# REINFORCING VALUE OF A STIMULUS AND ITS EFFECTS ON 'INTRINSICALLY' MOTIVATED PERFORMANCE

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by
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CERTIFICATION OF APPROVAL

# REINFORCING VALUE OF A STIMULUS AND ITS EFFECTS ON 'INTRINSICALLY' MOTIVATED PERFORMANCE

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## DEDICATION

I would like to dedicate this master's thesis to my parents, Ewa and Andrzej, whose support in pursuing my dreams is priceless. I would also like to dedicate this thesis to all Atlantis students, with whom I shared my adventure of studying at California State University Stanislaus.

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ABSTRACT

Since the introduction of Self-Determination Theory and Overjustification hypothesis a belief that rewards have detrimental effects on the intrinsic motivation perseveres. This assumption has led to the criticism of the reinforcement-based interventions, as reinforcers are often mistaken with rewards. The results of meta-analyses indicate that mentioned detrimental effect depends on multiple factors. The purpose of the present study was to compare the effects of two types of edible reinforcers, high-preferred and low-preferred, on intrinsically motivated performance. Behaviors maintained in the absence of socially mediated reinforcers were considered as intrinsically motivated behaviors. Engagement in the preschool activities preferred by participants served as the dependent variable. Three 5 years old typically developing children were participants in the study. A single subject A-B-A-C-A design with a prebaseline phase was used. The implementation of each type of edibles was randomly assigned to one of the two intervention conditions, and next they were withdrawn during the baseline phases. The results show that after the removal of the low-preferred stimulus the level of behavior has increased in subsequent baseline above initial level, whereas removal of the high-preferred stimulus was followed by a decrease in the level of behavior. Side effects of extinction along with the competing response hypothesis might account for the results. The second explanation refers to the potential alteration of the value of intrinsic consequences due to the introduction of external reinforcers.

# INTRODUCTION

Since the time of ancient Greeks, first philosophers, and then psychologists speculated about the most common reasons of taking an action by man and tried to discover what kind of circumstances underlie the intentions of human behavior (deCatanzaro, 1999; Klein, 1982). Contemporary psychologists tend to explain people's behavior in terms of internal and external factors influencing them. After the beginning of the 20th century there have been different theories in psychology regarding the subject of motivation, starting with the most common approaches such as Freud's psychoanalytic theory assuming that human behavior is determined by internal instincts, moving to behavioral conceptions, which postulate that behavior is a result of interaction between the individual and environment, ending up with cognitive approaches, which stress the role of cognition and humanistic approaches which emphasize the role of growth and maturity (Klein, 1982).

As Ryan and Deci (2000) state, "to be motivated means to be moved to do something" (p. 54). From a more precise point of view, motivation might be understood as a "reason or set of reasons for engaging in a particular behavior" (Olsson, 2008, p. vii). However, motivation not only explains the reasons for engaging in certain behaviors, but also it includes all the factors responsible for the sustenance, orientation and completion of the actions taken (Zimbardo, Johnson & McCann, 2009).

In the 1970s, cognitive psychologists initiated a great discussion about the influence of rewards on motivation (Cameron, Banko & Pierce, 2001). This

discussion was mostly concerned with the distinction between extrinsic and intrinsic motivation introduced by Deci and Ryan's in their Self Determination Theory. Deci and Ryan (1985) distinguish two basic types of motivation, intrinsic motivation and extrinsic motivation, depending on the locus of factors responsible for the emergence of behavior. People are said to act in accordance with intrinsic motivation if they have tendency to engage in certain behaviors because of the inherent pleasure and enjoyment the action brings. On the contrary, extrinsically motivated behaviors are those which are performed in order to gain some external outcomes, such as receiving rewards (Ryan & Deci, 2000). This distinction shows that cognitive psychologists treat motivation as a feature susceptible to the influence of rewards, and in most cases this influence is referred to as a detrimental effect of reward on intrinsic motivation. As some authors suggest, prevalence of cognitive theories led to the erroneous assumption that rewards always have negative impact on intrinsic motivation which in turn led to excessive criticism of reinforcement-based behavioral techniques in applied settings (Bąbel, Suchowierska & Ostaszewski, 2009).

Two cognitive theories tend to explain why implementation of rewards may lead to a decrease in intrinsic motivation. First, Self Determination Theory along with supporting Cognitive Evaluation Theory presented by Deci and Ryan (1985) states that engaging in intrinsically motivating tasks allow people to have a sense of competence and self-determination, whereas offering a reward for completing specified task causes people to perform desired behavior for the prize and not due to internal factors (Cameron et al., 2001; Rummel & Feinberg, 1988). In other words, the detrimental effect of rewards is due to transfer of locus of

causality from internal to external factors (Rummel & Feinberg, 1988). Overjustification hypothesis introduced by Lepper, Greene and Nisbett (1973) is the second approach that tends to explain negative effects of rewards on intrinsic motivation. According to this theory a "person's intrinsic interest in activity may be undermined by inducing him to engage in that activity as an explicit means to some extrinsic goal" (Lepper, Greene & Nisbett, 1973, p. 7) and offering a reward can surely serve as such a goal. These two theories provided empirical evidence to support their positions, for example Deci (1971) showed that rewarding people with money led to a decrease in performing the target activity, while Lepper et al. (1973) demonstrated that children's coloring behavior can be diminished by rewarding them with a "Good Player Award".

The subject of intrinsic and extrinsic motivation was of interest to behavioral researchers who defended the implementation of reinforcement-based interventions. The major objection raised by the behavioral researchers was the lack of consistency in the operational definition of intrinsically motivated activity (Vasta & Stirpe, 1979). Also, behavior analysts argued that intrinsic motivation itself was an inferred hypothetical construct that could not be directly observed (Perez, 1997). For research purposes there needed to be an operational definition of intrinsic motivation that was based on a measurable behavioral events (Barnet, Feingold & Mahoney, 1975). The behavioral literature devoted to this subject tried to define intrinsically motivated behaviors by referring to the principles of behavior and operant conditioning. From this standpoint intrinsically motivated behavior was depicted as a response maintained by intrinsic consequences, meaning consequences that are naturally and automatically produced by behavior

(Vaughan & Michael, 1982). Researchers from the community of Horcones (1987) state that intrinsic consequences are "more or less inevitably produced by the structural characteristics of the physical and the biological organism; they are not programmed by others to occur" (p. 291). Other approaches found in the literature define intrinsically motivated behaviors as behaviors maintained by consequences that are not arranged by the social environment (Davidson & Bucher, 1978) or behaviors that are maintained despite the lack of noticeable contingencies (Scott, Farh & Podsakoff, 1988). Also Skinner (1953), in "Science and human behavior" mentioned behaviors that often are said to be intrinsically motivated. According to his approach "we are automatically reinforced, (…) when we successfully control the physical world. This may explain our tendency to engage in skilled crafts, in artistic creation, and in such sports as bowling, billiards, and tennis." (p. 77).

It is worth noticing that other, more practical approaches to the definition of internal motivation can be found. For example, some researchers (Reiss & Sushinsky, 1975; Davidson & Bucher, 1978) used intrinsic interest in activity as their dependent variable, where intrinsic interest was defined as making a choice between two or more concurrently available alternatives of activities. Another operationalization method included defining the dependent variable by providing measurement procedures used in particular study, which in most cases consisted of either free-choice measures or self-reports of interest (Ryan & Deci, 2000). Nevertheless, the latter methods are considered as not sufficient for scientific purposes and resulted in inconsistent outcomes (Scott et al., 1988).

As was previously stated, since the development of Cognitive Evaluation Theory, many studies have investigated the effects of rewards on intrinsic motivation and have demonstrated mixed outcomes. As the number of studies on this topic increased, it was difficult to draw objective and unambiguous conclusions about the rewards' effects on motivation. There have been at least three important meta-analyses (Cameron et al., 2001; Cameron & Pierce, 1994; Deci, Koestner & Ryan, 1999) conducted on the relevant data on this subject, but again their outcomes were contradictory. The most recent meta-analysis by Cameron et al. (2001) showed that the effects of rewards on motivation vary between negative effect, no-effect, and positive effect. These effects depend on diverse factors including the type of task (low-interest task versus high-interest task), type of reward (verbal versus tangible), rewards contingencies (e.g. reward provided for doing well, for doing the task, for each unit solved etc.) and the type of method used to operationalize intrinsic motivation (free-choice versus self-report on task interest).

Dickinson (1989) provides a list of cognitive researches' drawbacks that might be responsible for the demonstration of decrements in intrinsically regulated behaviors due to implementation of rewards. Not distinguishing between reinforcement and reward was considered as one of them since in most cases cognitive researchers used the same type of reward for all participants, regardless of its real reinforcing or nonreinforcing value for certain persons. Other authors (Brennan & Glover, 1980; Dickinson, 1989; Perez, 1997) remark that cognitive experimenters tend to use the terms reinforcement and reward interchangeably and that they do not control for the reinforcing value of rewards

used in their studies. From the functional perspective, a distinction between two mentioned terms is crucial. Reinforcement is a stimulus that follows the behavior and increases the frequency of this behavior in the future (Dickinson, 1989). On the other hand, reward is a stimulus arranged in particular way by the social environment, which follows the behavior of an individual (Pierce & Cheney, 2013). Reward delivery is always preceded by some kind of instruction specifying what the individual should do in order to receive this reward (Dickinson, 1989, Pierce & Cheney, 2013). Therefore, the first factor, which allows for distinguishing between reward and reinforcer is its method of delivery. Reward is something that is announced in advance, before behavior is performed, while a reinforcer does not have to be announced, but instead it immediately follows the behavior. Secondly, the function of stimuli on behavior must be acknowledged in order to decide if a certain stimulus is a reward or a reinforcer. If a reinforcer follows the behavior, the future likelihood of this behavior increases. A reward follows the behavior, but it does not necessarily have to lead to an increase of the rewarded behavior in the future. As seen from two mentioned characteristics, both terms share common features, but cannot be used interchangeably as they do not describe exactly the same conditions (Pierce & Cheney, 2013).

Williams (1980) used a group design to examine the impact of attractiveness of a stimulus on the level of performance obtained during the post-intervention phase. Williams designed a preliminary study and initial assessment procedure, during which he identified stimuli preferred by participants (labeled as attractive in the main study) and stimuli not preferred by participants (labeled as unattractive in the main study). Ranked stimuli were used in the main study and

the effects of implementation of those stimuli as a consequence for target behavior was examined. Moreover, Williams assessed the reinforcing value of these stimuli, by noticing the increase or decrease of target behavior contingent on implementation of the stimuli as consequences. The main study consisted of three phases: baseline, intervention and post-intervention free-choice. During the baseline and post-intervention phase participants were allowed to play various games freely and without any constraints. A game that was chosen the most frequently served as a target behavior for a particular participant. In the intervention phase, depending on the group, attractive, unattractive or no stimuli were implemented contingent on playing the targeted game. Thereafter, Williams compared results obtained in all three groups (attractive stimuli, unattractive stimuli, and no stimuli - control). The analysis of outcomes showed that the attractive stimulus served as reinforcers for participants, as it led to an increase in performing the behavior during intervention phase. This increase was also observed for the group where unattractive stimuli were implemented, but the increase was not statistically significant. Secondly, results demonstrated that participants rewarded with an unattractive stimulus during intervention phase played the target game less during post-intervention phase compared with the baseline phase. This effect was not observed in the group where attractive stimuli were used. In this study, Williams highlighted the importance of controlling the reinforcing value of a reward, because he has shown that attractiveness of the offered reward is a factor that may indeed influence the level of performance obtained after the reward withdrawal. Moreover, it is worth noticing that single-case studies conducted in this area do control for the reinforcing value of the

stimuli used during experiments, either by recording the increase in behavior during the treatment phase (Vasta & Stripe, 1979) or by specially designed procedures (Davidson & Bucher, 1978). None of those studies showed a detrimental effect of reinforcers on the performance level obtained during the post-reinforcement baseline phase (Barnet et al., 1975; Davidson & Bucher, 1978; Mawhinney, Dickinson, & Taylor, 1989; Skaggs, Dickinson & O'Connor, 1992; Vasta, Andrews, McLaughlin, Stripe & Comfort, 1978).

Behavioral experiments conducted in other areas also indicate that not every reward will serve as reinforcement (Brennan & Glover, 1980; Cooper et al., 2013). Moreover, even a stimulus selected by an individual as preferred might not have reinforcing properties in a specific case (Pace, Ivancic, Edwards, Iwata & Page, 1985). Behavior analysts have developed particular assessment procedures to detect the stimuli, which might serve as reinforcers for a certain person (Cooper et al., 2013). Those procedures traditionally consist of a preference assessment combined with reinforcement assessment. There is also empirical evidence that a particular type of preference assessment - the forced-choice procedure, can be sufficient alone in determining reinforcing values of assessed stimuli (Piazza, Fisher, Hagopian, Bowman, & Toole, 1996). As these procedures are commonly used for identification of reinforcers in designing the behavior change programs, it is also worth considering implementing them while designing a study examining the influence of rewards on motivation, as it will ensure that the stimulus used as a reward will have reinforcing value for particular participant.

Dickinson (1989) presented another concern regarding the procedure used by cognitive researchers in their studies, which refers to the method of

implementation of the reward. She pointed out that in most cases they substituted the promise of reward for direct implementation of a reinforcer contingent on the target behavior. A promise delivered by the researcher functioned as a stimulus that could influence the behavior, but as Skinner (1969) pointed out, there is no reason to believe that verbal behavior, such as providing a promise to the participant, which describes the contingency that will follow the behavior, will have the same effect on behavior as the actual delivery of reward. Moreover, Dickinson (1989) pointed out that in the case of promising the reward for participants, it is more likely that other extraneous factors might influence the level of performance of the target behavior, and essentially those factors can be responsible for the detrimental effect of rewards on the level of behavior. In this case, the participant's verbal capabilities, previous experiences with an item promised as a reward, prior experience of actually receiving the reward after being promised, syntax of instruction describing the contingency, and all stimuli that might occur between the time of promise and the moment of reward delivery could influence the level of performance (Dickinson, 1989).

Reiss and Sushinsky (1975) conducted two experiments examining different methods of reward delivery and their influence on preference for listening to songs. The first experiment investigated the effects of expectancy of reward on the preference for listening to three different songs. Participants were divided into four experimental groups created by implementation of a 2 x 2 factorial design, with the following conditions: promise and no promise of reward and preexposure and no preexposure to reward. The research consisted of two phases. In the experimental phase participants were exposed to the combination of

mentioned conditions before listening to one target song. Next, after 5 minutes of listening to the song, participants were rewarded with an access to a doll. Posttest free-play served as a second phase. During this phase participants were allowed to listen to three different songs, including the target song. The main research question was to compare the no preexposure-no promise group with the promise-preexposure group. The researchers assumed that in the preexposure-promise group waiting for the reward would draw the participants away from engagement in listening to the target song. As predicted, participants from this condition listened to the target song less during posttest free-play than participants not previously exposed to expectation of reward. The second experiment addressed the issue of repeatable delivery of the reward contingent on engagement in the activity. This experiment consisted of two phases: the experimental and the posttest phase. During the experimental phase participants were taught to discriminate between listening to three available songs. Discrimination was accomplished by reinforcing listening to the target songs on multiple occasions and providing no reinforcer for listening to the other two songs. The posttest phase was conducted as a free-choice play, where participants were allowed to do whatever they wanted, including listening to three songs used in experimental condition. The outcomes showed that during posttest phase participants preferred to listen to the target song than to other two songs even after the withdrawal of the reinforcement. Reiss and Sushinsky were able to demonstrate that promises of reward can reduce the level of behavior of interest after withdrawal of reward, whereas multiple and contingent implementation of reward can give just the opposite results. Thus, outcomes of Reiss and Sushinsky's study directly confirm

the concerns raised by Dickinson (1989) in her analysis of differences between cognitive and behavioral approaches. From the applied perspective, Eisenberger et al. (1999) claim that a single implementation of reinforcement in group studies is artificial as compared to the natural environment where reward is usually used on repeated occasion. Therefore, results of those studies cannot be generalized to the natural settings, as they do not show the influence of reward on intrinsic motivation to the engagement in repeatedly performed behaviors.

The purpose of the present study focuses mostly on combining two discussed issues connected to the cognitive studies procedures. Only one study (Williams, 1980) in this area compared the effects of attractive and unattractive stimuli on 'intrinsically motivated' behaviors, but this researcher did not ensure multiple deliveries of consequent stimuli. Therefore, the current study examined the difference between high and low preference stimuli delivered on multiple occasions as a consequence for engaging in an initially interesting task. It is hypothesized that contingent delivery of the low-preferred stimulus will lead to a decrease in the level of performance during the post-intervention phase compared to its level observed in initial baseline. The second hypothesis is that providing the high-preferred stimulus as a consequence will lead to an increase of the level of performance during the post-intervention phase compared to the level of performance observed before the intervention.

# METHOD

## Participants

Three 5-year-old typically developing children, recruited from a preschool in Stanislaus County in California were participants in this study. The director of the preschool, based on the center's agreement with the children's parents, selected children who took part in the study. Preschool teachers were interviewed during the selection process in order to assure that participants were willing to engage in various activities. Consent from the parents and assent from the children were obtained before beginning the study.

## Setting and Materials

Research was conducted in a room situated in the preschool. The research room was equipped with one table and four chairs. Each chair was located on one side of the table. Materials required to engage in one of the activities examined in the study were placed on the table, in front of each chair. Therefore, four work stations were created on one table, from which one station corresponded to one activity.

Four activities (one target and three distracting activities) were selected for each participant separately. All the materials required for the engagement in those activities are enumerated in Table 1.

For each participant five edible stimuli were used during the preference assessment. Table 2 specifies amount and type of the stimuli used for each participants,

## Design

A single case reversal A-B-A-C-A design with a prebaseline phase was used in this study. Each intervention phase was preceded by a preference assessment in order to determine which stimuli to use as a consequence in the intervention phase. Therefore, the whole study consisted of following phases: prebaseline, baseline 1, preference assessment 1, intervention 1, baseline 2, preference assessment 2, intervention 2, and baseline 3.

## Dependent Variable

The dependent variable was the duration of performing targeted activities during baseline when a programmed reinforcement contingency was not in effect. Table 3 provides operational definition of all activities selected for the study. An observer measured the length of time the participant engaged in each activity (the target activity and the distracting activities) while watching the video recordings of sessions. The observer tracked the time by using a stopwatch.

For the purpose of this study, behaviors maintained in the absence of socially mediated contingencies of reinforcement were considered as intrinsically motivated behaviors. Activities already preferred by children were selected for the study, because it was assumed that those types of activities were more likely to be 'intrinsically motivated'. Four activities were selected for each participant individually, from which one served as a target activity and three served as distracting activities. Those four activities were chosen based on a short interview conducted with teachers who usually work with the participants (teachers were asked to list four activities preferred by each participant). Afterwards, a subsequent preference assessment was conducted in the prebaseline phase. During

this phase the length of time children engaged in each of chosen activity was measured. The activity, which was performed by a participant for the longest period of time, was selected as the target activity. The remaining three activities served as distracting activities in the baseline phases (see Table 4 for the overall results of preference assessment for each participant).

## Interobserver Agreement

Interobserver agreement (IOA) was calculated for 25% of sessions, a total of 6 sessions per participant, including 4 baseline sessions and 2 intervention sessions. Two observers separately measured the dependent variable in randomly predetermined sessions and their results were compared. The IOA was calculated as a percent of agreement on total duration of the dependent variable, by implementation of following equation: shorter duration (observer 1)/ longer duration (observer 2) x 100 = total duration IOA %. The duration measure was calculated as a number of seconds the engagement in the activity lasted. In the baseline sessions total duration IOA was calculated separately for each activity (the target activity and the distracting activities), and then mean IOA was calculated for the whole session by adding IOA for each activity and dividing it by four (number of available activities). Total IOA was calculated separately for each participant by adding IOA obtained for each assessed sessions and dividing this score by 6.

Total IOA for the participant A was 91.22%, for the participant B was 91.31% and for the participant C was 92.41%.

## Procedure

For all phases, prebaseline, baseline and intervention, sessions lasted for 10 minutes and they were conducted twice a day, one session in the morning and one session in the afternoon. At the beginning of each session the experimenter took each child individually to the research room. All sessions were video recorded for scoring and for the purpose of measuring the interobserver agreement. A countdown timer was used to signal the end of each session. After the timer buzzed the video camera was turned off and the participant was lead out of the research room.

### Prebaseline

In the prebaseline phase participants were allowed to freely engage in four activities selected for them based on teacher's report (see Table 4 for activities available for each participant). No consequences were delivered contingent on the engagement in activities. This phase was conducted in order to determine the target activity for each participant. One activity, which was performed by the participant for the longest period of time, was chosen as a target activity for the next phases. Initially interesting activities were chosen as targets to ensure that children were 'intrinsically motivated' to engage in them. The remaining three activities were used as distracting/alternative activities in the following baseline phases.

During prebaseline one participant was brought by experimenter to the research room and was instructed that he/she could engage in any of the activities that were available in the room. The experimenter used the following instruction: "You can play with one of those toys if you want". After delivering the instruction

the experimenter sat on the chair in the corner of the room and observed participant unobtrusively. The experimenter tried to avoid talking with children during the session and when asked a question only provided brief statements and did not engage in play with the participant. The experimenter's interaction with participants was minimized in order to prevent accidental social reinforcement of engagement in any of the activities.

**Baseline 1**

Baseline phases were conducted in the same manner as prebaseline described above, with one difference. In this phase, the experimenter moved around the room instead of sitting on the chair. In order to control for the potential influence of social reinforcement on the level of performance, the experimenter provided brief social praise ("Good job on ___ (activity name)") contingent on participant's engagement in the target activity. This social praise was provided on a 1-minute fixed interval schedule. The same statement was also used during the intervention phase, but in that phase an edible stimulus was also provided as a consequence of target behaviors. Apart from that, the experimenter did not initiate contact with the participant and answered questions only with brief statements.

**Preference Assessment 1**

The first intervention phase was preceded by paired choice preference assessment procedure conducted to select an edible used as a consequence in the intervention phase. Paired choice was chosen as a preference assessment procedure as it enabled creating a hierarchy of stimuli from the least to the most preferred. Thus, stimuli which were selected by participants the most often during

assessment were used as high preference stimuli while the stimuli chosen by participants the least often were used as low preference stimuli.

Preference assessment sessions took place in the research room. All other materials were removed from the room as they could influence the outcomes of the assessment. Preference assessment sessions were conducted by implementation of paired choice procedure as described in study by Fisher, Piazza, Bowman, Hagopian, Owens and Slevin (1992).

**Intervention 1**

There were two intervention phases. In each of those conditions engagement in the target activity was followed by one of the consequences determined during preference assessment, either low preference stimulus or high preference stimulus. The participants were randomly assigned to which condition (low preference or high preference) they were exposed first to counterbalance the treatment order and to control for potential carry over effects.

The research room was equipped with one table and one chair and only the materials needed to engage in the target activity (none of the other activity items were present). Materials required to perform the target activity were placed on the table in front of the chair. The participant was told that at this time the other toys were not available because other children were using them. After that the participant was instructed that he/she could play with materials placed on the table if he/she wanted to do it. The experimenter used the following statement: “This time we don’t have other toys, because other children are playing with them. But you can play with those toys if you want to”. The experimenter started to move around the room as described in baseline. This time participants were provided

with the appropriate consequence (low or high preference stimulus) accompanied by social praise ("Good job on ___ (activity name)"). These consequences (edible stimulus and praise) were delivered on 1-minute fixed interval schedule, contingent on the engagement in the target activity.

As mentioned before, there were four 10-minute intervention sessions in both intervention phases. The aim of those phases was to provide participants with a total of 30 consequences throughout the whole phase. This means that 30 deliveries of consequences were distributed among four sessions composing the whole phase. This method was implemented in order to assure that participants received equal amounts of edibles during both intervention phases, regardless of the length of time they engaged in the target activity. If the participants needed more than four sessions to reach the 30 consequences, they were provided with additional sessions. If a participant was within two consequences of reaching the 30 consequences, the current session was extended by a maximum of 2.5 minutes to accomplish the 30 consequences.

A least to most prompting procedure was implemented by the experimenter if the participant refused to engage in the target activity during the intervention phase. The prompting procedure consisted of the following steps. If the participant did not engage in the target activity 30 seconds after receiving the initial instruction, the experimenter provided the verbal prompt ("Go on, you can play now"). If the participant did not start to engage in the activity after 10 seconds from this prompt, the gesture prompt was used (pointing to the materials). If the gesture prompt also failed (no response after 10 seconds) a model prompt combined with the verbal prompt ("Come here and play") was implemented. In

this prompt the experimenter modeled engagement in the target activity for 10 seconds by appropriately playing with the materials. The experimenter stopped modeling at the very moment the participant engaged in playing with the materials. The modeling prompt was immediately ceased in order to prevent from providing the participant with additional social reinforcement. The prompting procedure was reintroduced whenever the participant discontinued engaging in the target activity for longer than one minute.

**Baseline 2**

The second baseline was conducted in the same manner as the first baseline described above. This phase was introduced at least 24 hours after the last intervention session, in order to ensure that the level of responding during the second baseline was not influenced by the participant's satiation.

**Preference Assessment 2**

The second preference assessment was conducted in the same manner as the first preference assessment. The same sets of five stimuli assigned at the beginning of the study to the participant were assessed in the second preference assessment (see Table 2). The second preference assessment was conducted to control for the potential switch in participants' preferences for edibles due to satiation or passage of time and therefore to assure that appropriate stimuli (high or low preference edibles) are used as a consequences during the second intervention phase.

**Intervention 2**

The second intervention phase was an exact replication of the conditions established during the first intervention phase with the exception that the

consequence delivered was the one not used in the first intervention condition. That is, if the high preference consequence was used in the first intervention, for this intervention, the low preference stimulus was used and vice versa.

**Baseline 3**

The third baseline was conducted in the same manner as the first baseline. Again at least 24 hours was required between the end of the last intervention session and the beginning of the first baseline session, as mentioned in the description of the second baseline.

# RESULTS

## Prebaseline

Prebaseline was conducted in order to determine the target activity for each participant. The duration of time participants were engaging in activities was cumulated over three sessions comprising prebaseline. The activity, which was performed for the longest period of time, was selected as the target activity for the following baseline and intervention sessions. Legos® were selected as the target activity for the participant A and Magna-Tiles® were selected as the target activity for the participant B and C, as in those activities participants were engaged for the longest period of time throughout the three prebaseline sessions. Table 5 shows detailed data indicating the length of time each participant spent on each activity available during the prebaseline phase.

## Preference Assessment

Preference assessment was conducted twice for participant A and participant B, to determine separately the high- and the low-preference stimuli for those participants. Participant C refused to take part in the second preference assessment, therefore the data from the first preference assessment was used to determine both the high- and the low-preference stimulus for this participant.

For participant A Skittles were chosen as a low-preference stimulus, and strawberries as a high-preference stimulus. For the participant B avocado served as a low-preference stimulus and strawberries as a high-preference one. Goldfish crackers were used as a low-preference stimulus and Caprisun juice as a high-preference stimulus for the participant C. The detailed results of the preference

assessment, indicating the number of times the stimuli were chosen, are presented in the Table 6. Stimuli that were not chosen by participants during preference assessment were excluded from the study in order to avoid accidental implementation of an aversive stimulus.

## Main Results

The data obtained for the participant A and B show the effects of the intervention that are opposite to those predicted by the hypotheses of the study. In the case of the participant C only the hypothesis referring to the effects of withdrawal of the high-preference stimulus was confirmed.

The performance of the participant A is depicted on the Figure 1. For the participant A the low-preference stimulus was implemented during the intervention 1 and the high-preference stimulus was used as a consequence in the intervention 2. During the prebaseline phase the target activity was performed on the moderate level (range: 194 – 264 seconds per session), with an increasing trend. In the baseline 1 there was a highly variable level of responding with no trends with the duration of time ranging from 80 seconds to 376 seconds per session. A slight increase in the level of responding was observed during intervention 1 when the low-preference stimulus was implemented as a consequence for engagement in the target activity, with high variability of responding and no trends. There is an explicit downward trend in the baseline 2. In intervention 2 (high-preference stimulus) responding occurs again in the higher level (range: 211 – 480 seconds per session) compared to the level observed in the previous phase, with a descending trend. In the last phase, the responding dropped to a low level ranging from 26 seconds to 221 seconds per session.

Figure 2 shows the performance of participant B. For this participant the high-preference stimulus was used during intervention 1, and the low-preference stimulus was used in the following intervention. Overall, there is high variability of the data throughout all phases. In the prebaseline phase, the duration of time ranges from 15 seconds to 504 seconds per session. In the baseline 1 phase, the participant performed the target activity only during one session, for 440 seconds. During intervention 1 (high-preference stimulus) there is an increase in the level of responding (range: 337 – 558 seconds per session), with an upward trend. In the baseline 2, responding dropped to a low level, as the target activity was performed during only two sessions (for 16 and 136 seconds). In the following intervention phase (low-preference stimulus), there was an increase in the level of responding (range: 297 – 430 seconds per session) and once again an increasing trend can be observed. During the last baseline phase responding stays at a higher level (range: 90 – 510 seconds per session) comparing to the two previous baseline phases, as the activity was performed during every session composing the last phase of the study.

The data for participant C is presented in the Figure 3. For this participant the high-preference stimulus was implemented during intervention 1 and the low-preference stimulus was used as a consequence during the intervention 2. The data can be overall characterized as highly variable, with clear differences in the level of responding between the intervention and the baseline phases. In the prebaseline phase the data were variable, ranging from 83 to 481 seconds per session, with no trends. During the first baseline the level of responding dropped significantly as the target activity was performed solely during one session for 244 seconds. In

intervention 1 (high-preference stimulus) there was a big increase in the level of responding (range: 335 – 479 seconds per session), but no trend was observed. During the following baseline phase, the level of the target behaviors dropped and is slightly variable, ranging from 0 to 242 seconds per session. In intervention 2, high levels of responding (range: 293 – 497 seconds per session) with no trends were observed. During the baseline 3 phase, the responding was maintained at a rather stable and moderate level (range: 42 – 145 seconds per session), especially in the three final sessions.

For all participants, the intervention phases with the implementation of the low-preference stimuli lasted longer than the intervention phases with the high-preference stimuli. For participant A and B the low-preference intervention phase had to be extended to five sessions in order to reach the delivery of 30 consequences. On the contrary, in the case of participant B and C the high-preference stimulus interventions were reduced to three sessions, as it was sufficient to deliver 30 consequences (see Figure 4). For the exact data indicating the number of consequences delivered per session see Table 7.

Figure 5 shows the comparison of the accumulated length of time each participant spent in the target activity during all baseline sessions. Participant A spent 787, 523 and 806 seconds per phase in the target activity during the initial baseline, the baseline after the withdrawal of the high-preference stimulus and the baseline after the withdrawal of the low-preference stimulus respectively. Participant B was engaged in the target activity for 440, 125 and 1216 seconds per phase respectively. Participant C performed the target activity for 244, 283 and 435 seconds per phase respectively. These results indicate that after withdrawing

the high-preference stimulus both participant A and participant B engaged in the target activity at a lower level than before introducing the consequences. On the opposite, the level of responding increased after withdrawing the low-preference stimulus compared to the level obtained during the two other baseline phases. For participant C, in both withdrawal phases the level of responding was higher than during the initial baseline phase, with the increase bigger after withdrawal of the low-preference stimulus.

# DISCUSSION

As it was previously mentioned, cognitive researchers were often accused of not controlling for the reinforcing value of the rewards used in their studies examining the effects of rewards on intrinsic motivation. It was said that this drawback could be solely responsible for the decrements in the level of responding observed during the post-reward phase. Williams (1980) indicated that the reinforcing value of the consequences, in applied and scientific settings, can be assessed in two ways, a priori and a posteriori. The present study was designed to ensure the implementation of these two methods.

First, a paired-choice preference assessment was used as an a priori procedure which allowed selecting the edibles preferred by the participants. This procedure significantly increased the probability that selected items would function as reinforcers. The stimuli not selected during the preference assessment by the participants were excluded from the study in order to avoid the use of an aversive stimulus. Participants did not express any problems with choosing preferred items from presented pairs. Even participant C, who refused taking part in the second preference assessment, did not have any issues with making choices.

Second, the reinforcing value of stimuli can be assessed a posteriori by determining whether providing an individual with the consequences had an impact on the level of responding (Williams, 1980). The visual analysis of data leads to the conclusion that stimuli used in the study served as reinforcers, since the level of behavior increased in all intervention phases for all participants. In addition, the high-preference stimuli seemed to function as stronger reinforcers. First, the

increase in the level of responding was greater during the implementation of the high-preference stimuli than during the phases where the low-preference stimuli were used. Second, for all participants the intervention phases with the implementation of low-preference stimuli comprised more sessions than phases with the high-preference stimuli. In the case of participants A and B, the low-preference stimuli intervention phases had to be extended beyond four sessions in order to reach the delivery of 30 consequences per phase, whereas with participants B and C, three sessions were sufficient for the delivery of 30 high-preference edibles. This effect might be due to two factors. During the high-preference stimuli interventions participants engaged more in the target activity, which gave more opportunities for the delivery of the consequences. On the other hand, the participants seemed to be less interested in receiving the low-preference edibles, as they did not reach for the edibles immediately and very often preferred to play with the materials than to eat the edibles.

According to the Self-Determination Theory (Deci & Ryan, 1985) and the Overjustification hypothesis (Lepper, Greene & Nisbett, 1973), the termination of reward offered for engaging in the behavior maintained by intrinsic consequences leads to a decrease in this behavior below its initial level. Reiss and Sushinsky (1975) use the term "successive behavior contrast" to describe this phenomenon. They state that the term successive behavior contrast describes a situation when "behavior frequencies increase and remain above baseline levels when reward is available but decrease below baseline frequencies when reward contingencies are withdrawn" (p. 1121). The purpose of the present study was to examine whether the difference in the reinforcing value of a stimulus used as a consequence for the

engagement in the behavior maintained by intrinsic consequences would influence the occurrence of the successive behavior contrast.

According to the results of the study, the successive behavior contrast occurred for two participants after the termination of the high-preference stimuli delivery, while this was not observed after withdrawing the low-preference stimuli. For the third participant, the successive behavior contrast did not occur in either of the conditions. Furthermore, for all three participants, the withdrawal of the low-preference stimuli led to an effect opposite to the successive behavior contrast, since the level of responding after the termination of the delivery of stimuli increased above its initial levels. These results seem to indicate that the reinforcing strength of a stimulus used as a consequence may influence the post-contingency performance and that this influence can go in opposite directions.

From the perspective of the analysis of behavior, researchers attempted to explain the successive behavior contrast by the principle of extinction (Williams, 1980). Extinction is a process, when reinforcement maintaining the behavior is discontinued, what leads to the decrease of this behavior in the future (Cooper et al., 2013). Extinction not only causes a decrease in the behavior, but also leads to other behavioral phenomena called the side effects of extinction. Pierce and Cheney (2013) note that some of the side effects include: an extinction burst, response variability, increased force of the behavior and the occurrence of emotional responses. The results of present study can be explained by referring to extinction bursts and response variability.

An extinction burst is a temporary escalation of the behavior that follows the withdrawal of the reinforcement (Pierce & Cheney, 2013). After the initial

escalation, behavior eventually drops below the previous level. This phenomenon can be used as an explanation for the increase in the level of behavior observed after the removal of the low-preference stimulus. It is especially apparent in participant's A performance where we see a high level of responding during the second sessions (baseline 2) followed by a descending trend during two subsequent sessions.

Increased response variability is another side effect of extinction. After the withdrawal of the reinforcer the organism often alters some dimensions of the behavior or engages in new behaviors, assuming that these modification bring reinforcing consequences (Pierce & Cheney, 2013). Anecdotally, during the baseline following the withdrawal of the high-preference stimuli, all participants started to talk to experimenters, asking for the availability of the preferred edible stimuli. Thus, the verbal behavior could have been the more variable responding to receive the edibles. The relationship between the increased level of the verbal behavior and the engagement in the target activity can be explained with the competing response hypothesis. In their study, Reiss and Sushinsky (1975) use this hypothesis to account for the post-contingent decrements in the frequency of the behavior. The authors assume that when the participants expect to receive the reward, thinking about the reward and waiting for it would compete with performing the target behavior. In the present experiment, the verbal behavior (asking about the edibles) could have competed with the target activity itself. In other words, the more participants were asking about the edibles, the less time they had to perform the target activities. For all participants, this effect was present in the baselines following the intervention with the implementation of

high-preference stimuli. During those baselines participants were asking for the edibles, especially during the first session. Once this verbal behavior was placed on extinction, since asking questions was not followed by the delivery of edibles, time spent in the target behaviors increased during subsequent sessions when the competing verbal behavior decreased. It is possible, that the competing responses effect was not present after the withdrawal of the low-preference stimuli as those stimuli were not so attractive for the participants. Indeed, according to anecdotal observation, participants did not engage in the verbal behaviors during the baseline following the intervention with the implementation of low-preference stimuli.

The side effects of extinction along with the competing response hypothesis can explain the effects observed in the study. Nevertheless, it is unclear why two different side effects of extinction would be present in two different conditions arranged in the research. Moreover, we assume that the target activities were maintained prior the study by some sort of intrinsic consequences, and that during the intervention participants received additional extrinsic consequences. Therefore, extrinsic consequences were not the only reinforcers maintaining the target behaviors. Put differently, the withdrawal of extrinsic stimuli did not cause a full extinction as there were still intrinsic consequences in place. Nonetheless, in order to verify whether the extinction in fact is responsible for the observed effects, it is recommended to prolong the baseline phases in the future studies.

Dickinson (1980) points out that one potential explanation of the post-contingent decrements in the level of behavior is the alteration of the value of intrinsic consequences. She suggests that offering the individual extrinsic

reinforcers may reduce the value of the intrinsic reinforcers due to satiation. Offering the individual external reinforcers leads to increased frequency of the responses and thereby to the higher frequency of the intrinsic consequences. Thus, after withdrawing the external consequences, intrinsic consequences, due to satiation, are not strong enough to maintain the initial level of the behavior. The introduction of extrinsic consequences may indeed change the value of the reinforcing value of intrinsic ones but the explanation based on satiation does not account for an increase in the level of behavior after the withdrawal of the low-preference stimuli observed in the current study. It is possible that the introduction of the external consequences may change the significance of intrinsic reinforcers in opposite directions. First, the high-preference extrinsic consequences may reduce the attractiveness and efficiency of the intrinsic consequences. On the contrary, introducing the low-preference stimuli can lead to higher value of intrinsic consequences. This may occur through the simple comparison of the attractiveness of the consequences made by the organism while receiving both types of reinforcers at the same time. Another explanation refers directly to the subject of motivating operations. In this case, receiving the two types of extrinsic stimuli might change the motivating operations of an individual (Cooper et al., 2013), which in turn leads to the changed value of the intrinsic consequences. Those conclusions were based on the anecdotal observations conducted during the current study. After withdrawing the high-preference stimuli participants were less interested in the engagement in the target activity, and they preferred to ask when they would receive the preferred edibles again. In addition, during the intervention phase, when offered the high-preference stimuli participants stopped

performing the target activity immediately in order to reach for the edibles. On the other hand, during the low-preference stimuli intervention participants very often remained engaged in the activity despite the availability of edibles. They kept performing the target activity and reached for the edibles a while after the stimuli were presented. These observations might indicate that the contrast between the attractiveness of the extrinsic and intrinsic consequences in both conditions changed the value of the intrinsic consequences.

Apart from above explanations, there are some limitations to the study that could account for the results as well as the differences in the results observed between the participants.

First, the experimental settings were contrived and somewhat artificial. The participants were placed in the research room equipped with only a limited set of activities, which looked quite different than their natural preschool environment. In addition, during the research the participants spent time with unfamiliar experimenters. Moreover, all the potential sources of social reinforcement were strictly limited to the experimenter (the only other person in the room). These characteristics seemed to be aversive for the participants, especially at the beginning of the study when participants B and C asked few times if they could go back to the classroom. The averseness of the circumstances could have influenced the participants' performance. It is recommended to conduct future studies in a more natural environment with researchers more familiar to the participants.

Second, the participants were familiar with the functions of the research room. It is possible that the participants took part in the psychological studies there before. Therefore, the research room could have been associated with a

particular type of instructional control. In other words, the room itself might serve as a discriminative stimulus for following instructions and directions. This is especially crucial from the perspective of the current study's design, as the association of the research room with the instructional control might be responsible for introducing the unintended element of coerciveness to the study. The intention of the study design was to limit extraneous sources of control. As the literature points out (Dickinson, 1989; Williams, 1980) coercion may be an element responsible for the decrease in the level of behavior observed after the reinforcement contingency was removed. Thus, it would be beneficial for future studies to conduct them in the more natural settings, where coercion is minimal.

Third, due to time constrains, all the phases of the study had to be limited to only a few sessions. The analysis of the data indicates that it might be worth extending the baseline phases, including the prebaseline phase. This seemed to be especially relevant in the case of the participant C. Possibly the prebaseline phase was too short to choose the target activity that was preferred by this participant. Two factors support this presupposition. First, the participant engaged in the target activity during the first baseline phase for a really short period of time. This might occur due to the satiation. Nevertheless, the additional data collected during the study indicates that during the first and following baseline phases, the participant showed a higher preference for the other activity that was provided for him (the sensory play) because he engaged in this activity for the longest period of time. This drawback might be responsible for the differences in the results observed for this participant. Moreover, the initial low level of the target activity hindered the experimental manipulations and further analysis of the data. As Reiss and

Sushinsky (1975) suggest, in order to examine the effects of the external stimuli on the level of behavior maintained by intrinsic consequences, an individual must engage frequently in the target behavior. Therefore, the low level of target activity observed for the participant C, create some doubt about the relevance of the results obtained for this participant.

Fourth, the preference assessment procedure was conducted for participant C only once during the study, just before the first intervention phase. Therefore, both types of stimuli used in the study for this participant were determined during the first preference assessment. It was not possible to control for the potential switch in this participant's preferences. Therefore, it is likely that the stimulus used in the second intervention phase was not a low-preference stimulus for this participant. Nonetheless, the results of the preference assessment conducted for the two remaining participants suggest that the initial preference was consistent throughout the study.

Another limitation refers to the frequency of the sessions. As previously mentioned, the low level of the target activity may be due to satiation. The assumption that the participants became satiated during the prebaseline phase accounts for the low level of the behavior observed for the participant B and C during the first baseline. Moreover, all the participants were able to engage in the target behaviors during their normal preschool activities, which also could lead to satiation. The solution to the potential effect of satiation would be to conduct the sessions less frequently and to limit the access to the materials used in the study for all participants for the time of the study.

The last limitation of the study refers to the potential effect of the differences between the arrangements of the baseline and the intervention phase. During the intervention phase only one activity was available for the participants, whereas during the baseline phase the participants were allowed to engage in four activities. The behavior of the participants could come under the stimulus control of the number of presented activities. It was observed that in the second baseline the participants knew that they would not receive the extrinsic consequences, as they were asking "why are we playing the first game again (from the first baseline) and not the second game" when they received the edibles. Therefore, availability of one activity in the research room functioned as a discriminative stimulus for the participants, and the availability of four activities served as a S-delta or extinction stimulus. It would be worth considering to modify the design by removing the mentioned differences between the two phases and using the reinforcement procedure with all activities present. Another argument supporting this modification comes from the second experiment conducted by Reiss and Sushinsky (1975). They showed that reinforcing the behavior on multiple occasions does not lead to decrements of the behavior during the post-test phase. Nevertheless, in their study during the intervention phase, the participants were allowed to engage in different behaviors (target and distracting behaviors) and the reinforcer was provided only for the engagement in the target behavior.

Dickinson (1989) notes one important characteristic of the detrimental effect of rewards assumed by the cognitive researchers. She points out that according to the cognitive researchers' presumptions, the negative effect of rewards on intrinsic motivation is persistent over time and irreversible. This means that once the

reward is removed the behavior would drop below the initial level and this would continue in the future. The results of the current study provide evidence against this assumption. In the case of participant B, the level of the behavior decreased in the second baseline, but afterwards when the low-preference stimulus was removed, the behavior increased above the initial level. What is even more interesting in the case of all participants, the withdrawal of the low-preference stimulus was followed by an increase in the behavior above the level observed before the introduction of the intervention. These results indicate that using the reinforcers of moderate attractiveness for individuals might be beneficial from the perspective of increasing the desired behaviors in the future, especially after the extrinsic reinforcers are discontinued.

According to the results of the study, the reinforcing value of a stimulus used as a consequence not only has an influence on the level of behavior when the contingencies are in effect, but it could be also a predictor of the change in the level of the behavior when the stimuli are withdrawn. As it was previously stated, the effect of extrinsic reinforcement contingencies on the level of behaviors maintained by intrinsic consequences is susceptible to various factors. The results of the present study confirm that the reinforcing value of a stimulus should be considered as one of those.

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# APPENDICIES

# APPENDIX A

## TABLES

Table 1

*Materials required for the engagement in activities*

| Name of the activity | Materials |
|---|---|
| Magna-Tiles® | Set of 25 Magna-Tiles® in different shapes and 3 animal figures |
| Legos® | Set of 25 Lego® blocks |
| Trains | Set of 10 tracks and 4 trains |
| Sensory play | Plastic box filled with uncooked rice and 6 animal figures |
| Wooden blocks | Set of 25 wooden blocks (cube shape) |
| Puppets | 3 hand puppets |
| Crystal Climbers® | Set of 25 Crystal Climbers® pieces |
| Books | 3 books |

* List of materials used in the study for each of the activity.

Table 2

*Edibles selected for the preference assessment*

| Participant | Edible | Amount per one presentation |
|---|---|---|
| Participant A | Fruit snacks | ½ of a fruit snack candy |
| | Strawberries | ¼ of a strawberry |
| | M&Ms | 1 M&Ms |
| | Skittles | ½ of a skittle |
| | Harshey kisses | ¼ of a harshey candy |
| Participant B | Animal crackers | ½ of an animal crackers |
| | Goldfish crackers | 1 goldfish cracker |
| | Strawberries | ¼ of a strawberry |
| | Avocado | ½ cm x ½ cm cube |
| | Pasta | ½ of pene pasta |
| Participant C | Strawberries | ¼ of a strawberry |
| | Goldfish crackers | 1 goldfish cracker |
| | Caprisun juice | 1 sip |
| | Banana | ½ of a slice of banana |
| | Avocado | ½ cm x ½ cm cube |

* Table showing edible stimuli and their amount used during preference assessment and intervention phase for each participant.

Table 3

*Operational definitions of activities*

| Name of the activity | Definition of the activity |
|---|---|
| Magna-Tiles® | Target behaviors: building constructions with Magna-Tiles, by moving and connecting pieces of the set, moving and manipulating the finished constructions or parts of the construction, also moving the animal figures around the constructions (e.g. putting them inside, moving them around the constructions). |
| Legos® | Target behaviors: building constructions with Legos by moving and connecting pieces of the set, moving and manipulating the finished constructions or parts of the construction. |
| Trains | Target behaviors: building constructions from wooden tracks by moving and connecting them, moving the wooden trains and the cars of the train (driving the train). |
| Sensory play | Target behaviors: putting the hands inside the box filled with rice, moving the hands inside the box, moving and shaking the box itself, moving the animal figures above and next to the box. |
| Wooden blocks | Target behaviors: building constructions with wooden blocks by moving the blocks, putting them one on the other or next to each other. |
| Puppets | Target behaviors: moving the puppets, putting hands inside the puppets, moving the parts of the puppets, putting objects (toys, blocks etc.) inside the puppets. |
| Crystal Climbers® | Target behaviors: building constructions with Crystal Climbers by moving and connecting pieces of the set, moving and manipulating the finished constructions or parts of the constructions. |
| Books | Target behaviors: holding the book in hands, turning the pages of the book. |
| Common features of the target | Target behaviors can be performed in either |

| | |
|---|---|
| behaviors | part of the research room (on the table, on the floor, also while walking around the room, if the participant is using parts belonging to the sets of materials allocated to the particular activity. Simply holding mentioned parts in hand is not considered as a target behavior when performed while talking to the people present in the room).<br>During the intervention phases, the time required for grabbing and eating the edible stimulus by participant is not included into the overall time of the engagement in the activity. |

* Description of the activities used in the study. Table shows, which target behaviors were considered as engagement in each of the activities.

Table 4

*Activities selected for each participant*

| Participant | Target activity | Distracting activities |
|---|---|---|
| Participant A | Legos® | Magna-Tiles® |
| | | Crystal Climbers® |
| | | Books |
| Participant B | Magna-Tiles® | Trains |
| | | Legos® |
| | | Puppets |
| Participant C | Magna-Tiles® | Trains |
| | | Wooden blocks |
| | | Sensory play |

* Table showing activities available for each participant, including the overall results of prebaseline preference assessment indicating the target activities and distracting activities.

Table 5

*Results of the prebaseline – determining the target activity*

| | Activity | Total duration in seconds |
|---|---|---|
| Participant A | Magna-Tiles® | 308 |
| | Crystal Climbers® | 528 |
| | Books | 114 |
| | Legos® | <u>676</u> |
| Participant B | Magna-Tiles® | <u>695</u> |
| | Legos® | 653 |
| | Trains | 124 |
| | Puppets | 158 |
| Participant C | Magna-Tiles® | <u>964</u> |
| | Trains | 209 |
| | Wooden blocks | 140 |
| | Sensory play | 305 |

* Table shows the data indicating how long each participant was engaged in the available activities. Underlined numbers indicate the longest engagement in the activity (the target activity).

Table 6

*Results of the paired choice preference assessment*

| | | Preference assessment 1 | Preference assessment 2 |
|---|---|---|---|
| | Stimulus | Number of choices | Number of choices |
| Participant A | Fruit snacks | 4 | 4 |
| | Strawberries | 8 | 6 |
| | M&Ms | 6 | 3 |
| | Skittles | 2 | 3 |
| | Harshey kisses | 0 | 4 |
| Participant B | Animal crackers | 5 | 5 |
| | Strawberries | 7 | 7 |
| | Avocado | 3 | 1 |
| | Pasta | 4 | 5 |
| | Goldfish crackers | 1 | 2 |
| Participant C | Strawberries | 6 | - |
| | Goldfish crackers | 1 | - |
| | Caprisun juice | 7 | - |
| | Banana | 3 | - |
| | Avocado | 3 | - |

* Table showing the number of times each stimulus was chosen by each participant during the preference assessment. Underlined numbers indicate the stimulus that was chosen for implementation in the following intervention phase.

Table 7

*Number of consequences delivered by intervention session*

| | Low-preference stimulus intervention | | High-preference stimulus intervention | |
|---|---|---|---|---|
| | Session | Number of consequences | Session | Number of consequences |
| Participant | | | | |
| A | 1 | 6 | 1 | 8 |
| | 2 | 8 | 2 | 10 |
| | 3 | 5 | 3 | 7 |
| | 4 | 5 | 4 | 5 |
| | 5 | 6 | - | - |
| Participant | | | | |
| B | 1 | 8 | 1 | 9 |
| | 2 | 6 | 2 | 9 |
| | 3 | 6 | 3 | 12 |
| | 4 | 5 | - | - |
| | 5 | 5 | - | - |
| Participant | | | | |
| C | 1 | 9 | 1 | 10 |
| | 2 | 6 | 2 | 9 |
| | 3 | 9 | 3 | 11 |
| | 4 | 6 | - | - |

* Table presents the number of session conducted in each intervention phase and number of consequences delivered per session, for each participant separately.

# APPENDIX B

## FIGURES

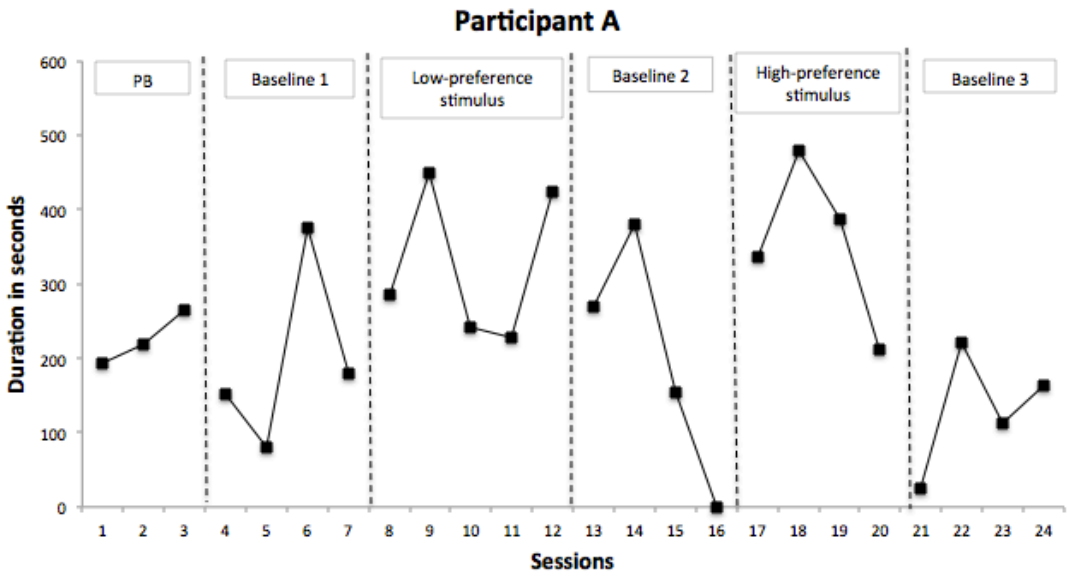


*Figure 1.* The duration of engagement in the target activity (Legos®) for the participant A across all sessions.

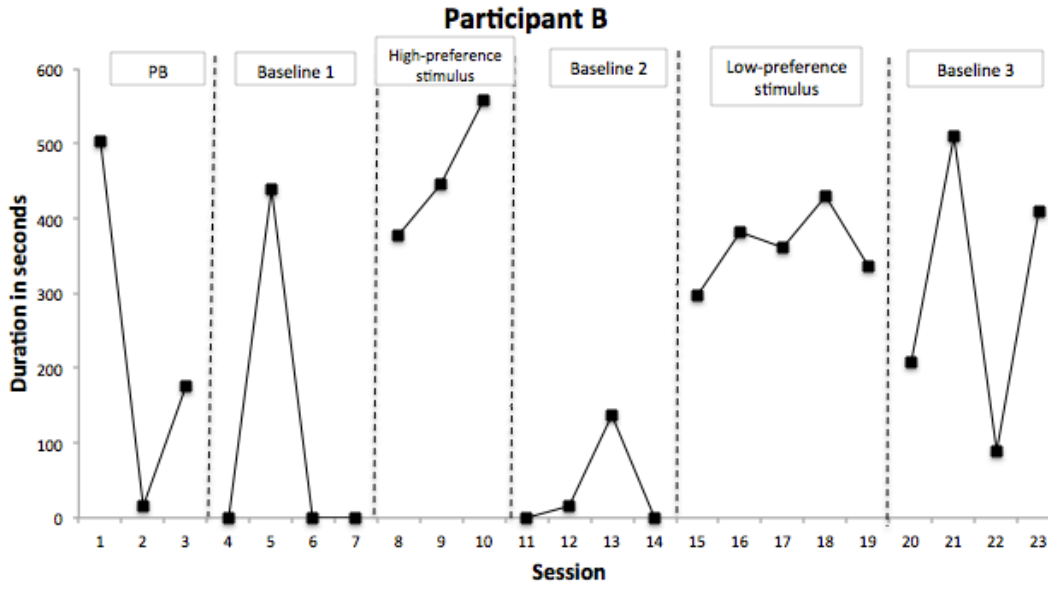


*Figure 2.* The duration of engagement in the target activity (Magna-Tiles®) for the participant B across all sessions.

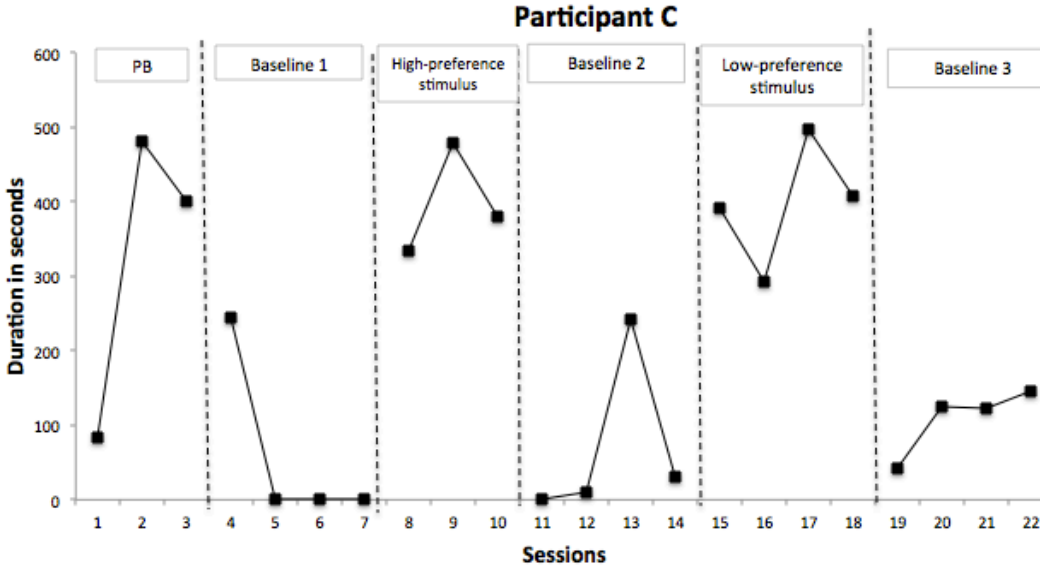


*Figure 3.* The duration of engagement in the target activity (Magna-Tiles®) for the participant C across all sessions.

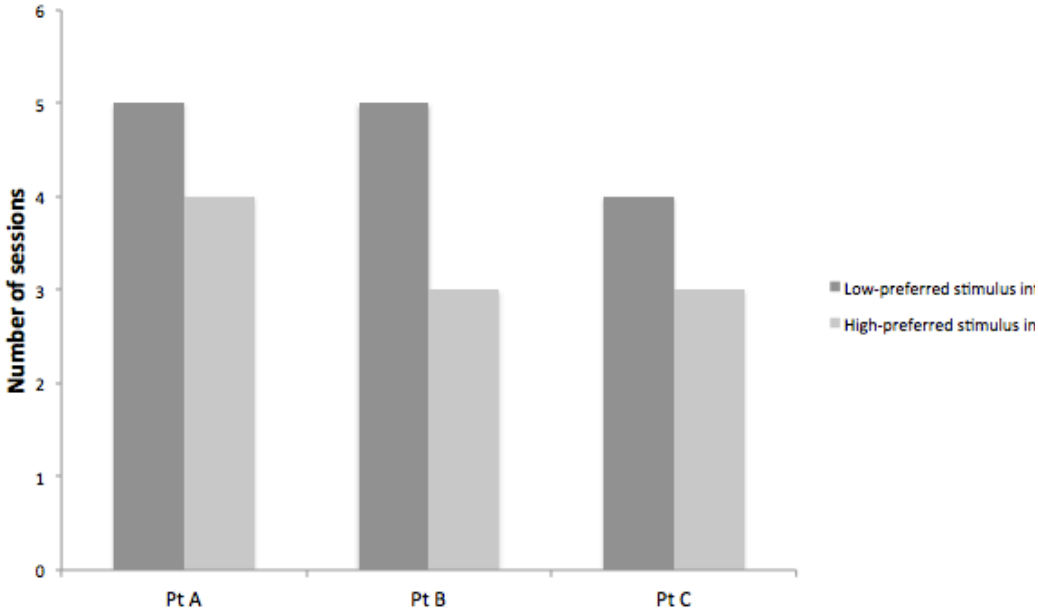


*Figure 4.* Number of session conducted in the intervention phases for each participant.

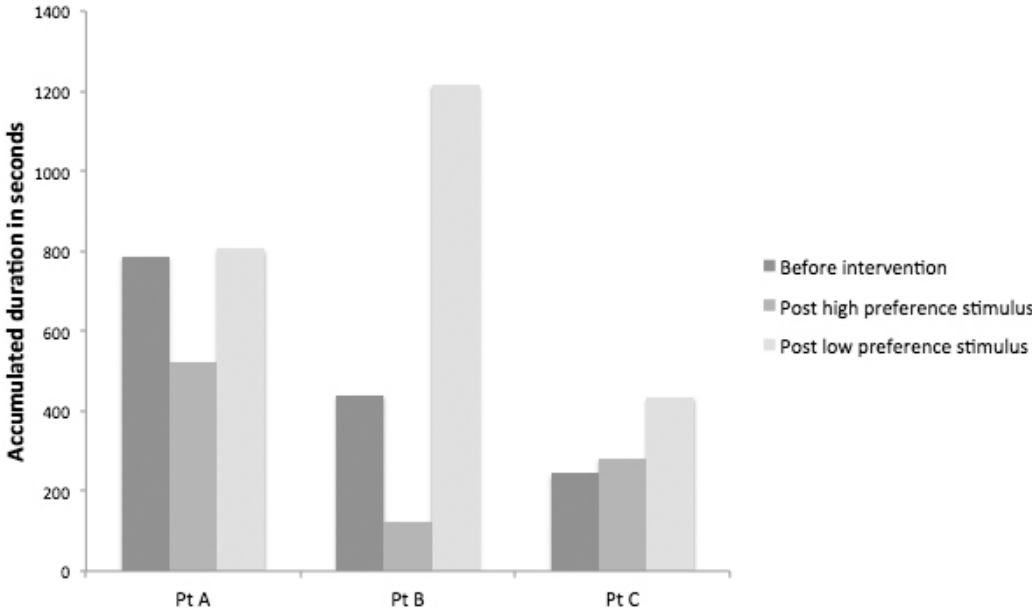


*Figure 5.* The accumulated duration of engagement in the target activity during the baseline phases for all participants