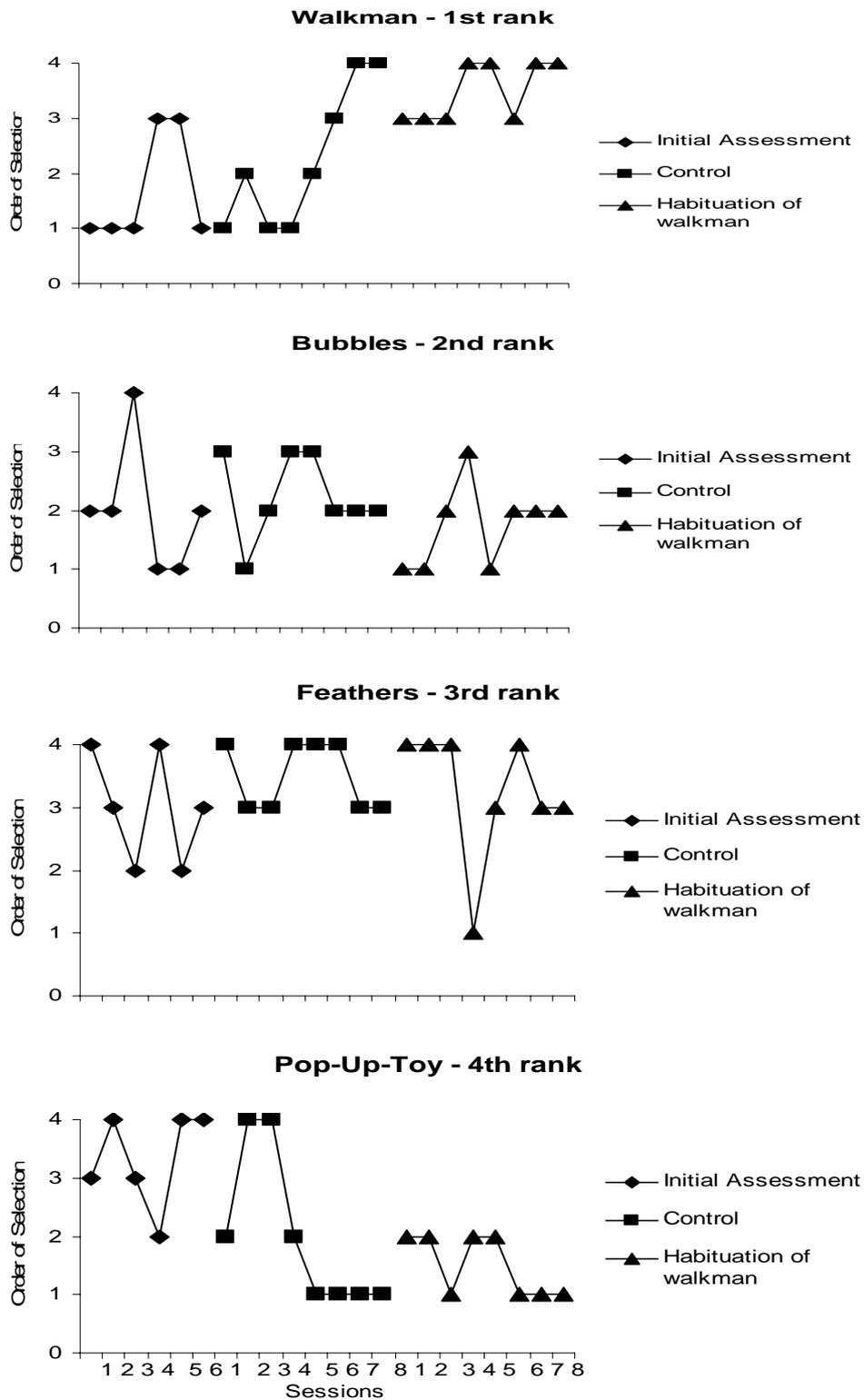


Figure 10. The order of selection of a toy across successive sessions with data from the two lowest ranked items removed. The diamonds represent the initial preference assessment, the squares represent the control condition and the triangles represent the habituation condition.

Therefore, temporarily exposing Michael to the thimbles memory toy did have some effect on the order of selection for two of the toys compared to the control sessions. Figure 9 and Figure 10 for Alex and Jenna show that there was a similar pattern. For Alex, the ball selected first in the control sessions, moved to being selected third and fourth on several occasions, while the bob-the-builder toys moved from being selected fourth to being selected first. Therefore, temporarily exposing Alex to the ball had an effect on the order of selection of two of the toys compared to the control sessions. For Jenna, the walkman selected first and second on most occasions, moved to being selected either third or fourth. The pop-up-toy selected either second or fourth on four of the eight occasions, moved to being selected either first or second over the eight occasions. Therefore temporarily exposing Jenna to the walkman reduced her selection for the walkman and increased her selection for the pop-up toy.

Discussion

The results of this study suggest that the possible EO's (deprivation and habituation) did not have large effects on the order of selection of the tangible (or leisure) items for any of the participants. In the deprivation condition, not providing access to the least preferred toy had no consistent effects on preferences for the toy for any of the participants. However, in the habituation condition, exposing the participants to the most preferred toy only, did have some effects on preference. These results will be discussed further below.

Deprivation Condition

In the deprivation sessions and their accompanying control sessions, there was some small variations in the rank orders (Table 6) and order of selection of the toys (Figures 1-3) for all the participants but no consistent changes from the initial preference assessment for two of the children (Charlie and Jenna). Thus for these two children exposure to the three toys did not increase preference for the fourth toy. However, the third participant, Michael, in the deprivation and accompanying control sessions, chose the sheep first over all sixteen sessions (even if he had just been exposed to the toy) and the guitar second over all these sessions while the snow toy and the book were selected either third or fourth. This is different from the initial preference assessment session where Michael's order of selection of the toys was more varied. There was very little difference in the results for Michael's control and deprivation sessions, thus exposure to the three toys did not increase his preference for the fourth toy relative to the other three. It is unclear why he consistently chose the sheep first and the guitar second in the control and deprivation sessions. He did

not select the sheep first in the control sessions during the following habituation condition, although he did continue to select it first in many of the habituation sessions. These data suggest selecting the sheep was not just a stereotype response. That is he was not just performing the same behaviour over and over again irrespective of other environmental events. Stereotypy is a characteristic often seen in children with autism, but did not appear to be what Michael was doing here.

In the McAdam et al. (2005) study a similar deprivation procedure influenced the outcome of the preference assessments for participants who had either a moderate or severe developmental disability and for typically developing preschool children. The results of the McAdam et al. (2005) study are different from those in this research and while there are obviously differences with the participants used in the two studies such as age and diagnosis, it is not clear if these differences could account for the different results.

Perhaps the results were different between the two studies because of the way the preference assessments were conducted. While the current study used an MSWO procedure, McAdam et al. (2005) used a PS procedure. However, previous literature has demonstrated that although the PS procedure takes longer to administer, the PS and MSWO assessment procedures produce very similar results. These data suggest that it is unlikely that using an MSWO preference procedure instead of a PS preference procedure influenced the results of this study. However, while the MSWO preference assessment produces results more quickly than the PS assessment procedure, as used here it was only conducted once in a session which is how it is usually used in practice, but may be less reliable than the PS procedure. The MSWO gives a single ordinal scale and does not give any measure of “degree” of preference. That is, it does not indicate how much one toy is preferred over another. In the PS

procedure, each toy is paired with every other toy and so this might produce a more reliable measure than the MSWO assessment and it is possible the results might be more sensitive. However, this needs to be further investigated.

Another explanation as to why the results of this study are different from previous research could be the relative values of the toys selected for the children. It is not known if McAdam et al. (2005) used the same procedures as this study to select the toys. It is possible that the toys in this study were not as valued by children as those in the McAdam et al. (2005) study. However, the toys selected had to be items that could be presented easily to the child which certainly restricted the range available for the present study. Had the money been available it might have been possible to provide a larger selection of such toys and maybe toys that would have been more valued.

A further possibility could be that the middle ranked toys in the initial preference assessment were of similar values. In fact Table 5 shows that over the six initial preference assessments these toys obtained very similar preference rankings. If this was the case, then it would be unlikely that making a toy unavailable for a short period of time would increase the individual's preference for that toy. What might have happened in this study is instead of the least preferred toy moving up the rank as expected, the other three toys moved down in rank, making them closer in value to the least preferred toy. This would mean it was more difficult for the MSWO preference assessment to differentiate the values of the toys.

Habituation Condition

Since deprivation did not consistently increase the value of the least preferred toy for any of the participants the habituation condition was introduced. This examined whether exposing the children to only the most preferred toy for 5 min prior to the preference assessment would reduce the value of that toy. If habituation occurred, it was expected that the most preferred toy would drop down to a lower rank in the MSWO preference assessment. The results from the habituation sessions show that the order of selection of the most preferred toy did decrease compared to both the accompanying control sessions and initial preference assessments as referred to in Table 7 and in Figures 4 – 6. Therefore, exposing the participants to the most preferred toy did reduce their preference for that toy for all three participants.

In the habituation condition, instead of the value of the other toys moving systematically up the rank one at a time as expected, on several occasions the least preferred toy moved to the most preferred rank and the most preferred toy moved to the least preferred rank. This could be a result of the values of the middle ranked toys being quite similar as mentioned previously and as shown in Table 5. The close “values” of the toys might also explain why the order of selection of the toys in the preference assessments were so variable. However, given the ordinal measure of the preferences, it is difficult to draw any firm conclusions as to why the generally least preferred toy was selected first on at least half of the occasions.

Both Michael and Alex selected the most preferred toy first on one occasion in the MSWO preference assessment, right after they had just been exposed to the toy for 5 min. It is unclear why these participants selected the toy that they had just played with. Michael, as reported previously, also selected the toy (e.g., the sheep),

that he had just been exposed to first on several occasions in the deprivation condition. It might be that under some conditions, if a child has not finished a sequence of activities with a toy, they may select that toy immediately upon been given a preference assessment, just so as they can finish the task. In this case the value of the toy would be increased by the need to finish the game.

These results of the habituation condition support the idea that exposure reduced the value of three toys in that condition rather than increase the least preferred toy. Thus the idea that all four toys became more equal in value in the deprivation conditions is supported. Therefore, rather than studying “deprivation”, that condition may have studied the effects of habituation to the three middle toys.

General Issues

As discussed earlier, habituation refers to a decrease in responsiveness to a stimulus when that stimulus has been presented repeatedly or for a prolonged time (e.g., Groves & Thompson, 1970; Thompson & Spencer, 1966). The characteristics of habituation are sensitization, dishabituation and spontaneous recovery (McSweeney & Murphy, 2000). Sensitization is when an individual’s responding increases in response to a stimulus when that stimulus is first presented. Dishabituation is when a new stimulus or some kind of change in the environment causes an individual’s responding to increase. Spontaneous recovery refers to an increase in an individual’s responding to a stimulus that has not been presented for some time. A decline in responding to a repeatedly presented stimulus is usually considered to be habituation if it shows at least some of these empirical characteristics. Therefore, the question is did any of these characteristics occur in the present study?

Both Jenna and Charlie's behaviour over the study was consistent with habituation to the toys in that, at the beginning of the study, they appeared happy to sit and play with these toys. However, about half way through the study, both individuals seemed to lose interest in the toys. For example, on several occasions Jenna said that she did not want to play with the toys any more and told the researcher to go home. Charlie often asked if he could play with other toys. This lack of interest in the selected toys could be habituation as a result of repeated presentations (McSweeney, Hinson, & Cannon, 1996; McSweeney & Murphy, 2000; McSweeney & Roll, 1998). It was observed that after Jenna had a small break away from the toys, after her accident, her interest in the toys appeared to increase again as she did not ask the researcher to go home and began to play nicely with the toys again. This behaviour might be consistent with spontaneous recovery. It is interesting that Michael did not appear to habituate to the toys since his interest in the toys did not increase or decrease but remained stable throughout the entire study.

The results of this study are somewhat dependent on how good the parents were in selecting toys that their children liked. It may have been that the participants did not find the toys selected by their parents desirable at all, so that even when a toy was temporarily withheld, preference for that toy was not enhanced as the toy was undesirable. The present procedure assumed that any toy could be made more preferred, but in the extreme case where an individual finds a toy aversive, it is not clear that this toy would or even could have increased in value.

Preference assessments may also depend on the type of toys selected for the participants. Perhaps some of the toys selected for the participants in this study were too much alike. When a group of toys are dissimilar, their rankings might have a

broader range which would make it easier for the MSWO preference assessment to differentiate the reinforcing values of the toys.

A limitation of this study was that there were only three participants and only a small number of trials conducted for each participant. Although a small number of participants is common in this type of research using more may have given more generalizable results. However, using more participants and conducting more trials would have taken up a lot of time and would not have been practical because the results was carried out in the participants' homes and was limited to after school hours. This meant having to travel to the different locations which were a considerable distance apart. Conducting the experiment also had to be arranged around other after school activities such as sport and music. It might have been possible to obtain more data had the research been conducted in an environment (e.g., a school) where the participants were all located in one place rather than having to travel to each of the participant's houses.

Another limitation was that there was no interobserver reliability on the items chosen by the participants. However, it was very clear to the researcher which toys the participants had selected during the MSWO preference assessments as they then interacted with the selected toy, so even if a second person had been present to observe behaviour of each of the participants during the preference assessments, it is unlikely that they would not have disagreed with the researcher's observations.

In summary, deprivation, as used here, did not have much effect on the value of toys. Habituation, on the other hand, did have an effect on the value of the toys. Therefore, habituation may be an important aspect to consider when using reinforcers to teach children with developmental disabilities.

The results of this study suggest that perhaps further research should be conducted to explore the influence of habituation on preference assessments used to select reinforcers. Given the present findings it is suggested that future research in this area should compare the use of the PS and MSWO procedures. It may have been better to have continued to use the PS procedure (as did McAdam et al. (2005), as the present data suggest that it is possible that the MSWO procedure may produce less reliable and less sensitive results than the PS procedure. The PS procedure might allow better quantification of the 'value' of the toys. Furthermore, the results suggest that it would be worthwhile using a wider range of toys to produce a broader spread of preferences to make it easier to differentiate the value of the toys. In future research a reinforcer assessment could be conducted to evaluate the efficiency of the preference items as reinforcers.

Finally, the present data suggest that exposure rather than deprivation seems to have the greater effect on the 'value' of the toys used. This provides support for the idea that it is best to use several reinforcer items for a child rather than just one item with the aim of preventing habituation and so maintaining the value of the items.

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