EXAMINING THE OVERJUSTIFICATION EFFECT AS A FORM OF INCENTIVE CONTRAST

by

SEAN PATRICK PETERSON

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Texas Christian University
Fort Worth, Texas

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Will paying a child to do chores cause him/her to refuse doing them when no money is involved? What about an activity done simply for pleasure, such as reading or drawing? Based on decades of research on a phenomenon known as the *overjustification effect*, it has been suggested that external rewards compete with a person's intrinsic motivation to engage in an activity, resulting in detrimental effects on performance when external reinforcement is discontinued (Deci, Koestner, & Ryan, 1999). According to Eisenberger and Cameron (1996), this idea has had a widespread effect on common practices in education and industry.

Briefly, the overjustification effect occurs when an external reward contingency is imposed on behavior that already occurs in the absence of external rewards. A common observation is that when the external rewards are withdrawn, performance deteriorates *below* levels observed in the absence of an external reward history. An influential interpretation of this phenomenon states that the overjustification effect is caused by a personal evaluation of one's purpose for the behavior, which leads to decreased interest in the task because one feels controlled (e.g., Deci, 1976; Deci et al., 1999). In contrast, others have attributed the overjustification effect to a decrease in the total amount of reinforcement that occurs when a reinforcing consequence is withdrawn, independent of whether or not the withdrawn reinforcer was a part of an external reinforcement contingency (e.g., Neuringer, 2003). Many studies have examined the overjustification effect between groups, with one group receiving an external reward and another receiving no such reward (e.g., Deci, 1976; Lepper, Greene & Nisbett, 1973; Neuringer & Donnelly, 1998). However, the few studies that have attempted to examine the effect at the individual level have failed to produce it (e.g., Akin-Little & Little, 2004; Bright & Penrod, 2009; Feingold & Mahoney, 1975). The purpose of the present study was to demonstrate

the overjustification effect at the individual level, and examine the hypothesis that the overjustification effect is a form of incentive contrast that requires no distinction between intrinsic and extrinsic motivation.

The Overjustification Effect

Lepper et al. (1973) asked a group of nursery school children to participate in a drawing task. Initial intrinsic interest in coloring with markers was measured by recording the amount of free-choice time a child was present at a table with drawing materials or placed a hand on one of the "magic markers." Children who demonstrated interest in the markers were selected to participate in the experiment, which was conducted in a separate room, one child at a time. All participants were presented with the same drawing materials as before, and instructed to draw pictures. At the end of a 6 min period, participants in two experimental groups received award certificates and ribbons for drawing. The expected-award group was informed of the award before the drawing period began, whereas the unexpected-award group did not know about the award until the drawing period had ended. Participants in a third, no-award condition did not receive an award. Intrinsic interest was measured in baseline and again 7 to 14 days after the experimental manipulation. Children who had participated in the expected-award condition spent less time drawing in the free-choice situation than children in the other two groups. Also, independent judges rated the pictures produced by this group as lower in quality than those of the other two groups. On the basis of these results, Lepper et al. warned against the practice of using "grades, gold stars, or the awarding of special privileges" (pp. 135-136) to motivate children to perform tasks that they might already find interesting.

The purpose of Lepper et al. (1973) was to test a prediction of Bem's (1965) self-perception theory. Self-perception theory states that people make inferences regarding the causes

of their own actions based on the salience of external rewards. Only in the absence of sufficiently large and salient external rewards do we attribute our behavior to internal motivation or interest. When we perceive external rewards that may justify our behavior, we infer that the behavior is caused by them. Lepper et al. hypothesized that if a person is offered a reward for engaging in an activity he or she is already motivated to perform, such that the rewards provide overly high justification for performing, the person will cease to see the activity as an end in itself and lose interest in it. The results of the study were consistent with this overjustification hypothesis. Children for whom the promise of an award was salient, while they were drawing, appeared to lose interest in the task compared to those who had no knowledge of or did not receive an award. Although the overjustification hypothesis is not universally accepted, the term overjustification has frequently been used to describe behavioral effects similar to those observed in Lepper et al., even by those who favor alternative explanations (e.g., Roane, Fisher, & McDonough, 2003).

In another study, Deci (1971) obtained similar effects with college students who received monetary rewards for completion of puzzles, and student workers who received monetary rewards for writing headlines for a college newspaper. However, no effects on intrinsic motivation were obtained on the puzzle task when participants received verbal praise and feedback instead of monetary rewards. Deci hypothesized that the effect might be related to the use of money in our culture to buy goods and services that could otherwise not be obtained. The receipt of money contingent on an activity might consequently lead to "a cognitive re-evaluation of that activity from one which is intrinsically motivated to one which is motivated primarily by the expectation of financial rewards" (p. 114). By contrast, social approval might be perceived as less controlling and thus have less of an effect on the intrinsic value of the activity. These findings and hypotheses formed the basis of Deci and Ryan's cognitive evaluation theory (CET).

CET suggests that rewards affect intrinsic motivation through two processes: (a) a change in the perceived locus of causality, and (b) a change in how competent one feels and in one's self-determination (Deci, 1976). If an extrinsic reward is provided, the locus of causality shifts from the internal needs to the external reward and the person is likely to perform the behavior only when the extrinsic reward is imminent (Deci, 1976). However, a reward that makes the person feel competent and self-determined will also increase their intrinsic motivation. Finally, if the feelings of competence do not also provide a sense of autonomy, then intrinsic motivation is not increased (Ryan & Deci, 2000).

The overjustification effect has since been demonstrated in a large number of studies. As an example of more recent work, Warneken and Tomasello (2008) found that 20-month old infants who were repeatedly given access to an attractive toy contingent on helping behavior were subsequently less likely to help than infants who received social praise or no consequences. Similarly, Oliver and Williams (2006) found that accuracy-contingent and completion-contingent rewards resulted in a decrease in 4^{th} and 5^{th} grade students' completion of math problems, compared to a non-rewarded control group. However, a number of studies have either failed to find the effect (e.g., Akin-Little & Little, 2004; Bright & Penrod, 2009; Scott & Miller, 1985) or found the opposite effect in which a reward history has increased subsequent engagement in an activity (e.g., Cameron, Pierce, Banko, & Gear, 2005; Pierce, Cameron, Banko, & So, 2003; Reiss & Sushinsky, 1975).

In a meta-analysis of 128 published and unpublished studies, Deci et al. (1999) found that consistent with self-determination theory, the overjustification effect was observed only when tangible rewards were used, but the opposite effect was observed when performance was rewarded with verbal praise. Also consistent with self-determination theory and CET was the

finding that unexpected rewards and task-noncontingent rewards (which would not be perceived as controlling), overall, were not detrimental to intrinsic motivation. The effect was produced only when rewards were expected and contingent on task engagement, task completion, or task performance. On the basis of a more fine-grained analysis of these studies, Cameron, Banko, and Pierce (2001) concluded that the effect was further limited to situations in which there was high initial interest in the task and the rewards were only loosely tied to performance levels. In addition, they concluded that the size of the overjustification effect in those cases, while statistically significant, does not suggest a strong impact on the task. If this is true, the overjustification effect may be of little relevance to behavior-change programs in which target behaviors are initially absent or occur at low levels, and rewards are contingent on progressive improvement. However, to the extent that parents, teachers, and employers may not always implement rewards in such a careful and systematic fashion, the effect on unrewarded behavior may still be of practical concern.

Alternative Explanations of the Overjustification Effect

Introductory psychology texts (e.g., Myers, 1989; Smith, Nolen-Hoeksema, Fredrickson, & Loftus, 2003) typically explain the overjustification effect in terms of CET or similar cognitive terms. However, several alternative explanations have been offered.

Learned Industriousness

Eisenberger (1992) proposed the theory of learned industriousness to explain the overjustification effect. When response effort is paired with reinforcement, the effort expended is endowed with secondary reinforcement properties, leading to the industriousness. Learned industriousness suggests that when an organism receives a reward for expending high effort on a task, the aversive nature of the effort required to increase physical or cognitive performance is

reduced. The reduction in aversion can then generalize across behaviors for which similarly high effort is also needed, such that a history of hard work will lead to hard work and persistence in the future. However, when hard work is not necessary for reward, future effort will decrease and subsequent tasks may show less responding, similar to the overjustification effect.

When students with learning disabilities were rewarded for simply completing a reading task, rather than for accuracy, they were less accurate in subsequent tasks that involved drawings and stories and were slower at constructing stories than participants who were rewarded for speed of reading (Eisenberger, Mitchell, McDermitt, & Masterson, 1984). In another study with a word construction task, participants were provided a word and asked to make a new word out of the letters. Participants in a low divergent thinking condition were asked to form one new word, whereas those in a high divergent thinking condition were asked to form six words from the letters (Eisenberger & Selbst, 1994). Participants in the low divergent thinking condition were less creative in a later drawing task than participants in the high divergent thinking condition, when a small reward or a large non-salient reward (i.e., the reward was hidden) was given for the word construction task. This was evidence for decreased generalized creativity after a low degree of divergent thought is rewarded. Additional support for the learned industriousness explanation of the overjustification effect has come from a number of experimental preparations with pre-adolescent children (Eisenberger & Adornetto, 1986), college students (e.g., Boyagian & Nation, 1981; Eisenberger & Leonard, 1980; Pierce et al., 2003), individuals with depression (Eisenberger, Heerdt, Hamdi, Zimet, & Bruckmeir, 1979, Experiment 1), children with learning disabilities (Eisenberger et al., 1979, Experiment 2), and animals (e.g., Eisenberger, Weier, Masterson, & Theis, 1989).

Competing Response Hypothesis

When describing how quality of performance can change over time, Child and Waterhouse (1952) use the concept of regression- a shift back to less mature (more primitively learned) behavior. A decrease in quality of performance may occur in an activity because frustration induces a shift toward less mature behavior. This less mature behavior becomes the focus in order to obtain the reinforcer and thus the less mature behavior is a competing response occurs for the activity. Reiss and Sushinsky (1975) utilized this competing response hypothesis in order to suggest an alternative for why the overjustification effect occurs. When using a reward for performing an activity, the reward may become the focus and the activity less so, such that the reward competes with the performance of the rewarded activity. If the reward is no longer provided for performing the activity, then the idea of the reward inhibits the performance of the activity and thus the overjustification effect is seen.

Reiss and Sushinsky (1975) provided experimental support for the competing response hypothesis in two experiments. In the first, they demonstrated the typical effect of overjustification seen through expectation of a noncontingent, tangible reward (a doll). In the second, a token economy was used in which participants were able to earn tokens and trade them for a toy. The token economy allowed an examination of how a reinforcement effect arose as a result of repeated reinforcement trials. The competing response hypothesis would predict that since the tokens were contingent on listening to a target song, listening to the target song would end up being a preferred activity. The contingency should not cause a decrease in listening to the target song (therefore, there would be no decrease in intrinsic motivation) due to a competing response coming from the tangible reward because participants had to earn tokens in order to trade them for time with the tangible reward. The use of tokens would not interfere with the

target behavior and no decrease in behavior would be seen. The results of Experiment 2 supported the competing response hypothesis (Reiss & Sushinsky, 1975). There was no decrease in intrinsic interest as measured by time spent listening to the target song, suggesting that only when participants are expecting a reward at the expense of enjoying the activity did the overjustification effect occur (Reiss & Sushinsky).

Satiation

Dickinson (1989), among others, suggested that satiation of response-produced consequences may contribute to the overjustification effect. According to this view, behavior that is typically considered "intrinsically" motivated is maintained by automatic consequences produced by the response, such as when drawing produces pictures. It is proposed that when the behavior increases due to an external reinforcement contingency, increased exposure to the response-produced consequences results in satiation, and thus the behavior subsequently decreases. This satiation effect, it is predicted, should dissipate with time after a period of no drawing (Dickinson).

Negative Contrast

Several researchers have proposed that the overjustification effect may represent an instance of the more general effect termed negative contrast (Balsam & Bondy, 1983; Flora, 1990; Neuringer, 2003; Roane, Fisher, & McDonough, 2003; Zentall, 2005). Negative contrast, in general, refers to the observation that exposure to a particular reward condition will reduce behavior in a second, less favorable condition, relative to a conditiononly exposed to the less favorable reward. Among different types of contrast that have been described in the literature are behavioral contrast and successive negative contrast.

Flora (1990) proposed that the overjustification effect might be an instance of negative behavioral contrast. Behavioral contrast refers to an increase or a decrease in responding in one context when the rate of reinforcement changes in a different context. Negative behavioral contrast occurs when the rate of reinforcement increases in one context, resulting in a decrease in behavior in the other context. For example, in Lepper et al. (1973) participants underwent a baseline and a secondary measurement of intrinsic interest for drawing in their classrooms. A phase occurred between the two measurements of intrinsic interest, during which participants were rewarded for drawing in a separate room, and during which no measure of intrinsic interest was obtained. Prior to the experimental manipulation, it is likely that the participants had a history of variable reinforcement such that on occasion a teacher would praise them for drawing, but the probability of reinforcement was less than 1. As a result of the experimental manipulation, the probability of reinforcement for drawing increased to 1, but in a different context than the normal classroom. Once the participant returned to the measurement context, where the probability of reinforcement remained unchanged, drawing decreased due to the exposure to higher-probability reinforcement in the experimental context. Flora's matching law interpretation of behavioral contrast predicts that as time passes and the participant continues to be exposed to the measurement context, but not the experimental manipulation, there will be recovery of engagement to the original level.

Whereas behavioral contrast exemplifies simultaneous negative incentive contrast (Flaherty, 1996), Neuringer (2003) and Zentall (2005) have conceptualized the overjustification effect as a case of successive negative contrast. Successive contrast occurs when the behavior of a group decreases after receiving one reward magnitude that is suddenly shifted to a lower reward magnitude, relative to another group that received only the second reward magnitude

throughout. For example, it has been shown that rats trained to run down a runway for a larger reward (e.g., 15 pellets) will run faster than rats trained to run for a smaller reward (e.g., 1 pellet). Abrupt decreases in speed have been observed once rats in the larger reward group are downshifted to the smaller reward condition, so much that the downshifted groups initially run slower than the groups that had been maintained on one pellet through all trials (Crespi, 1944; Daly, 1969).

According to Dickinson (1989) and Neuringer (2003), behavior that is typically labeled intrinsically motivated does not in fact occur in the absence of any consequences. Rather, it is maintained by consequences produced automatically by the behavior itself, such as when drawing produces a completed piece. When the artist is paid for the piece, they receive the automatic consequences as well as the external reinforcement that comes from money. If the artist is no longer paid, there is a reduction in the total amount of reinforcement from external (money) and automatic sources to reinforcement by automatic consequences only. Thus, the behavior (e.g., painting) decreases below baseline levels as in the overjustification effect. The successive negative contrast interpretation predicts that the overjustification effect should be blind to the source of reinforcement, that is, whether the decrease in total reinforcement represents removal of external sources of reinforcement or removal of automatic consequences of behavior. Thus, it should be possible to observe the effect when the automatic consequences of the behavior are blocked, leaving only an external reward contingency in place (Neuringer, 2003). In addition, studies on successive negative contrast (e.g., Capaldi, 1972; Flaherty & Rowan, 1986) have often found the effect to be transient; after repeated exposure to the lower magnitude of reinforcement, behavior recovers to the same level that would have been observed

in the absence of the external reward history. Thus, if the overjustification effect is a case of negative contrast, it is possible that it is short-lived.

The Overjustification Effect as an Example of Negative Contrast

No published studies have explicitly examined the negative incentive contrast interpretation of the overjustification effect. In addition, most studies on the overjustification effect have included only one or two measures of intrinsic interest following withdrawal of external rewards, precluding an assessment of potential recovery. An exception is a study by Vasta and Stirpe (1979) in which three measures of performance on a mathematics task were examined: (a) the number of pages of math problems completed, (b) the time spent engaging in the activity, and (c) the accuracy of performance on the activity. An ABA design was used; Phase 1 was baseline 1, Phase 2 was the reinforcement phase, for completing three pages of problems, and Phase 3 was Baseline 2. There was an additional baseline, Baseline 3, that was conducted 2 weeks after the conclusion of Baseline 2, during which time there were no additional sessions. The experimental and control groups did not differ significantly during the first baseline in any of the three measures. During Phase 2, turning in completed pages of math problems was reinforced in the experimental group and there was a significant increase in the amount of time spent working on the math problems, whereas there was no increase for the control group (correct answers were not reinforced) during this phase. Accuracy, however, did not significantly differ across phases or groups. When reinforcement was removed for the experimental group in Phase 3, on average there was a return to baseline levels of time spent on the math task and number of pages completed. For two of the four participants in the experimental condition, there was an initial decrease below baseline in the number of completed

pages, consistent with the overjustification effect, but the effect was transient and quickly returned to baseline 1 levels.

Other studies on the overjustification effect that have included multiple measures following the withdrawal of reward have typically employed single-case experimental designs in an attempt to demonstrate the effect at the individual level (e.g., Akin-Little & Little, 2004; Bright & Penrod, 2009; Feingold & Mahoney, 1975). However, these studies have generally failed to demonstrate overjustification, as behavior has not decreased below baseline levels (nor decreased at all) following the withdrawal of the reward. As a result, it has not been possible to evaluate recovery. However, a phenomenon similar to the overjustification effect has been observed in single-case design studies in which problem behavior has been explicitly reinforced, followed by withdrawal of the reinforcement contingency (Neisworth, Hunt, Gallop, & Madle, 1985; Schmid, 1986). In Schmid's study, participants underwent a baseline phase for problem behavior followed by continuous reinforcement of the problem behavior. During a second baseline phase, all participants had decreased problem behavior in comparison to the first baseline, thus demonstrating an effect similar to the overjustification effect if it is assumed that the participants had "intrinsic interest" in engaging in the problem behavior. In this study, however, no recovery to baseline levels was seen across as many as ten 5-min observations in the second baseline phase. Another study used a similar procedure; after baseline a distinct problem behavior was continuously reinforced for each of two participants (Neisworth et al., 1985). One participant's behavior increased above baseline, while the other had a slight decrease, suggesting that the presumed reinforcer may actually punish behavior in some cases. When the reinforcement contingency was withdrawn, both participants had a decrease in problem behavior from the initial baseline. On the third day, however, the participant who had increased behavior

during continuous reinforcement had recovered to levels exceeding baseline, as a behavioral contrast interpretation would predict. No such effect was seen with the other participant. A limitation of these studies, however, was that it was not known which (if any) contingency maintained the behavior in baseline, so the extent to which the results bear on a negative contrast interpretation is unclear.

More recently, Roane et al. (2003) attempted to demonstrate the overjustification effect at the individual level, but actually obtained the opposite effect. In this instance, a boy enjoyed sorting silverware into a plastic tray for no apparent external consequences, thus fulfilling a requirement for the task to be considered intrinsically motivating. Two highly preferred toys were utilized as rewards for performing the task; however, silverware sorting decreased instead of increasing during the reward phase. When the rewards were withdrawn, silverware sorting increased above baseline levels. These effects were replicated in two additional reward and withdrawal phases. A subsequent analysis revealed that silverware sorting was more highly preferred than either of the toys and thus when sorting was stopped for a period in order to allow for interaction with the toys, sorting was punished. The authors suggested that the increase above baseline levels when punishment ceased might be akin to the overjustification effect seen when there is removal of preferred positive reinforcers, and hypothesized that it might be an instance of punishment contrast, previously demonstrated in animal research (e.g., Azrin, 1960). The participant's sorting never decreased to levels equivalent to the original baseline after punishment was withdrawn, thus providing little support for the contrast interpretation. However, there may not have been enough sessions to demonstrate recovery during the withdrawal conditions.

Neuringer (2003) described data from an unpublished manuscript (Neuringer & Donnelly, 1998) that provided an innovative test of the negative contrast interpretation of the overjustification effect. The extrinsic reinforcer was consistently present, but the automatic, response-produced consequences of the target response were manipulated. It was predicted that the results would mirror results of studies in which the overjustification effect is demonstrated by manipulating external rewards. The study utilized a three-phase mixed design. During phases 1 and 3, extrinsic reinforcers (stickers) contingent on drawing with a colorless marker were administered to the experimental group. The assumption was that by utilizing colorless markers, the task contained no intrinsic motivation or automatic consequences of drawing. During phase 2, the experimental group was provided with colored markers and continued to be rewarded with stickers for drawing. The control group went through an identical number of trials as the experimental group, but did not receive colored markers in the second phase. Children in the experimental group spent significantly more time coloring in phase 2 (when colored markers were introduced) than they did in Phase 1, and spent significantly less time coloring in Phase 3 (colored markers were removed) than they had in phase 2. The most important finding was that the experimental group colored significantly less in Phase 3 as compared to Phase 1, even though the experimental conditions were identical. The control group had no change in the amount of time spent coloring throughout the three phases. Thus, an overjustification effect was demonstrated when the traditional intrinsic and extrinsic motivation conditions were reversed. As the time spent coloring was averaged for each phase, it was not possible to evaluate a potential recovery effect during the second baseline, although with the limited number of trials performed, it might not have been possible to observe recovery.

Present Study

The purpose of the present study was to explore the idea that the overjustification effect may be conceptualized as a type of successive negative contrast. Experiment 1 attempted to demonstrate the overjustification effect at the individual level, as such demonstrations are mostly absent from the literature. With a successful demonstration, Experiment 1 also examined whether performance would recover to baseline levels across successive opportunities to engage in an activity without the external reinforcer. A multiple baseline, ABA design was used to evaluate the effects of withdrawing the reinforcer on time allocation to a drawing task in a concurrent-operant choice situation. Participants had access to colored markers and two other activities and were externally rewarded for drawing during the second phase of the experiment. As Experiment 1 was successful in showing that the overjustification effect could be observed at the individual level, Experiment 2 explored an incentive contrast interpretation of the overjustification effect by examining the notion that the explicit distinction of intrinsic and extrinsic motivation to explain the overjustification effect is unnecessary. The same multiple baseline, ABA design was used in Experiment 2, with a drawing task that is similar to that of Neuringer and Donnelly (1998). In Phases 1 and 3 participants received food rewards for utilizing colorless markers and received colored markers and food rewards in Phase 2.

General Method

Materials

Materials used in the experiment included six different Color Wonder™ markers and Color Wonder™ paper sheets (8.5 in x 10 in). Color Wonder™ markers have the appearance of regular color markers, but do not leave color on any surfaces except for Color Wonder™ paper sheets. Various toys and food items were also used. A preferred items survey (see Appendix 1)

adapted from Fisher, Piazza, Bowman, and Amari (1996) was used to identify an initial pool of food items for each participant.

Data Acquisition

The primary dependent variable was the percentage of time the participant spent engaging with the drawing materials in a 2-min period. Engagement was defined as the amount of time spent with both hands inside of the quadrant that contained the drawing materials or touching either the Color Wonder™ markers or paper. Engagement was recorded by the experimenters using real-time recording with the aid of a Windows® based laptop computer running the Behavior Evaluation Strategies and Taxonomies (BEST) software (Sharpe & Koperwas, 1999). During the experimental manipulation sessions, the software was programmed to run 120-s trials, and during each trial, the experimenter could start and stop a timer based on whether or not the participant was engaged. Each experimental manipulation session consisted of up to five trials. The total duration of engagement, in seconds, was averaged across trials and converted to a percentage. For the pre-experimental response restriction analysis (RRA), BEST was programmed to run 5-min trials with the ability to record the time spent manipulating six items. The food preference assessment was scored using the same Windows® based laptop and a spreadsheet that provided the trial order and item locations.

Intraobserver Agreement

Intraobserver agreement (IOA) was assessed on at least 30% of all trials in each experimental condition, by having a second observer score the trials live or from video. For each session, the lower cumulative duration of engagement recorded by an observer in each trial was divided by the higher duration, converted to a percentage and averaged across trials. Trials in which both observers agreed that there was no engagement were removed from the IOA analysis.

The IOA for experimental phases was 81.0% (range 0-99.6%) for P2, 99.5% (range 98.7-99.9%) for P3, 98.5% (range 87.0-100.0%) for P5, was 94.8% (range 0-100.0%) for P21, 93.2% (range 0-100.0%) for P22 and 99.0% (range 94.2-100.0%) for P23. During the RRA, IOA was assessed on at least 30% of all trials by dividing the lower interaction percentage by the higher interaction percentage for the two observers, and multiplying by 100. For the RRA any item that was scored by the primary experimenter and the secondary observer as not touched during a trial was eliminated from the analysis for that trial. For RRA trials the IOA for P1 was 89.5% (range 0-100.0%), for P2 was 88.1% (range 0-99.9%), for P3 was 98.9% (range 94.5-100.07%), for P4 was 90.4% (range 48.7-99.9%), for P5 was 85.7% (range 0 -99.9%), for P21 was 88.4% (range 58.2%-99.8%), for P22 was 92.3% (range 64.1-100.0%) and for P23 was 86.5% (range 0-99.9%). For the food preference assessment IOA was obtained for all participants on all trials and was calculated as the number of agreements divided by the total number of trials and converted to a percentage. IOA for the food preference assessments was 100.0% for all participants.

Procedure

Response restriction analysis. A RRA (Hanley, Iwata, Lindberg, & Conners, 2003) was conducted in order to identify two activities for use in each participant's experimental sessions, in addition to Color Wonder™ markers and paper. Prior to the analysis, six items, including Color Wonder™ markers and paper were chosen as age appropriate toys or activities. Participants were shown the six items in random succession and prompted to manipulate each item for 30 s. The six items were then spaced equidistantly around a table, and participants underwent up to four 5-min trials per daily session, during which an experimenter recorded the time spent interacting with each item. An interaction was scored only once an item was touched

for 1 s. An interaction percentage was calculated to determine what percentage of time an item was manipulated during each trial. Interaction percentages were calculated by totaling the time, in seconds, an object was manipulated during a trial and converting to percentage of total trial time. Across consecutive trials, items were removed from the analysis one by one in order to identify a preference hierarchy. An item was deemed preferred and removed on the basis of the interaction percentage as outlined in Table 1. The first five rules were based on those established by Hanley et al. The two additional rules were a result of P1 undergoing 19 trials prior to having a single item restricted. Beginning with trial 25 for P1 and trial 15 for P2, the additional rules were added and used for the remainder of the RRA for each participant. The RRA for all the other participants was completed using all seven rules from the beginning.

Table 1

Rules for Assessing a Preference Hierarchy

Rule	Explanation
1	If during two consecutive trials an item was interacted with for 60% or more of each 5 min period, the item was be considered preferred and subsequently removed from the analysis.
2	If during two out of three trials an item was interacted with for 60% or more of the time and during the third trial no other item reached 60% then the item was be removed.
3	If responding was variable and ceased to reach 60% for a single item then trials continued until responding was equally distributed among multiple (2 or more) items and all of those items were removed.
4	If responding was variable and ceased to reach 60% for a single item then trials will continue until responding is more consistent with a single item and that item alone was removed.
5	If there was little (less than 20% of the trial) or no interaction with the remaining items for 2 consecutive trials then the remaining items were removed.
6	If responding was variable across trials, then a daily average across trials was taken. If an item reached the highest daily session average across 2 days, that item was removed.
7	If responding was variable across trials, then a daily session average across trials was taken. If an item reached the highest daily average across 2 out of 3 days, without average responding on another item reaching more than 5% higher on the third day, the item was removed.

Daily sessions continued until all items had been removed. A mean interaction percentage was calculated by summing the interaction percentage from each trial and dividing by the number of trials for which an item was present. On the basis of the mean interaction percentage, the two activities whose mean interaction percentages across trials were closest to the mean interaction percentage for Color Wonder™ markers and paper were chosen for use in experimental sessions.

Food preference assessment. Following the RRA, participants underwent a preference assessment to identify potential food reinforcers. The preference assessment was conducted in a paired-stimulus format (Fisher et al., 1992). Participants were allowed to sample each of six items, prior to starting the preference assessment. During the preference assessment, participants had a choice of two different food items in each trial. The items were presented in randomized positions on a table equidistant from the participant, approximately 3 cm apart. Participants were asked to choose one item that they would like to eat; immediate consumption of this item was allowed and the other item was removed. Once the participant had consumed the chosen item, two new items were placed on the table and a new trial began. Each item was randomly presented with each other item and the location of each item was also randomized. A selection percentage was calculated in order to determine a hierarchy of preference. The selection percentage was the total number of times an item was chosen, divided by the five times it was presented and converted to a percentage.

Experiment 1

Participants and Setting

Five children, 2 boys and 3 girls, were recruited from a local preschool. All of the participants were considered to be typically developing by the preschool staff and the primary

experimenter. At the start of the experiment P1 was a boy aged 3 years 8 months, P2 was a girl aged 3 years 10 months, P3 was a girl aged 4 years 1 month, P4 was a boy aged 4 years 1 month, and P5 was a girl aged 3 years 10 months. Participants were recruited with packets sent home to parents expressing the nature of the experiment. Their participation began only after obtaining parental permission and child assent. Each participant completed 20 to 45 sessions (23 to 45 for participants who completed the entire experiment) each lasting no more than 25 min. Each participant was removed from his or her classroom and escorted to a staff break room, isolated from other children so as to minimize disruption. Upon completion of the session, the participant was escorted back to his or her classroom and the teacher was notified of the participant's return.

Procedure

Upon completion of the RRA and food preference assessment, each participant began the experimental manipulation phases, starting with the intrinsic motivation (IM) condition.

Intrinsic motivation. In this condition, the participants' engagement relative to competing activities was assessed in the absence of experimenter-delivered consequences for engaging in any activities. Each participant was exposed to a single daily session consisting of up to five 2-min experimental trials. The first participant (P3) underwent sessions until a stable baseline of engagement was achieved, with each subsequent participant undergoing additional sessions to achieve stable baselines of differing lengths. The table used for experimental manipulation sessions was split into quadrants (Figure 1) and participants began each trial in a seat located approximately 1 m behind the quadrant that did not contain the drawing materials or one of the two distracter tasks. Six Color Wonder ™ markers and a sheet of Color Wonder™ paper along with the distracter activities were placed randomly in one of three separate quadrants

of the table (i.e., quadrants labeled 1, 2, or 3). A digital timer, set to beep and flash a light at the end of the 2 min trial, was started, placed in the fourth quadrant (the same quadrant on all trials) and the trial began. Before the beginning of each trial, participants were told, "When I say go, you will have two minutes to play with anything on the table you want. Ready go." At the conclusion of the trial, as marked by the beeping timer, the experimenter told the participant, "Time is up, please sit back down" and removed the materials from the participant. After the first trial, and each subsequent trial, of a daily session the materials were rotated one spot clockwise. A new trial began immediately following the replacement of the materials into their appropriate quadrants and updating the computer file, until the session was completed. Upon conclusion of a session, the participant was escorted back to his or her classroom.

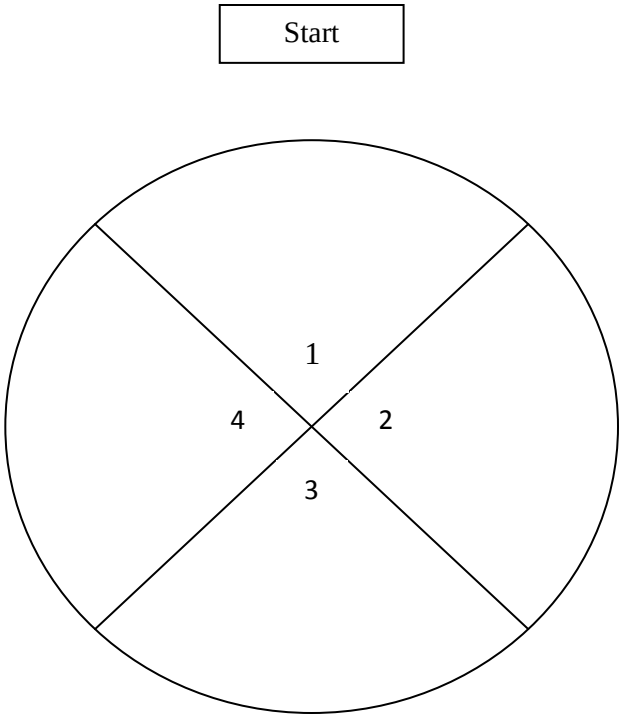

Figure 1. Setup of experimental table. The drawing materials and the two distractor tasks were randomly placed in the quadrants labeled 1, 2, and 3. Quadrant 4 always contained the digital timer and the container for the food reinforcer (when necessary). In the position marked "START" was a chair from which the participant started each trial.

Extrinsic-intrinsic motivation. In the extrinsic-intrinsic motivation (EIM) condition, preferred food items were contingent on engagement with drawing materials. Participants underwent up to five daily 2-min EIM trials. They were given access to six Color Wonder ™ markers and Color Wonder ™ paper with the distracter activities all placed in randomized quadrants on a table as in the IM condition, along with the digital timer. Prior to the start of a trial the experimenter delivered the following instructions: "Today if you draw with the markers, you can earn some snacks. Which one would you like to earn?", then presented the child with small pieces of his or her three most highly preferred food items. The first food item that the child pointed to or touched was used in the trial. A clear container was placed on the table in front of the participant, in the same quadrant as the digital timer, and the experimenter said, "When I say go, you will have two minutes to play with anything on the table you want. Ready, go." During each trial, every time the cumulative duration of engagement reached 75% of the baseline average duration (P1 *75% M* = 17.3, P2 *75% M* = 31.1, P3 *75% M* = 38.6, P4 *75%M* = 27.0, P5 *75% M* = 65.7), the experimenter placed a small piece of food into the clear container and provided verbal praise. At the end of a trial in which the participant earned food, the experimenter gave verbal praise, followed by, "Time is up. You can eat your snack now." The participant received access to the food container and the preferred activity stimuli were rotated clockwise. A new trial began immediately after the stimuli had been shifted one spot clockwise, the data file had been updated and the participant had consumed his/her food items. At the conclusion of any trial in which the duration of engagement did not reach at least 75% of his or her baseline average, the experimenter told the participant, "Time is up. Next time if you draw (more) you can earn some snacks." All of the activity stimuli were again removed from the participant, replaced in the appropriate quadrant and a new trial began once the data file was

updated. At the conclusion of the session, participants were returned to their classrooms. EIM condition sessions continued until a clear increase was observed in engagement with the drawing materials, or responding at ceiling level was maintained.

Experimental Design

The experimental design was a three phase ABA reversal design. Phases 1 and 3 were IM only, in which participants received Color Wonder™ markers and paper, but did not receive preferred food items for engagement with drawing materials. Phase 2 was an EIM condition. When participants were in Phase 2 they received the Color Wonder™ markers and paper, but also received a preferred food item contingent on engagement with the drawing materials. Participants were exposed to Phases 2 and 3 only if stable, above-zero responding was achieved in Phase 1. The primary comparison was between levels of responding in Phase 1 and at the beginning of Phase 3. The effects of the EIM history were evaluated in a multiple-baseline design across participants, in which the onset of EIM was staggered across stable IM baselines of differing lengths. This arrangement permitted a comparison of phases 1 and 3 and verification that engagement would not decrease below baseline simply as a result of the passage of time and continued exposure to IM sessions.

Results

Response restriction analysis. Table 2 contains the data from the RRA of each participant. The items for each participant are presented in the order in which access was restricted, along with the average interaction percentage for an item when it was restricted. Upon the completion of a participant's RRA, an interaction percentage was calculated for each item. Based on the interaction percentages for the items, in addition to markers (18.4 %) for P1, play-doh (20.8 %) and the train (18.6 %) were used during the experimental phases. Puzzle and play-

doh were the distracter tasks included with markers for the experimental sessions of P2 based on interaction percentages of 20.5%, 20.8% and 18.4% respectively. Of note for P2 during her RRA is that in 8 out of the first 10 trials she played only with a single item, and across those 10 trials, she played with each item at least once. Anecdotally, it appeared as though she had a place preference for the item located nearest to her at the beginning of a trial. In order to alleviate any effects of a place preference, all of the items were placed in a box for trials 11 – 14. Prior to trial 15 the participant requested that the items be placed on the table instead of in the box. At this time, the items were again placed in randomized order around the table; however, for the remainder of the RRA, all items were spaced evenly, as close to the center of the table as possible. For P3, based on interaction percentages, slinky (48.7%) and play-doh (25.8%) were included in the experimental sessions with markers (38.9%). P4 had access to markers (19.2%), slinky (31.3%) and play-doh (17.3%) during the experimental phases. P5 received the markers (26.1%), a puzzle (27.2%) and a microphone (25.2%) based on the interaction percentages.

Table 2

Response Restriction Analysis Results, Experiment 1

Restriction Order	Participant				
	P1	P2	P3	P4	P5
1	Puzzle (23.4%)	Slinky (26.0%)	Slinky (48.7%)	Puzzle (54.7%)	Slinky (43.1%)
2	Slinky (25.2%)	Barbie (25.9%)	Markers (38.9%)	Train (48.3%)	Microphone (25.2%)
3	Train (18.6%)	Play-Doh (20.8%)	Play-Doh (25.2%)	Fire Truck (35.8%)	Markers (26.1%)
4	Play-Doh (20.8%)	Puzzle (20.5%)	Puzzle (19.3%)	Slinky (31.3%)	Barbie (32.2%)
5	Fire Truck (14.1%)	Markers (18.4%)	Microphone (17.5%)	Play-Doh (17.3%)	Play-Doh (24.3%)
6	Markers (18.4%)	Microphone (21.2%)	Barbie (0.0%)	Markers (19.2%)	Puzzle (27.2%)

Food preference assessment. All participants underwent a food preference assessment in order to identify three preferred food items for use in the EIM condition. Table 3 shows the rank of each food item along with the respective selection percentage for each participant. The items are presented in order of most preferred to least preferred. In the event that two items were chosen an equivalent number of times as happened with P1, P3 and P4, the item chosen when those two items were paired was deemed more preferred. For example P3 chose Skittles® over raisins, and as a result, Skittles® are ranked as more preferred.

Table 3

Food Preference Assessment Results, Experiment 1

	Participant				
Order of Preference	P1	P2	P3	P4	P5
1	Skittles (100.0%)	Skittles (100.0%)	Skittles (80.0%)	Pretzels (80.0%)	Fruit Loops (100.0%)
2	Gold Fish (60.0%)	Fruit Loops (80.0%)	Raisins (80.0%)	Skittles (80.0%)	Cheetos (80.0%)
3	Fruit Loops (60.0%)	Choc. Chip Cookies (60.0%)	Gold Fish (60.0%)	Gold Fish (60.0%)	Cheerios (60.0%)
4	Pretzels (40.0%)	Pretzels (40.0%)	Fruit Loops (40.0%)	Fruit Loops (60.0%)	Raisins (40.0%)
5	Choc. Chip Cookies (20.0%)	Raisins (20.0%)	Choc. Chip Cookies (40.0%)	Raisins (20.0%)	Gold Fish (20.0%)
6	Raisins (20.0%)	Gold Fish (0.0%)	Pretzels (0.0%)	Choc. Chip Cookies (0.0%)	Pretzels (0.0%)

Experimental manipulation. Figure 2 presents the data for the Phase 1 condition of P1 and P4. During baseline, both of these participants' response allocation to the markers decreased to zero. Therefore, they did not participate in the remainder of the experimental conditions.

Figure 3 contains the multiple baseline graphs from the remaining participants' three experimental phases. P3 showed a clear and consistent increase in engagement during Phase 2 (M = 106.6 seconds per trial) above Phase 1 (M = 51.5) and consistently lower engagement during Phase 3 (M = 7.1) than during Phase 1. For P2, there was overlap between Phase 1 (M = 41.5) and Phase 2 (M = 48.7) engagement, but overall, an increase was seen during Phase 2. From Phase 1 to Phase 3 (M = 9.7) there was a decrease in engagement for P2. Neither P3 nor P2 showed recovery to Phase 1 levels of engagement during Phase 3 or a follow-up session four weeks later. During Phase 1 (M = 87.5), P5's duration of engagement was near the ceiling, with the exception of session 3, in which she was provided with novel distracter tasks due to experimenter error, this session was removed from analysis. As a result, it was not possible to obtain consistently higher levels of responding in Phase 2 (M = 102.1). However, variability during Phase 2 decreased and engagement drawing was consistently closer to ceiling levels of responding. P5 had a dramatic decrease in her first session of Phase 3 (M = 83.7) when compared to Phase 1. However, unlike P2 and P3, she showed some initial recovery to levels of engagement drawing near Phase 1, but was below baseline for her final 3 sessions. The reinforcement criterion at 75% of Phase 1 for P2 was 31.0 sec, P3 38.0 sec and P5 66.0 sec.

Discussion

To demonstrate the overjustification effect at the individual level, it was necessary to show that each participant consistently engaged with the drawing materials less in Phase 3 than in Phase 1. In Experiment 1, a clear and consistent difference between Phase 1 and Phase 3 was observed with two of the three participants for whom it was possible to establish a stable IM baseline (i.e., P2 and P3). For the third participant, P5, the effect was less clear, as engagement was not sustained below baseline levels in Phase 3. However, the data from her first Phase 3

session were consistent with a possible overjustification effect, and mean levels of responding were lower in Phase 3 than in Phase 1. The ambiguous results from P5 notwithstanding, P2 and P3's data provide an individual-level demonstration of the overjustification effect that is unique in the literature to date. It is unclear why the decrease from Phase 1 to Phase 3 was less consistent for P5 than for P2 and P3. One possibility, suggested by the near-ceiling levels of responding in Phase 1, is that P5 greatly preferred the drawing materials to the distracter activities. As a result, it is possible that the EIM history affected the absolute value of the drawing materials, but they continued to be more preferred than the distracter activities, resulting in less robust effects than those seen with the other participants. If this was the case, it appears that the RRA failed to identify items that could effectively compete with engagement drawing. The RRA has at least two limitations that could have been responsible for such an outcome. First, as items are eliminated from the RRA, the interaction percentages for other items may become artificially inflated because access is not distributed across as many items. Second, the way the RRA was conducted in the present study, it was possible for the participant to manipulate more than one item at the same time. This sometimes resulted in participants' creating a specific activity that involved more than one of the items. For example, a participant might trace a puzzle piece with the markers, such that both items were in use at the same time. This may have resulted in inflated interaction percentages for specific items, such that an item that achieved a similar interaction percentage as the markers in the RRA was actually less preferred than markers when presented on its own. Future research should address some of these issues associated with the RRA. In future research on the overjustification effect, the RRA should be used to provide at least one distracter task that is definitely more preferred than the target activity, in order to reduce the likelihood of ceiling level responding

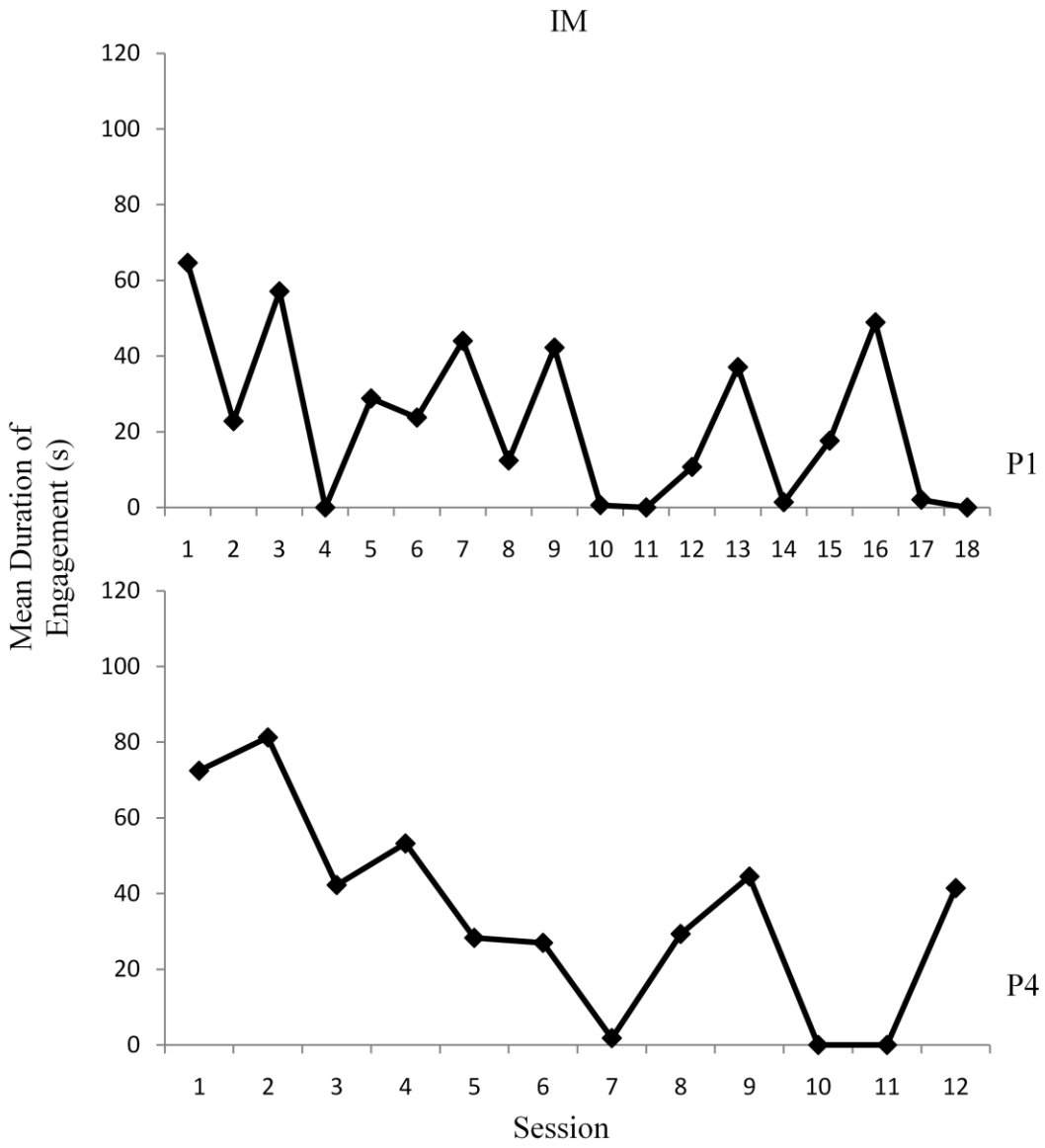

Figure 2. For P1 and P4, stable responding in Phase 1 was not obtained. Both participants' duration of engagement was at or near 0 s on multiple trials. With near 0 responding, it would have been nearly impossible to interpret an overjustification effect and these participants were subsequently dismissed from the study.

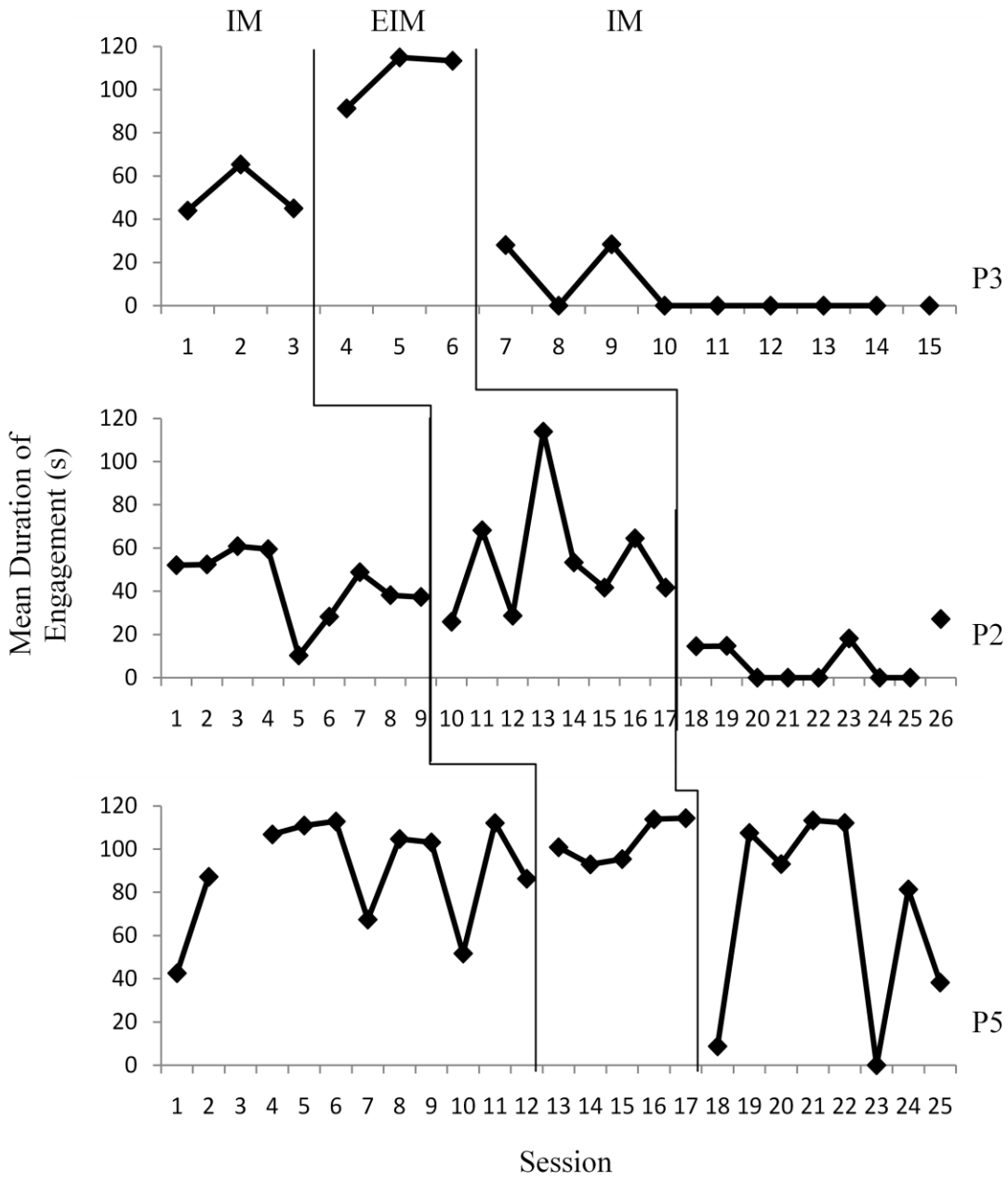

Figure 3. P3, P2 and P5 completed the three phases of Experiment 1. The data from these participants are presented in a multiple-baseline format. All three participants showed stable responding in Phase 1 and went on to EIM. During EIM there was an overall reinforcement effect observed for both P3 and P2. With near ceiling levels of responding during Phase 1, P5 maintained at near ceiling levels in EIM. For at least P3 and P2, the overjustification effect was observed with no recovery back to Phase 1 levels, even with a session 4 weeks after Phase 3. For P5 there was some responding below baseline levels, but levels of responding were not consistently lower than in baseline.

during baseline. In addition, a restriction of playing with multiple items simultaneously should be enacted in order to eliminate biased interaction times due to the participant playing with multiple items in concert.

The less robust effect for P5 may also be related to the lack of a reinforcement effect in the Phase 2. Although it is plausible that its absence was due to a ceiling effect, an alternative possibility is that the reinforcement contingency arranged in Phase 2 was ineffective, either because food was not a highly potent reinforcer for P5, or because the delivery of food was not sufficiently frequent in Phase 2. Because P5 had such high levels of responding during Phase 1, and the criterion for reinforcement in Phase 2 was 75% of baseline average, it was not possible for her to earn food more than once per trial during Phase 2. This arrangement may be unlikely to sustain high levels of responding, because after meeting the 75% criterion, further engagement could not produce further reinforcement deliveries.

A second goal of the experiment was to investigate whether performance would recover to baseline levels during Phase 3, with repeated opportunities to engage with drawing materials without the external reward. Such recovery is commonly seen in the animal literature on successive negative contrast (e.g., Capaldi, 1972; Flaherty & Rowan, 1986). In the present study, the two participants who showed a clear effect did not show recovery to baseline levels with repeated testing in Phase 3, or in a follow-up session conducted four weeks later. However, retarded recovery has also been seen in the successive negative contrast literature, in which rats are maintained at a free-feeding weight (Grigson, Spector, & Norgren, 1993; Riley & Dunlap, 1979). When rats were kept at a free-feeding weight and shifted from a higher concentration (i.e., 32%) of sucrose to a lower concentration (i.e., 4%) they showed little recovery, after 4 days, to levels equal to rats maintained throughout the experiment at the lower concentration (Riley &

Dunlap). By contrast, rats that had been maintained at 80% of their free-feeding weight recovered from the shift within four days. Similar results were shown by Grigson et al. for rats that were at 82% of their free-feeding weight compared to free-feeding rats that underwent shifts from 1M to 0.1M sucrose solutions. Although these findings are from the literature on consummatory contrast, and the effect in the present study may be better classified as instrumental contrast (Flaherty, 1996), these findings may still apply. In Experiment 1, participants' access to markers and other similar drawing materials (e.g., crayons, pencils, and pens) were not restricted outside of the experimental sessions, so P2 and P3 may not have been in any state of deprivation for such materials. As for P5, although she appeared to show recovery to baseline after the first session of Phase 3, it is possible that the level of responding in these sessions simply reflects the lack of a robust effect of the EIM history.

Having shown the overjustification effect in at least two out of three participants, but with no evidence of recovery, Experiment 2 attempted to explore the negative contrast interpretation of the effect. Experiment 2 was similar to Experiment 1, except that the external reinforcer remained constant throughout all conditions, whereas the response-produced consequences of drawing were manipulated by giving the participants plain copy paper that was impossible to draw on in the first and third phases, but Color Wonder™ paper in the second. By examining the possibility that the overjustification effect might be indifferent to the distinction between intrinsic and extrinsic motivation, Experiment 2 addressed an incentive contrast interpretation of the overjustification effect.

Experiment 2

Participants and Setting

Three children, 2 boys and 1 girl, were recruited from a local preschool. All of the participants were considered to be typically developing by the preschool staff and the primary experimenter. P21 was a boy aged 3 years 6 months at the start of the experiment, P22 was a girl aged 5 years 1 month, and P23 was a boy aged 5 years 1 month. Participants were recruited with packets sent home to parents describing the nature of the experiment. Their participation began only after obtaining parental permission and child assent. Each participant completed 20 or 21 sessions each lasting no more than 25 min. Each participant was removed from his or her classroom and escorted to the staff break room, isolated from other children so as to minimize disruption. Upon completion of the session, the participant was escorted back to his or her classroom and the teacher was notified of the participant's return.

Procedure

Extrinsic motivation. In the extrinsic motivation (EM) condition, preferred food items were contingent on engagement. Participants underwent five daily 2 min EM trials. They were given access to six Color Wonder ™ markers and plain white copy paper along with the distracter activities. The items were placed in randomized quadrants, along with the digital timer on a table as in Experiment 1. Prior to the start of a trial, the experimenter delivered the following instructions: "Today, if you draw with the markers, you can earn some snacks. Which one would you like to earn?", then presented the child with small pieces of his or her three most highly preferred food items. The first food item that the child pointed to or touched was used in the trial. A clear container was placed on the table in front of the participant, in the same quadrant as the digital timer, and the experimenter said, "When I say go, you will have two

minutes to play with anything on the table you want. Ready, go." During each trial, every time the participant engaged with the drawing materials for a cumulative duration of 75% of the baseline average for P2 and P3 of Experiment 1 (P21 *75% M* = 14.4, P22 *75% M* = 76.3, P23 *75% M* = 39.9), the experimenter placed a small piece of food into the clear container and delivered verbal praise. At the end of a trial in which the participant earned a piece of food, the experimenter gave verbal praise, and said, "Time is up. You can eat your snack now." The participant received access to the food container and the preferred activity stimuli were rotated clockwise. A new trial began immediately after the stimuli had been shifted one spot clockwise, the data file had been updated and the participant had consumed his/her food items. At the conclusion of any trial in which the duration of engagement did not reach at least 75% of the baseline average of P2 and P3, the experimenter told the participant, "Time is up. Next time if you draw (more) you can earn some snacks." All of the activity stimuli were again removed from the participant, replaced in the appropriate quadrant and a new trial began once the data file was updated. At the conclusion of the session, participants were returned to their classrooms.

Intrinsic-extrinsic motivation. This condition was the same as in Experiment 1.

Experimental Design

Each participant underwent a three phase ABA reversal design, similar to Experiment 1. Phases 1 and 3 were EM only condition, in which participants received Color Wonder™ markers and white paper, along with preferred food items for engagement, but did not receive the Color Wonder™ paper necessary for seeing their drawings. Phase 2 was an EIM condition. When participants were in Phase 2 they received the Color Wonder™ markers and Color Wonder™ paper, and they also received a preferred food item for engagement with the drawing materials. The main comparison occurred between the levels of responding in Phase 1 and at the beginning

of Phase 3. A multiple-baseline design across participants was used to evaluate the effects of the EIM history by staggering the onset of EIM across stable EM baselines. This design verified that engagement time would not decrease below baseline simply due to passage of time and continued exposure to EM sessions.

Results

Response restriction analysis. The RRA data for P21, P22 and P23, of Experiment 2 are shown in Table 4. Items for each participant are presented in the order in which access was restricted. In the event that two items were eliminated simultaneously as with marker and puzzle for P21 and numbers and slinky for P22, the item with the higher average interaction percentage is listed first. In order to determine the two distracter tasks included with the markers during the experimental phases, an interaction percentage was calculated for each item at the conclusion of the RRA. Based on the interaction percentages for each of the three participants they all received markers, puzzle and blocks. For P21 the interaction percentages were 37.8% (markers), 45.4% (puzzle) and 47.5% (blocks), for P22 they were 54.2% (markers), 25.7% (puzzle) and 25.0% (blocks) and the interaction percentages for P23 were 55.8% (markers), 29.9% (puzzle) and 35.9% (blocks).

Table 4

Response Restriction Analysis Results, Experiment 2

	Participant		
Restriction Order	P21	P22	P23
1	Play-Doh (50.0%)	Markers (54.2%)	Markers (55.8%)
2	Puzzle (45.4%) /	Puzzle (25.7%)	Blocks (35.9%)
3	Markers (37.8%)	Play-Doh (24.2%)	Play-Doh (18.7%)
4	Blocks (47.5%)	Blocks (25.0%)	Puzzle (29.9%)
5	Slinky (48.9%)	Numbers (11.4%) /	Slinky (29.5%)
6	Fire Truck (12.4%)	Slinky (10.3%)	Fire Truck (22.2%)

Food preference assessment. As in Experiment 1, upon completing the RRA P21, P22 and P23 underwent a food preference assessment. Table 5 shows the results for these participants; the items in the table are ranked in order of preference from most preferred to least, with the selection percentage for each item listed as well. When multiple items were equally preferred, the item selected during the paired presentation of those items was chosen for use during the experimental manipulation. For P21 both gold fish and Cheerios® were selected when paired with Cheetos® so they were used with Froot Loops® during the experimental phases. For P23, Cheerios®, Cheetos®, and Froot Loops® were all equally preferred and thus used during the experimental trials. Froot Loops®, Cheetos®, and Cheerios® were the most highly preferred items for P22 and were therefore used during the experimental phases.

Table 5

Food Preference assessment Results, Experiment 2

	Participant		
Order of Preference	P21	P22	P23
1	Fruit Loops (80.0%)	Fruit Loops (100.0%)	Cheerios (60.0%)
2	Gold Fish (60.0%)	Cheetos (80.0%)	Cheetos (60.0%)
3	Cheerios (60.0%)	Cheerios (60.0%)	Fruit Loops (60.0%)
4	Cheetos (60.0%)	Pretzels (40.0%)	Raisins (40.0%)
5	Pretzels (40.0%)	Gold Fish (20.0%)	Gold Fish (40.0%)
6	Raisins (0.0%)	Raisins (0.0%)	Pretzels (40.0%)

Experimental manipulation. The data for the experimental phases of Experiment 2 are presented in Figure 4. P21 (*M* = 107.2 s), P22 (*M* = 101.7) and P23 (*M* = 111.9) were near ceiling levels of engagement during phase 1. During Phase 2, the participants continued engagement at approximately ceiling levels; P21 (*M* = 113.4), P22 (*M* = 116.0), and P23 (*M* = 116.4). For P22 (*M* = 117.1) and P23 (*M* = 116.5). Responding remained high during EM2, however, P21 (*M* = 85.7) showed a clear decrease in engagement below phase 1. During day 1 of

Phase 2, P21 touched the markers to the paper in only one of his five trials, and for a total of only 6.2 s. Because this resulted in minimal experience with the change from Phase 1 to Phase 2, at the beginning of each session for the remaining 3 days in Phase 2, the experimenter manipulated the distracter tasks and the markers to show that the markers produced color on the Color Wonder™ paper provided. On the third day of EM2, P22 received Color Wonder™ paper, which gave her an additional day in Phase 2, but continued to have near ceiling levels of engagement drawing for the following three days. The session average before day 3 in Phase 2 (M = 116.5), after day 3 (M = 117.1) and without day 3 (M = 116.9) for P22 are consistent with her ceiling responding throughout the experiment

Due to a ceiling effect for these participants when examining engagement with the drawing materials, a measure of actual drawing was obtained by recording the amount of time the tip of the marker touched the paper during each trial. The level of marker-to-paper drawing for P21 decreased steadily throughout the experimental sessions, as was evidenced in the average duration of marker-to-paper drawing in phase 1 (M = 19.2), Phase 2 (M = 5.7) and EM2 (M = .5). P22 and P23, whose engagement remained at near-ceiling levels in all experimental sessions, had slightly longer durations of marker-to-paper drawing during EM2 than in phase 1. The session averages of marker-to-paper drawing for P22 were Phase 1 (M = 47.1), Phase 2 (M = 68.1) and EM2 (M = 66.0) and for P23 they were Phase 1 (M = 53.2), Phase 2 (M = 69.8) and Phase 2 (M = 63.8).

Discussion

Although the procedure from Experiment 2 was nearly identical to that of Experiment 1, an effect similar to the overjustification effect was seen for only one of the three participants (i.e., P21). This participant's data are consistent with the concept that the overjustification effect

may be blind to intrinsic vs. extrinsic sources of motivation, and thus consistent with a contrast interpretation. However, because the effect was not replicated with the two other participants, P21's data must be interpreted with caution, as it is not possible to rule out that the decrease in engagement drawing in Phase 2 was produced by extraneous factors.

A change in the methodology for P21, whereby the experimenter modeled marker-to-paper drawing with the markers during only Phase 2, may have contributed to the effect seen with this participant. During Phase 2 there was no continuation of the experimenter explicitly interacting with the markers and distracter tasks prior to the beginning of the daily session, as there was during Phase 2. The reason for the contrast seen with P21 may have a few alternative explanations that need to be explored further.

The demonstration may have encouraged the participant to draw with markers to paper in Phase 2 and contributed to the participant's experiencing the difference between Phase 2 and Phase 3. Interestingly, however, the marker-to-paper drawing time indicated that P22 and P23 spent much more time involved in marker-to-paper drawing than did P21 in all conditions, so it seems implausible that the lack of an effect with those two participants was due to lack of contact with the difference between conditions. In addition, P23's duration of marker-to-paper drawing was shorter in Phase 2 than in baseline, even after the introduction of the experimenter's demonstration. Another possible explanation is the difference in age between the three participants; P21 was closer in age to the participants of Experiment 1 and was 1 year 7 months younger than P22 and P23.

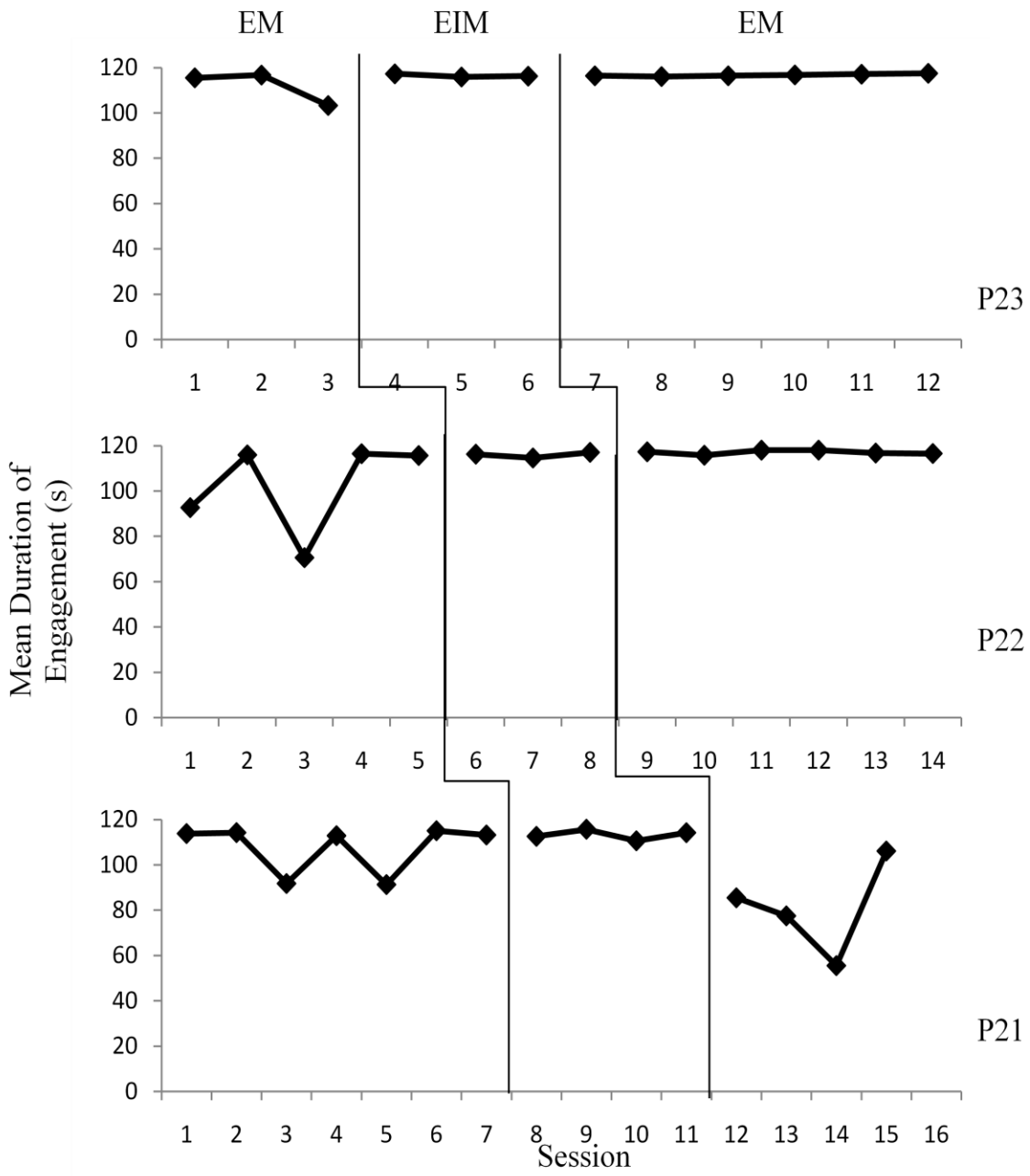

Figure 4. P23, P22 and P21 completed the three phases of Experiment 2. The data from these participants is presented in a multiple baseline format. All three participants showed stable responding in Phase 1 and went on to Phase 2. As all three participants showed stable responding in Phase 1 and went onto Phase 2. As all three participant's duration of engagement approached ceiling levels during Phase 1, a reinforcement effect could not be seen during Phase 2. The overjustification effect was seen for only one of the three participants (P21), so the incentive contrast interpretation was not entirely supported.

General Discussion

Experiment 1 provided a demonstration of the overjustification effect at the individual level. For at least two of the three participants who completed Experiment 1, a decrease in engagement below baseline level was seen after the removal of the extrinsic reinforcer. Experiment 2 attempted to examine the overjustification effect as a form of incentive contrast, by investigating the possibility that the distinction between intrinsic and extrinsic motivation is nonessential. However, the results were neither able to suggest that it is unnecessary to distinguish between intrinsic and extrinsic motivation nor to provide strong support for an incentive contrast interpretation.

The Overjustification Effect at the Individual Level

Using a multiple baseline design, as was recommended by Akin-Little and Little (2004) for studying the overjustification effect at the individual level, Experiment 1 took several steps to increase the likelihood of observing the overjustification effect in a single-case design. Previously, Akin-Little and Little, Bright and Penrod (2009) and Feingold and Mahoney (1975) attempted to demonstrate the overjustification effect in single case designs; however, none of them were able to obtain the overjustification effect. All three were similar to the present study in that they employed extended phases with pre-, during and post-reinforcement measures of intrinsic interest. However, only Bright and Penrod conducted experimental phases to stability, as is typical practice in single-case designs. Feingold and Mahoney and Akin-Little and Little made use of extended phases, but phase length was pre-determined and consistent for all participants. The present study employed a multiple baseline design with varying phase lengths based on a stable level of responding prior to moving to the next phase. Additionally, during

EIM in Experiment 1, enough sessions were allowed to observe a reinforcement effect, when possible.

Bright and Penrod (2009) describe how reinforcement and reward are used interchangeably in the literature on the overjustification effect, but that explicit methods to show a reinforcement effect are often not employed. As such a reward cannot be considered a reinforcer in that it may not increase behavior. Bright and Penrod, along with Feingold and Mahoney (1975), showed support for a reinforcement effect of their rewards on the target activity, whereas Akin-Little and Little (2004) did not. Bright and Penrod used a leisure activity to reinforce one academic task and verbal praise to reinforce a different academic task, whereas Feingold and Mahoney and Akin-Little and Little employed token reinforcement. The present study, by contrast, used food as the external reinforcer, along with simultaneous verbal praise. Feingold and Mahoney's participants could redeem points in their token economy for candies, among other prizes. However, participants in the present study were able to see the food items they earned immediately upon completing the engagement duration requirement, and consume them at the end of brief (2-min) trials. At least one study (Reiss & Sushinsky, 1975) has found that the overjustification effect was eliminated with the use of token reinforcement. Future research might explore further the role of different reinforcers in producing the effect.

Another difference between this and previous single-case design studies is the target activity. The fact that the activity was a leisure activity similar to that used in the landmark study by Lepper et al. (1973), and participants were arbitrarily chosen by the director of the preschool, may have contributed to the demonstration of the overjustification effect. In order to earn points, the participants in Akin-Little and Little (2004) had to follow a set of rules that were already established by the school, and the three participants were chosen for participation on the basis of

their high rule-following behavior. In the present study, the target activity was one that is typically considered a play or leisure activity and not a task of rule following behavior (e.g., Akin-Little & Little), or an academic task (e.g., Bright & Penrod, 2009). Engagement in a leisure activity may be maintained wholly or mostly by response-produced positive reinforcers, whereas rule following and academic task completion may be related to a prior history of external consequences (positive or negative reinforcement) or current avoidance of aversive consequences. If the overjustification effect is a case of negative contrast and related to a reduction in the total amount of reinforcement (e.g., Neuringer, 2003), then it should not be seen unless engagement in the target activity does produce automatic reinforcement.

Participants in the present study were provided with the choice of multiple activities during the experimental sessions, but they are not entirely unique in this. Feingold and Mahoney (1975) supplied multiple tasks for participants to engage in, but they made no attempt to balance the preference of the activities. The lack of an overjustification effect could simply be due to a higher preference for the target activity.

Cameron et al. (2001) suggested that the overjustification effect may occur only when the reward is loosely tied to performance. By utilizing only an engagement criterion for reinforcement (i.e., not requiring actual production of marker-to-paper drawings), the present study may have maximized the chances of observing the overjustification effect. Other studies examining the overjustification effect at the individual level have arranged reinforcement contingencies on the basis of performance (Akin-Little & Little, 2004; Feingold & Mahoney, 1975). Even when reinforcement was only based on task engagement (Bright & Penrod, 2009) it was necessary to engage in the task 10% longer than in baseline, whereas participants in the present study could begin to earn food after reaching only 75% of their average baseline

engagement. Further research should evaluate how the overjustification effect is affected by duration criteria for reinforcement.

The Overjustification Effect as Negative Contrast

Having observed the overjustification effect at the individual level, Experiment 2 examined an incentive contrast interpretation of the overjustification effect by questioning whether a distinction between intrinsic and extrinsic motivation is necessary. For two participants in Experiment 2, no decrease in engagement to below baseline levels was seen when the natural consequence of coloring was removed during Phase 3. However, a third participant's engagement clearly decreased below baseline levels during this phase.

The failure to observe an effect with two out of three participants is inconsistent with the results of Experiment 1. This might suggest that the overjustification effect is not simply attributable to a reduction in the total amount of reinforcement. However, it is possible that some methodological aspect of Experiment 2 was responsible. Experiment 2 followed up on Neuringer and Donnelly's (1998) idea to explore the overjustification effect as a form of incentive contrast. Similar to the present study, Neuringer and Donnelly employed a three phase design in which participants had access to an extrinsic reward throughout all three phases, but response-produced consequences were introduced in the second phase and removed prior to the beginning of the third phase. This was done using colorless markers in the first and third phases and colored markers in the second phase. An overjustification effect was observed, which led to the suggestion that the overjustification effect could be interpreted as a type of negative contrast for which the distinction of intrinsic and extrinsic motivation is unnecessary. After providing an example of the overjustification effect at the individual level in Experiment 1, Experiment 2

explored the distinction between intrinsic and extrinsic motivation and thus the overjustification effect as a form of incentive contrast.

There are several factors that may have contributed to the differences between the results of Neuringer and Donnelly and the present study. First, Neuringer and Donnelly used a between-group design that was common to procedures previously used to explore the overjustification effect (e.g., Lepper et al., 1973), whereas the present study used a single case design. This is an important distinction, because the overjustification effect has been very reliably shown in group designs (e.g., Deci, 1971; Lepper et al.; Oliver &Williams, 2006; Warneken & Tomasello, 2008), but has been difficult to achieve at the individual level (e.g., Akin-Little & Little, 2004; Bright & Penrod, 2009; Feingold & Mahoney, 1975). Further development of procedure may be necessary to achieve a consistent effect at the individual level.

Second, Neuringer and Donnelly (1998) found an increase in drawing in their second phase, consistent with a reinforcement effect of the response-produced consequences. In the present Experiment 2, by contrast, a reinforcement effect was not demonstrated, possibly due to a ceiling effect. The addition of Color Wonder™ paper in EIM may have increased the total amount of reinforcement, but because of the near-ceiling levels of drawing in Phase 1, this possibility cannot be distinguished from the alternative possibility that the color of the markers added no reinforcing value.

Although Color Wonder™ markers do not produce color when used with plain copy paper, they do produce greasy marks. The data on the participants' marker-to-paper drawing show that although it produced only colorless marks, and marker-to-paper drawing was not required to earn the food reward, P22 and P23 spent a substantial amount of time involved in marker-to-paper drawing throughout all conditions, whereas P21 spent less time completing

marker-to-paper drawing. These data may suggest that the colorless marks provided sufficient reinforcement to maintain engagement drawing for P22 and P23, but not for P21. In fact, it is possible that P22 and P23 were indifferent to whether or not the marks they produced with the markers were colored. If this was the case, the transitions from EM to EIM and from EIM to Phase 2 may not have involved any changes in the total amount of reinforcement for these participants. Under those circumstances, contrast would not be expected because the addition of color would not have produced any supplemental reinforcement and the three phases would in essence be identical for the participants.

Although Experiment 2 provides only limited support of the incentive contrast interpretation, it does not rule it out. Further refinement of methodology may shed light on whether it is possible to produce the effect seen with P21 reliably. First, in the present Experiment 2, an engagement criterion was used for reinforcement, which meant that the participants did not actually need to engage in marker-to-paper drawing in order to earn food; it was sufficient to manipulate the materials. The engagement criterion was used for consistency with Experiment 1, in which an engagement criterion was chosen because it provided a loose criterion for performance. In Experiment 2, however, the engagement criterion had the effect that there was no control over the participant's actual marker-to-paper drawing, and therefore no control over the extent to which they experienced the response-produced consequences introduced in EIM. The marker-to-paper data indicate that the participants nevertheless did engage in some marker-to-paper drawing, and particularly the two participants with whom no effect was observed. Nevertheless, it is possible that a marker-to-paper reinforcement criterion would have been more appropriate for Experiment 2, and this issue should be explored in future research.

Next, the greasy marks left by the Color Wonder™ markers on copy paper may have provided a source of reinforcement to P22 and P23 that was no less powerful than the color that they left on Color Wonder™ paper. Eliminating any effect of the markers on the paper during an EM phase (for example, by drying them out) would come closer to total removal of intrinsic reinforcement, at least due to a visual stimulus. If contrast were observed during Phase 2 compared to a Phase 1, along with a reinforcement effect, this would provide some necessary support for the overjustification effect. The reinforcement effect between Phase 1 and EIM would provide the necessary evidence for a distinction between the conditions and the contrast observed between Phase 1 and Phase 2 would support the notion that intrinsic and extrinsic distinctions are unnecessary. However, if there were no contrast between Phase 2 and Phase 1, it would lend support to the need for a distinction between intrinsic and extrinsic motivation.

Alternatively, given that these participants engaged in marker-to-paper drawing with plain copy paper without being required to, it might be possible to manipulate response-produced consequences without including extrinsic rewards in the study. For example, instead of the EM or IM phase changing to EIM, the three phases could be conducted as a baseline no IM phase, with white copy paper (no color), an IM phase with Color Wonder™ paper and back to a no IM phase. Although this setup would not allow for a discussion of extrinsic reinforcers, if contrast was observed between the first and last phases, it would suggest that an increase in the total amount of reinforcement can produce an overjustification-like effect and would support a contrast interpretation. In the absence of food reinforcers, ceiling levels of responding might be eliminated, permitting an evaluation of the extent to which the addition of color would reinforce drawing.

Although the results of the present studies do not conclusively support the incentive contrast interpretation of the overjustification effect, there was at least some evidence for this interpretation (e.g., P21). Future research will need to look for ways to address some of the methodological concerns presented and further investigate the possibility that intrinsic and extrinsic motivation is an unnecessary distinction.

Appendix

Preferred Items Survey[1]

The purpose of this survey is to obtain information about the foods you believe would be useful as rewards for your child. If you have signed a permission form for the study, please answer the following questions regarding your child's preferences.

1. Some children really enjoy foods like crackers, chips, pretzels, cereal, cookies, candy, etc. What are the specific foods your child likes to eat the most?

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

2. Please go back to the list in question number one, and place a number in each box to rank these foods from most favorite (1) to least favorite (10).

3. Is your child allergic to any foods? _____

_____

4. Are there any foods that you would prefer your child not eat during our study? _____

_____

[1] This instrument is adapted from The Reinforcer Assessment for Individuals with Severe Disabilities (Fisher, Piazza, Bowman, Amari, 1996)

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Curriculum Vitae

Education

B.S. in Neuroscience
May, 2008
Texas Christian University, Fort Worth, TX

Teaching Experience

Laboratory Instructor, Texas Christian University
Principles of Behavior, Fall 2009
Principles of Behavior, Fall 2008

Teaching Assistant, Texas Christian University
General Psychology, Spring 2009
Behavioral Research, Spring 2009

Publications

Petursdottir, A. I., **Peterson, S. P.**, & Peters, A. C. (2009). A quarter century of *The Analysis of Verbal Behavior*: An analysis of impact. *The Analysis of Verbal Behavior, 25,* 109-121.

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Honors and Awards

Student Poster Presentation Award recipient. *Effects of identity-matching and echoic prompts on the acquisition of auditory-visual conditional discriminations*. Texas Association for Behavior Analysis, February 2010.

Abstract

EXAMINING THE OVERJUSTIFICATION EFFECT AS A FORM OF INCENTIVE CONTRAST

By Sean Patrick Peterson, M. S., 2010
Department of Psychology
Texas Christian University

Thesis Advisor: Anna I. Petursdottir, Assistant Professor of Psychology

The present study examined the overjustification effect at the individual level, using a multiple-baseline design. After successfully observing the overjustification effect with at least two participants in a single subjects design, recovery to baseline evaluated, but not observed. Experiment 2 used a similar multiple-baseline procedure as Experiment 1 to evaluate an incentive contrast interpretation of the overjustification effect. Instead of manipulating external consequences, the response-produced consequences of the target behavior were manipulated. Under these conditions, an effect similar to the overjustification effect was observed with only one out of three participants when response-produced consequences were withdrawn. As a result, Experiment 2 provided limited support for the incentive contrast interpretation of the overjustification effect, which states that the effect is a result of reduction in the total amount of reinforcement, regardless of its source.