EFFECTS OF SOCIAL REINFORCEMENT CONTINGENT ON CONVENTIONAL OR UNCONVENTIONAL RESPONSES ON GENERALIZED CREATIVITY BY OLDER ADULTS

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ABSTRACT

The effects of social reinforcement contingent on usual (conventional) or unusual (unconventional) responses during an object uses task on measures of generalized creativity in older adults living in residential care settings were assessed in two novel tasks. In a counterbalanced within-subjects design, 20 participants completed both experimental conditions across two sessions. Results suggest that social reinforcement contingent on unconventional responses during the initial task was associated with increases in both objective and subjective measures of creativity. These findings are consistent with Eisenberger's learned industriousness theory (Eisenberger, 1992), and indicate that contingent social reinforcement can increase generalized creativity in older adults living in residential care environments.

Acknowledgments

First and foremost, I would like to express my sincere gratitude to Dr. Stephen R. Flora. Without his steady encouragement, patience, and guidance, the completion of this work would not have been possible. I could not have asked for a better advisor throughout this experience, and I feel very fortunate to have had the opportunity to work with him.

I would also like to thank my committee members, Dr. Julie Blaskewicz Boron and Dr. Jane Kestner, who provided many helpful suggestions and insights during both initial and final phases of this project, as well as directions for future research.

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The ability to be creative is highly valued in diverse disciplines such as fine arts, science, and business. However, the term *creativity* lacks a clear, universal definition and is often regarded with an air of mystery (Marr, 2003). What exactly does it mean to be creative? Winston and Baker (1985) suggested that some aspect of novelty or originality is a necessary component to a definition of creativity, but is not always sufficient. Eisenberger, Haskins, and Gambleton (1999) described creativity as "the generation of novel behavior that meets a standard of quality or utility" (p. 308). Creative behavior can also be conceptualized as ordinary problem solving (Marr, 2003). Behavioral variability is essential in the production of novel solutions to problems because in the absence of variability, novel or creative solutions could not occur (Shahan & Chase, 2002). Skinner (1953) argued that what we consider to be creative depends on the degree of stimulus control, meaning that responses that are imitative or under obvious external control are not labeled as original. Instead, he described original responses as "ideas which result from manipulations of variables which have not followed a rigid formula and in which the ideas have some other sources of strength" (p. 254). Similarly, Sloane, Endo, and Della-Piana (1980) contended that responses that are under informal, or multiple, sources of stimulus control are considered to be more creative than responses that are under formal control, or control that is determined by specific stimulus characteristics that are typically reinforced by one's community.

A behavioral approach to studying creativity first requires the determination of what is discriminative for labeling something as creative (Sloane et al., 1980). Objective,

measurable aspects of creativity allow behaviorists to study creative behavior. As with any other operant behavior, creativity is selected by environmental consequences (Flora, 2004, pp. 75-104; Maltzman, 1960; Marr, 2003; Skinner, 1974, p. 126; Winston & Baker, 1985). In a review of 20 behavioral creativity studies, Winston and Baker (1985) concluded that "behavioral procedures can effectively alter a wide range of creative products with varied age groups" (p. 200).

One aspect of creativity that has been the focus of past behavioral research is novel behavior (e.g., Goetz & Baer, 1973; Pryor, Haag, & O'Reilly, 1969). Shahan and Chase (2002) described novel behavior as responses emitted during occasions where variability in context, response topography, or consequences is observed and that variability is considered to be important. For example, Pryor et al. (1969) found that a porpoise learned to display highly varied and complex behaviors when reinforcement depended on the production of novel behaviors. When novel behavior was reinforced, a large increase in the rate of novel behavior was observed. Human subjects have displayed similar effects. Goetz and Baer (1973) used differential social reinforcement to increase the novelty of block formations built by preschool children. They also discovered that reinforcing repetitions of the same block forms resulted in less varied or novel block building. Behavioral variability was also increased in both depressed and nondepressed college students using class instruction and reinforcement for response-sequence variability in a computer game procedure (Hopkinson & Neuringer, 2003).

Other studies used token reinforcement contingencies to increase creativity in student compositions. In a remedial fifth grade classroom, Brigham, Graubard, and Stans (1972) used the sequential application of reinforcement contingent on three objective

aspects of composition to increase both length of compositions and overall writing quality, which included variety of words used, number of ideas, and development of ideas. In a similar study, Maloney and Hopkins (1973) found that reinforcing the use of different adjectives, action verbs, and sentence beginnings with team points increased subjective judgments of compositional creativity. Campbell and Willis (1978) increased objective measures of creative writing using token reinforcement contingencies placed on three of Torrance's components of creativity (Torrance, 1966): fluency (i.e., the number of different but relevant responses or ideas provided for a topic), flexibility (i.e., the change in perspective of thought from the previous idea or response), and elaboration (i.e., the amount of additional information used to describe an idea). These improvements were maintained when reinforcement was gradually withdrawn. Objective measures based on Torrance's components of creativity were also demonstrated to be under experimental control in a study by Glover and Gary (1976), where fourth and fifth grade students were asked to list possible uses for a common object. In addition to measures of fluency, flexibility, and elaboration, students were reinforced for response originality (i.e., the statistical infrequency of response forms). A combination of instructions, reinforcement, and practice increased all four measures of creativity, and also increased students' scores on the Torrance Tests of Creative Thinking (Torrance, 1966).

In a series of experiments examining generalized creativity, Eisenberger and colleagues investigated the effects of reinforcement during an object uses task on generalized creative responding in subsequent, unrelated tasks (Eisenberger & Armeli, 1997; Eisenberger, Armeli, & Pretz, 1998; Eisenberger et al., 1999; Eisenberger & Rhoades, 2001). In the *usual use condition*, preadolescent students were rewarded for

providing a common use for each object (requiring conventional thought). In the *unusual use condition*, reward was contingent on the generation of uncommon or atypical object uses (requiring unconventional thought). A drawing task was used as a measure of generalized creative responding (Eisenberger & Armeli, 1997; Eisenberger et al., 1998; Eisenberger, et al., 1999). In the drawing task, participants were given a sheet of paper containing rows of open circles and were asked to make pictures using the circles as the main part of the drawings. A simple happy face was penciled in the first circle as an example of a picture that could be made. Creativity was assessed by assigning an originality score to each drawing, which was equal to the number of times that the drawing's subject appeared in the total number of drawings produced by the entire sample of participants. Eisenberger and Rhoades (2001) used a movie title task as a measure of generalized creativity. In this task, participants were asked to generate potential titles for a movie about a student's summer vacation. Creativity scores were determined by judges who assigned a score to each participant's entire set of responses ranging from 1 (*little or no creativity*) to 5 (*highly creative*).

In all of these studies by Eisenberger and colleagues, contingent reinforcement for providing unusual object uses increased subsequent measures of creativity. Generalized creative responding was increased when participants were given a monetary reward and verbal feedback for providing unusual object uses (Eisenberger & Armeli, 1997; Eisenberger & Rhoades, 2001). Generalized creativity also increased when participants received social reinforcement (Eisenberger et al., 1998), or verbal feedback alone or combined with a monetary reward (Eisenberger et al., 1999) for generating unusual object uses. These findings support Eisenberger's learned industriousness theory

(Eisenberger, 1992). According to this theory, "when individuals are rewarded for carrying out a task, they learn which dimensions of performance are appropriate" (Eisenberger & Rhoades, 2001, p. 729). Thus, when a history of reinforcement is provided to an individual for creative responses in one task, increases in creativity may be observed in subsequent tasks.

Research suggests that older adults experience declines in cognitive abilities believed to be related to creativity (e.g., McCrae, Arenberg, & Costa, 1987; Reese, Lee, Cohen, & Puckett, 2001; Ruth & Birren, 1985; Tranter & Koutstaal, 2008). Fluid intelligence, which refers to the ability to generate solutions to problems that cannot be solved by explicitly relying on prior learning or knowledge (Horn & Cattell, 1967), often shows linear declines with age (Tranter & Koutstaal, 2008). Declines in divergent thinking abilities, which are involved in the production of original solutions to problems that have many possible solutions, also have been observed in older adults (Reese et al., 2001; Ruth & Birren, 1985). Ruth and Birren (1985) suggested that age-related cognitive changes (e.g., reduced speed of information processing and a decreased capacity to process complex information) negatively affect ideational fluency and flexibility. However, these processes may not reflect unavoidable consequences of aging. Tranter and Koutstaal (2008) investigated the "disuse" theory of cognitive aging in terms of fluid intelligence, which posits that the disuse of problem solving skills leads to a reciprocal reduction of ability in this area. Therefore, declines in measures of fluid intelligence in older adults may be the result of a decrease in opportunities for active problem solving. The disuse theory was supported by findings following a 10 to 12 week period of participation in novel, creative activities (e.g., word logic puzzles, critique of unfamiliar

music, creative modeling and drawing) that increased measures of fluid intelligence in older adults. These findings were particularly important because, unlike previous test-specific guided training studies (e.g., Ball et al., 2002; Baltes, Dittmann-Kohli, & Kliegl, 1986), performance gains were attributed to engagement in novel tasks that were unrelated to the measure used to evaluate cognitive performance. Tranter and Koutstaal concluded that environmental conditions that facilitate the use of aspects of fluid intelligence (e.g., creative problem solving) may be effective in maintaining cognitive performance in older adults. Similarly, Stine-Morrow, Parisi, Morrow, Greene, and Park (2007) reported increases in divergent thinking and inductive reasoning scores in older adult participants following a cognitive intervention that featured repeated exposure to ill-defined problems, collaboration with others, and a competition that rewarded innovative solutions. In a similar study, Stine-Morrow, Parisi, Morrow, and Park (2008) found that older adults who participated in a team-based problem solving competition demonstrated gains in measures of fluid abilities (i.e., speed of processing, inductive reasoning, and divergent thinking) from pretest to posttest. These results strongly suggest that an older adult's environment likely plays a large role in maintaining or increasing cognitive functioning thought to be associated with creativity.

In addition to experiencing declines in cognitive abilities, older adults typically behave more conventionally and are less likely to be open to new, original ideas (Ruth & Birren, 1985; Zuprich, Allemand, & Dellenbach, 2009). Although this may be related to a decreased cognitive capacity to be flexible and creative, it is also likely that older adults are generally more conventional because, compared to younger adults, they have a longer reinforcement history for conventional behavior (Skinner & Vaughn, 1983, p. 74). From

a behavioral perspective, this would not be surprising. Throughout childhood and into adulthood, conventional behavior is reinforced more often than unconventional behavior (Flora, 2004, p. 80). Gregory, Nettelbeck, and Wilson (2010) found that older adults who consider themselves as being open to new experiences (i.e., more willing to accept novel challenges) age more successfully, meaning that they function more independently in their everyday lives. This suggests that older adults who are more creative may be better able to maintain independent functioning.

Thus, increasing creativity in older adults may have multiple beneficial effects on measures of daily functioning and overall well-being. Research suggests that there is a strong relationship between creativity and successful aging (Fisher & Specht, 1999; Flood & Phillips, 2007). New life challenges (e.g., coping with illness, declines in physical or cognitive functioning, loss of loved ones, adapting to new social roles and living environments) are an inherent part of the aging process. Creative activities enhance problem solving abilities, which can increase adaptive skills and facilitate a flexible approach to handling everyday challenges (Fisher & Specht, 1999; Flood & Phillips, 2007). By nature, problem solving aspects of creativity also necessitate active decision making, which may help older adults to feel that they have more control in their environment (Hannemann, 2006). Creative activities that result in the production of original ideas or products can help older adults to maintain a sense of purpose and productivity, and can increase feelings of competence (Fisher & Specht, 1999). Engagement in creative activities has also been associated with reduced levels of anxiety and depression (Flood & Philips, 2007; Hannemann, 2006). Additionally, activities that involve creativity can introduce older adults to new sources of positive reinforcement

(e.g., social praise or winning an award) and can increase naturally occurring reinforcement.

The purpose of the present study is to extend the current research by applying procedures used by Eisenberger and colleagues to increase generalized creative behavior in preadolescent students (Eisenberger & Armeli, 1997; Eisenberger et al., 1998; Eisenberger et al., 1999; Eisenberger & Rhoades, 2001) to older adults living in a residential care setting. Social reinforcement was contingent on the production of either usual (conventional) or unusual (unconventional) uses for a series of common objects. The effects of rewarding conventional or unconventional responses on the degree of creativity expressed in two subsequent, unrelated tasks were examined to determine if reinforcement contingent on unconventional (i.e., creative) responses increases generalized creative responding in older adults living in residential care environments.

Method

Participants and Setting

Participants were older adults (aged 63 to 89) who were recruited from a joint skilled nursing and assisted living facility in Northeast Ohio. Facility staff assisted with identifying individuals who might be able and willing to participate. Participants were asked directly by the experimenter if they would like to volunteer for the study. Participants who were not able to provide a correct use for all objects during the usual use condition, and/or were not able to provide a correct use for at least 13 out of 18 objects during the unusual use condition were not included in the study. Individual sessions occurred at each subject's place of residence, in a quiet area with limited distractions. Prior to data collection, the experimental procedure was approved by Youngstown State

University's Human Subjects Research Committee. Additionally, participants were provided with a verbal and written description of the study, and were asked to sign an informed consent form.

Design and Procedure

Twenty-five participants were originally recruited for this study. Partial data were collected for five participants for the following reasons: one suffered complications from a fall, one had a family emergency, one was unable to provide appropriate responses for at least 13 out of 18 objects during the unusual condition of the object uses task, and two stated that they did not to wish to continue. A total of 20 participants completed both experimental sessions. At the time of the study, 11 participants were residing in the skilled nursing wing of the facility and nine participants lived in the assisted living section of the facility. Participants were quasi-randomly assigned to one of two groups containing 10 participants each, and were told that the purpose of the study was to examine aspects of cognitive functioning in older adults. Group Usual-Unusual included five assisted living residents and five skilled nursing residents, aged 64 to 89 years (M = 82.40). Group Unusual-Usual consisted of four assisted living residents and six skilled nursing residents, aged 63 to 89 years (M = 79.40). For both groups, seven residents ambulated using a wheelchair and three residents used a walker. Both groups contained four male participants and six female participants. In a counterbalanced within-subjects design, Group Usual-Unusual received the usual object use instructions during the first session and the unusual object use instructions during the second session. Participants in Group Unusual-Usual were given the unusual object use instructions during the first session and the usual object use instructions during the second session.

During each session, the two generalization tasks were completed.

For all participants, there were at least six days and no more than 10 days between the two experimental sessions. Each session lasted approximately 20 to 30 minutes. Both sessions were conducted during the same time of day (e.g., morning or afternoon) for all participants. For the object uses task, common objects were selected for having standard uses (Appendix). The name of each object for which participants were to give a usual or unusual use was printed on a 7.62 x 12.7 cm note card. Examples of object names include paper clip, rubber band, and sock. For the first generalization task, participants were asked to make up story titles about a given subject. Participants verbally provided responses during this task, while the experimenter wrote down each response. For the second generalization task, participants were given a 21.59 x 27.94 cm sheet of paper containing 15 circles (three rows by five columns), each with a diameter of 4.1 cm (Appendix). To demonstrate to participants the need to incorporate the circles into their drawings, a simple happy face with small dots for eyes and a nose and an arc for a mouth was penciled in the first circle. Participants were given a fine-point black marker to complete this task. A marker was chosen because it required little pressure to make marks on the paper. Following the completion of the second experimental session, participants were debriefed regarding the full purpose of the study.

Dependent Measures

The primary dependent measures for each participant were the creativity score for each session on the first generalization task and the mean originality score for each session on the second generalization task. Three judges, working independently and blind to experimental conditions, determined scores for the story title task. As in Eisenberger

and Rhoades (2001), the creativity score in the story title task was determined using a 5-point Likert scale ranging from 1 (*little or no creativity*) to 5 (*highly creative*), and creativity was defined as "novelty combined with quality in terms of how well responses dealt with the posed problem" (p. 732). Prior to scoring, the judges were asked to rate responses according to this definition of creativity. Scores were assigned to each participant's entire set of responses. Response sets with a higher score were considered to have greater originality. Creativity scores were determined using the mean of the scores assigned by the three judges. Interrater reliability was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying that number by 100. Scores were considered to agree when all three judges assigned the same score or when two judges assigned the same score with the third judge scoring within one point of that score. In addition, the number of titles generated during each session was collected as another objective dimension of creativity. A higher number of titles indicated greater creativity.

As in studies by Eisenberger and colleagues (Eisenberger & Armeli, 1997; Eisenberger et al., 1998; Eisenberger et al., 1999; Eisenberger & Selbst, 1994), originality in the drawing task was defined as the statistical infrequency of an individual response in the total sample of participant responses. An originality score was assigned to each drawing equal to the total number of times that the same subject was used in drawings produced by all of the participants across both experimental sessions. If a drawing subject was repeated by a participant in an experimental session or if it did not incorporate the circle as a main element of the drawing (e.g., if a picture was made using the circle as a border), that drawing was assigned a score equal to the most common subject in the entire

population of drawings. Drawing subjects with a lower frequency of occurrence were scored as having higher originality. Mean originality scores were determined for each participant by adding the originality scores for all drawings completed during the session and dividing that number by the total number of drawings produced for that session. As an additional objective measure of creativity, the number of drawings produced by participants during each session was recorded.

Initial Task: Object Uses. The procedure and materials for this task were similar to the ones used by Eisenberger and colleagues (Eisenberger & Armeli, 1997; Eisenberger et al., 1998; Eisenberger et al., 1999; Eisenberger & Rhoades, 2001). In both the usual use condition and the unusual use condition, a total of 18 object names written on 7.62 x 12.7 cm note cards were shown to the participants. Note cards were presented one at a time. To control for potential differences in task difficulty, the order of the names was reversed for half of the subjects in each group. In both conditions, social reinforcement was provided for each correct response. Social reinforcement consisted of a brief statement of approval by the experimenter (e.g., "great job," "good answer," "excellent"), along with smiles and eye contact. In the usual use condition, a correct response was one in which the participant provided the standard use for the object (e.g., if a participant stated that a pencil is used for writing or drawing). Participants responded correctly in the unusual use condition when they provided an unusual use for the object (i.e., a non-standard use) that also made use of the object's distinctive physical properties. An example of an unusual use that is impossible (i.e., does not employ the object's physical properties) would be if the participant said that a sheet of paper could be used as a bookend. Identical to Eisenberger et al. (1999), the experimenter provided the following

instructions at the beginning of the usual use condition:

> I am going to show you words for everyday objects. When I show you each word, read it out loud. Then tell me the usual use for that object. Do you understand? Okay. Here is the first word. What is this word? [Word is shown to participant, who responds]. What usual use might you have for a ___?" [Participant responds.]

Identical to Eisenberger et al. (1998), if the participant stated an unusual use for the object, the experimenter said, "That is something that people seldom do with a ___. Tell me something *usual* you might do with a ___." If the participant gave another unusual use (i.e., an incorrect response), or failed to respond after 10 s, the experimenter moved on to the next object. An incorrect response or a failure to respond resulted in the withholding of social reinforcement by the experimenter (i.e., no eye contact, no verbal feedback, and a neutral facial expression) for 3 s.

The instructions provided at the beginning of the unusual use condition were identical to Eisenberger et al. (1999):

> I am going to show you words for everyday objects. When I show you each word, read it out loud. Then tell me an unusual use for the object. For example, if I showed you the word "book," you might tell me that you could use the book to hold open a door. Do you understand? Okay, here is the first word. What is this word? [Word shown to participant, who responds]. What is an unusual use for a ___?" [Participant responds.]

Identical to Eisenberger et al. (1999), if the participant stated a usual use for the object, the experimenter said, "That is something that people often do with a ___. Tell me

something unusual you might do with a ___." If the participant gave an unusual use that is impossible, or did not incorporate any distinctive physical properties of the object, the experimenter said, "Tell me something unusual you might *actually* do with a ___." If the participant provided another usual or impossible use (i.e., an incorrect response), or failed to provide a response after 10 s, the experimenter moved on to the next object. Incorrect responses or the failure to respond resulted in the withholding of social reinforcement by the experimenter (i.e., no eye contact, no verbal feedback, and a neutral facial expression) for 3 s.

Generalization Task 1: Story Titles. The procedure and materials for this task were similar to the ones used by Eisenberger and Rhoades (2001). Participants were asked to verbally provide an unspecified number of possible titles for a story about a particular open-ended topic. Two topics were used for this task: (1) a boy and his dog, and (2) a girl and her vacation. One topic was presented during each session. To control for potential differences in task difficulty, Group Usual-Unusual received the first topic during the usual use condition and the second topic during the unusual use condition, while Group Unusual-Usual received the first topic during the unusual use condition and the second topic during the usual use condition. Participants were told to make up as many titles as they would like, to take as much time as they needed, and to verbally indicate when they are finished giving responses. The experimenter also asked participants not to provide titles that have previously been used for well-known stories, books, or movies (e.g., "Alice in Wonderland," or "Old Yeller"). No feedback or contingencies were provided for this task. The experimenter maintained a neutral facial expression and stared at her notebook while the participant provided responses. If a

participant asked how he or she is doing during the task, the experimenter stated in a neutral tone of voice that he or she is doing fine.

Generalization Task 2: Drawings. The procedure and materials were similar to the ones used by Eisenberger and colleagues (Eisenberger & Armeli, 1997; Eisenberger et al., 1998; Eisenberger et al., 1999; Eisenberger & Selbst, 1994), who adapted this task from the Torrance Tests of Creative Thinking (Torrance, 1966). During each session, the experimenter placed the circle sheet with the simple happy face drawn in the first circle directly in front of the participant and provided the following instructions, identical to Eisenberger & Armeli (1997):

> Make pictures from these circles. A circle should be the main part of whatever you make. Remember, make pictures from these circles. A circle should be the main part of whatever you make. Here is an example of a picture you might make [Experimenter pointed to the happy face picture on the participant's sheet]. Do you understand?

When explaining that a circle should be a main part of the picture, the experimenter traced the shape with a pen. While the participant completed the task, the experimenter turned her chair to face away from the participant and pretended to review her notes. When the task was finished, the experimenter asked the participant to state the subject of each picture and wrote down the participant's answers. No feedback or contingencies were provided for this task. As in the first generalization task, if a participant asked how he or she is doing during the task, the experimenter stated in a neutral tone of voice that he or she is doing fine.

Results

Generalization Task 1: Story Titles

The number of story titles to be produced was not specified to participants. Therefore, participants gave different numbers of titles. A mixed-design ANOVA was conducted on the data with condition (i.e., usual or unusual) as the within-subject variable and sequence as the between-subject variable. A significant main effect was found for condition, $F(1, 18) = 5.67$, $p < .05$. As shown in Figure 1, participants produced significantly more titles during the unusual condition ($M = 4.95$, $SD = 2.89$) than during the usual condition ($M = 3.40$, $SD = 1.90$). Effects of condition by sequence interaction approached significant levels, $F(1, 18) = 4.30$, $p = .053$, suggesting a high number of titles for Group Unusual-Usual was maintained across sessions despite the change in reinforcement contingencies. Figure 2 shows the number of titles that were produced by each group during Sessions 1 and 2. Independent t tests revealed a significant difference between the means of the two groups during Session 1, $t(18) = -3.32$, $p < .05$. Participants in Group Unusual-Usual produced significantly more titles ($M = 4.80$, $SD = 2.29$) than participants in Group Usual-Unusual ($M = 2.20$, $SD = .92$). In Session 2, however, the difference between Group Unusual-Usual ($M = 4.60$, $SD = 1.89$) and Group Usual-Unusual ($M = 5.10$, $SD = 3.51$) was not significant.

Interrater reliability of subjective creativity scores in the story title task was 92.5%. The only significant main effect was for condition, $F(1, 18) = 11.19$, $p < .05$. Thus, participants earned significantly higher title creativity scores during the unusual condition ($M = 3.39$, $SD = .97$) relative to the usual condition ($M = 2.33$, $SD = .96$), as shown in Figure 3. Figure 4 depicts the mean title creativity scores for the two groups

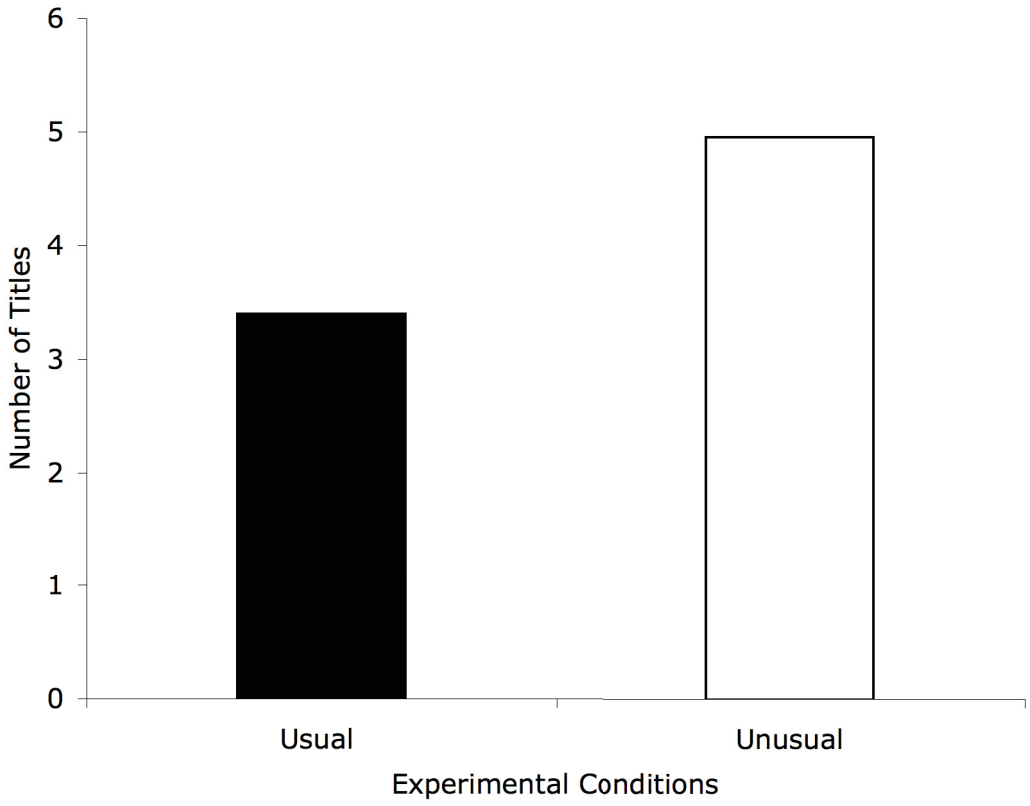


Figure 1. Mean number of story titles for all participants (N = 20) during both experimental conditions. Higher numbers indicate greater creativity.

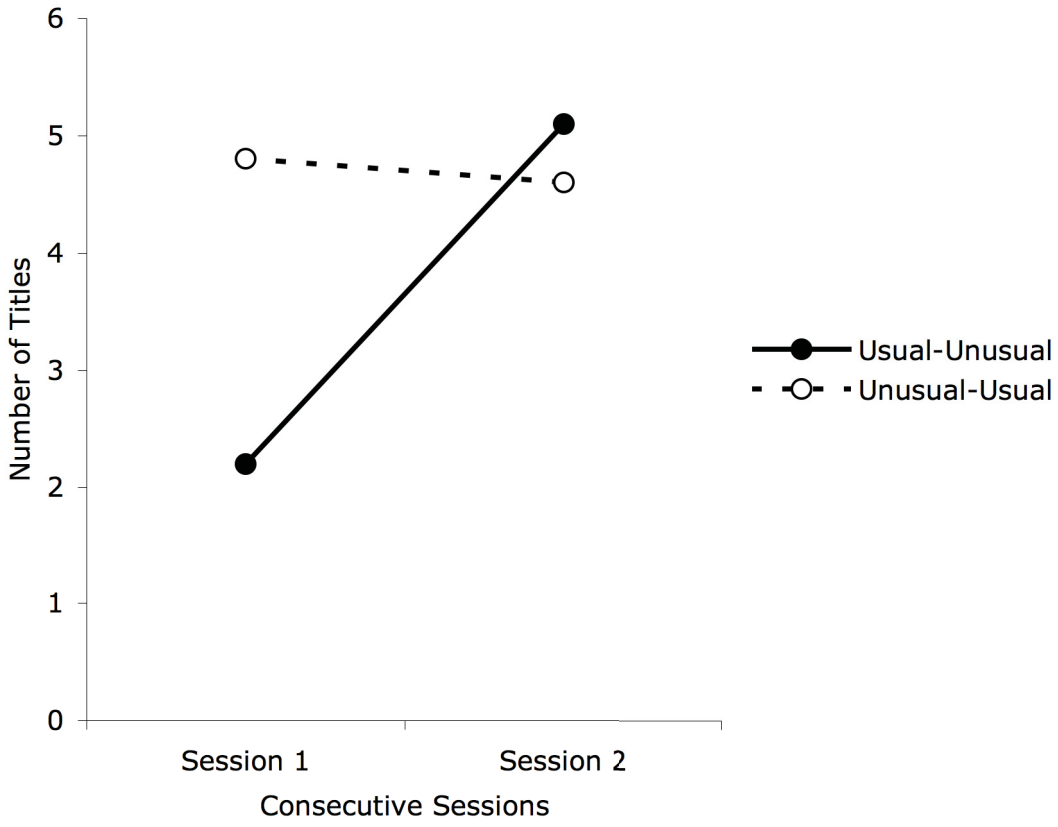


Figure 2. Mean number of story titles for Group Usual-Unusual and Group Unusual-Usual for Sessions 1 and 2. Higher numbers indicate greater creativity.

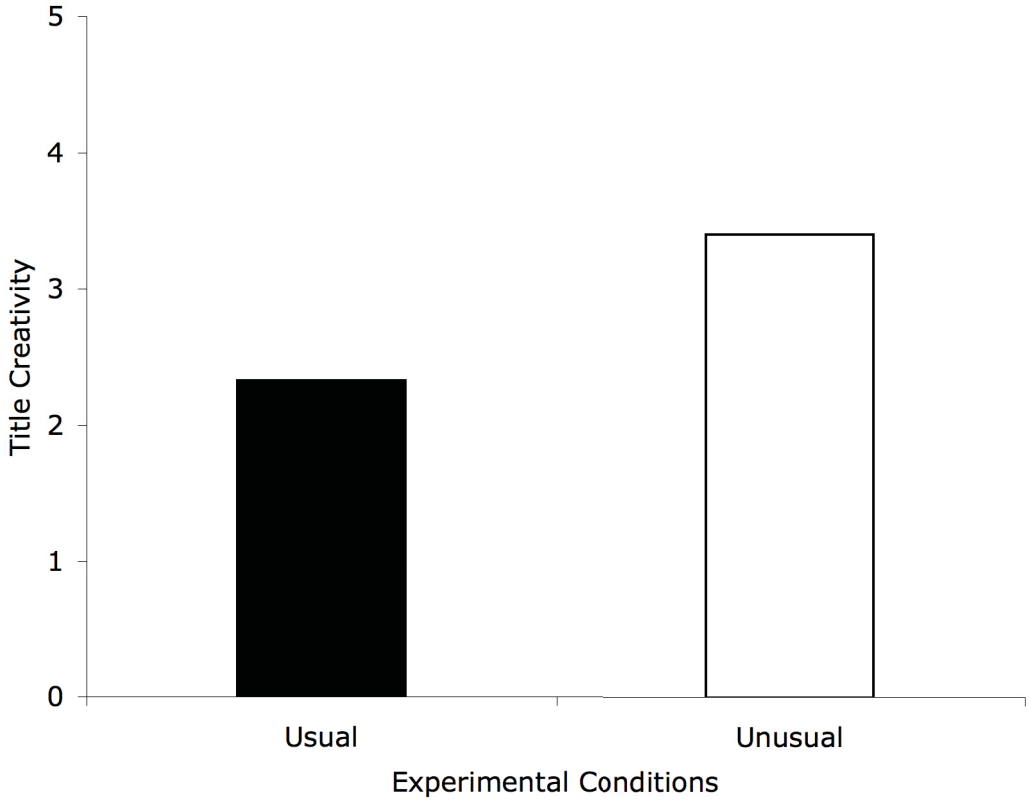


Figure 3. Mean title creativity scores for all participants (N = 20) during both experimental conditions. Higher scores indicate greater creativity.

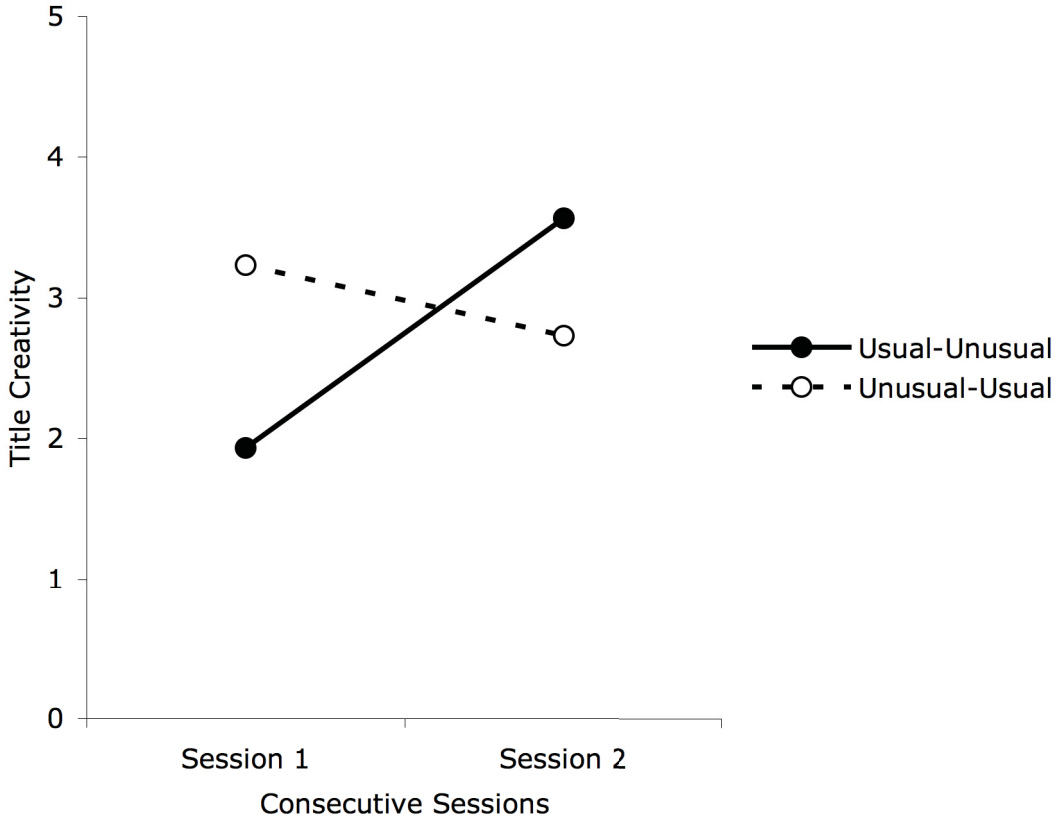


Figure 4. Mean title creativity scores for Group Usual-Unusual and Group Unusual-Usual for Sessions 1 and 2. Higher scores indicate greater creativity.

across Sessions 1 and 2. Title creativity scores ranged from 1 (*little or no creativity*) to 5 (*highly creative*), with higher scores indicating greater creativity. For Session 1, a significant difference was determined between Group Usual-Unusual (M = 1.93, SD = .78) and Group Unusual-Usual (M = 3.23, SD = .99), with the latter group earning significantly higher scores, $t(18) = -1.30067$, $p < .05$. Scores were not significantly different for Group Usual-Unusual (M = 3.56, SD = .98) and Group Unusual-Usual (M = 2.73, SD = 1.00) during Session 2.

Generalization Task 2: Drawings

As in the story title generalization task, the number of drawings to be produced was not specified to participants. Therefore, participants made different numbers of drawings. For the number of drawings produced during each session, the only significant main effect was for sequence, $F(1, 18) = 5.50$, $p < .05$. An inspection of the data in Figure 5 reveals that the mean number of drawings produced by participants in both groups was equivalent across both conditions (M = 5.10, SD = 4.59). However, Figure 6 shows that participants in Group Unusual-Usual produced significantly more drawings during Session 1 (M = 6.80, SD = 5.49) relative to participants in Group Usual-Unusual (M = 2.60, SD = 2.12), $t(18) = -2.26$, $p < .05$. This trend carried over into Session 2, with Group Unusual-Usual (M = 7.60, SD = 5.10) again producing significantly more drawings than Group Usual-Unusual (M = 3.40, SD = 2.84), $t(18) = -2.28$, $p < .05$.

Mean drawing originality scores were assigned so that lower scores indicated higher originality. For simplicity of presentation, scores in Figures 7 and 8 were arranged so that higher scores would indicate greater originality, as in Eisenberger and Armelli (1997). The main effect for condition was significant, $F(1, 18) = 5.25$, $p < .05$. As shown

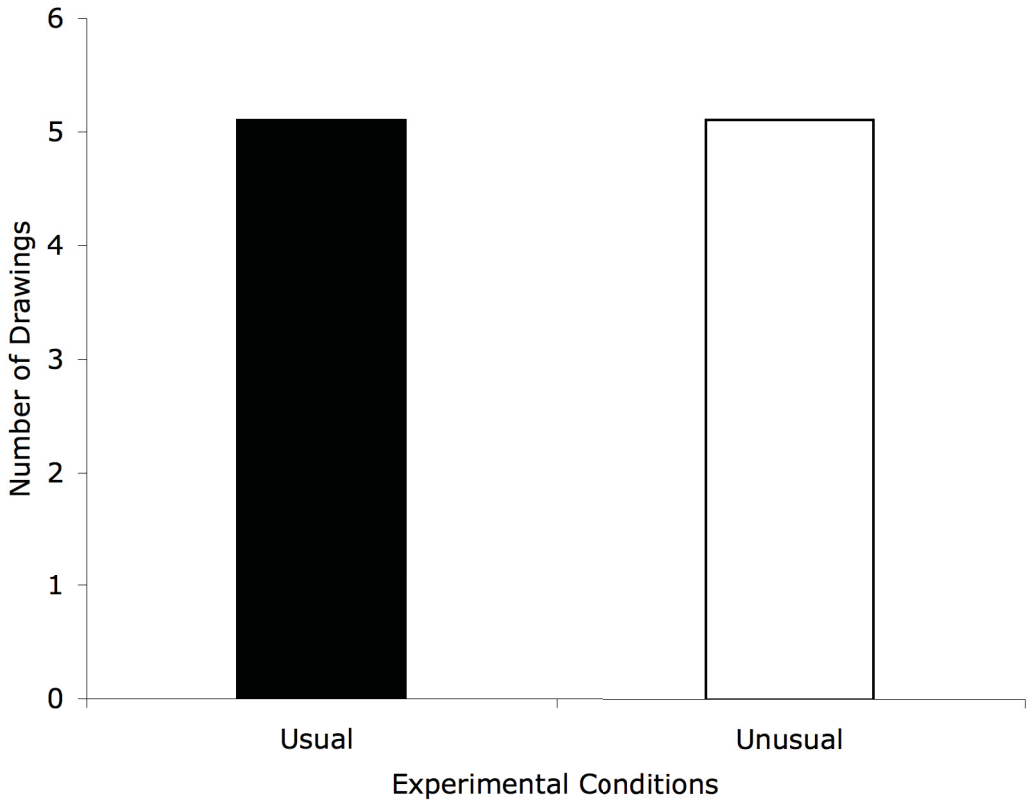


Figure 5. Mean number of drawings for all participants (N = 20) during both experimental conditions. Higher numbers indicate greater creativity.

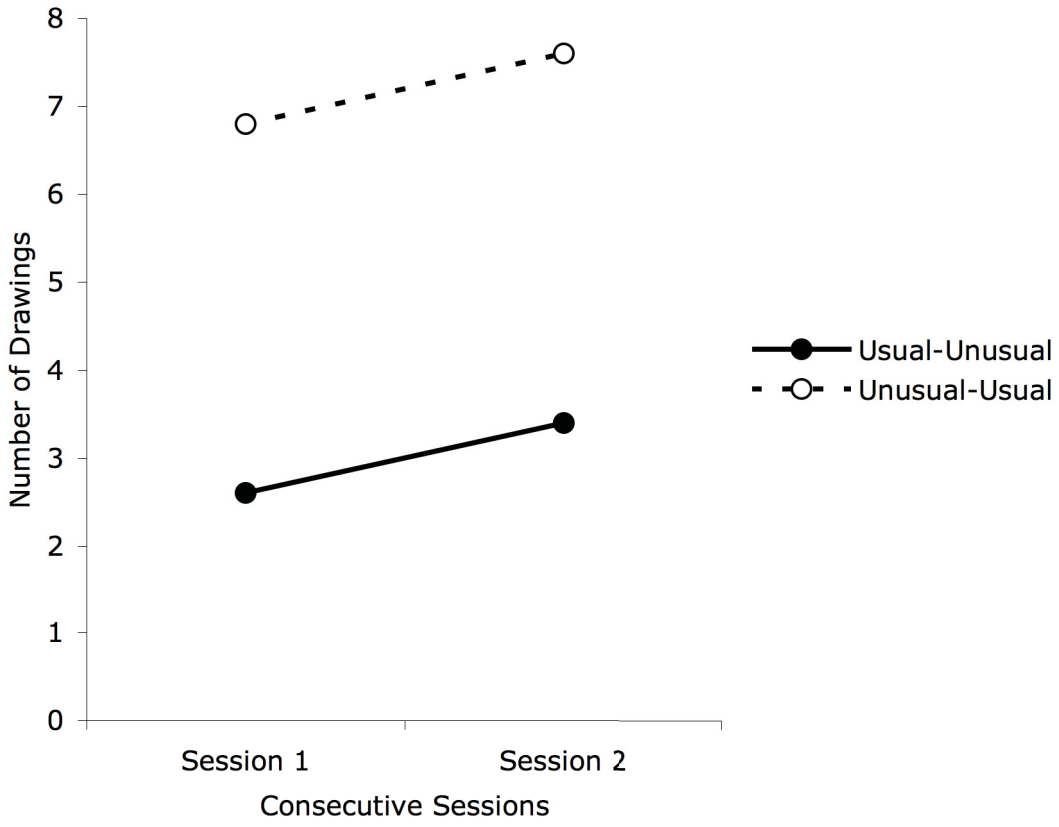


Figure 6. Mean number of drawings for Group Usual-Unusual and Group Unusual-Usual for Sessions 1 and 2. Higher numbers indicate greater creativity.

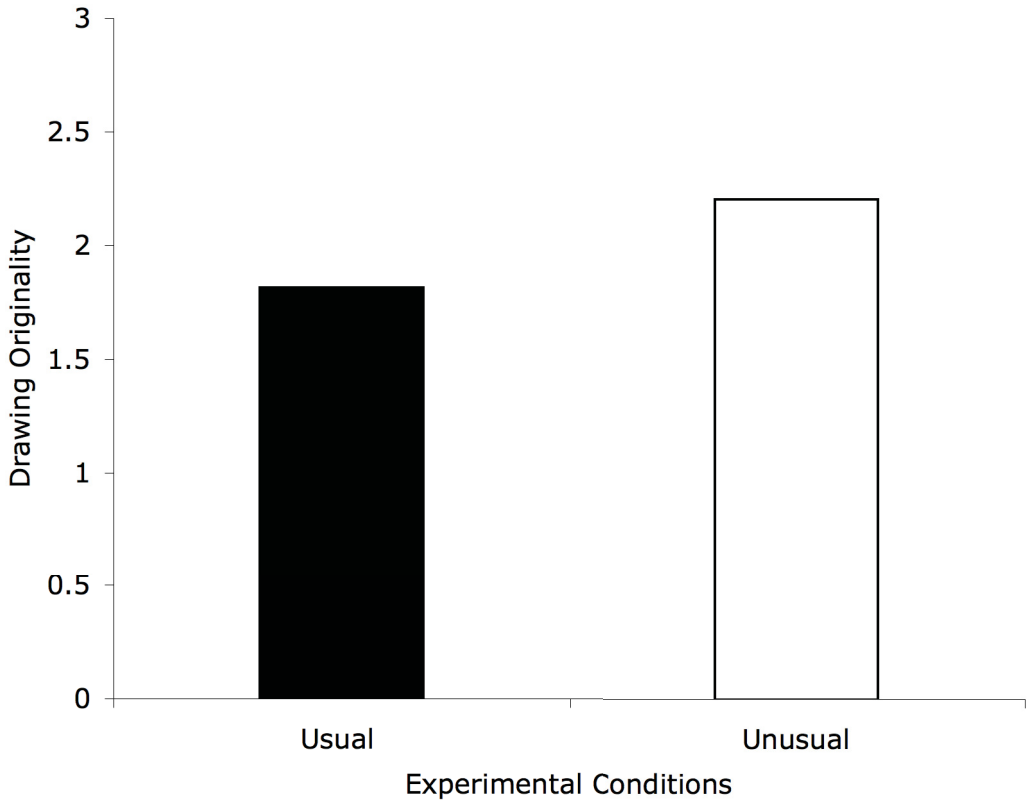


Figure 7. Mean drawing originality scores for all participants (N = 20) during both experimental conditions. Higher scores indicate greater originality.

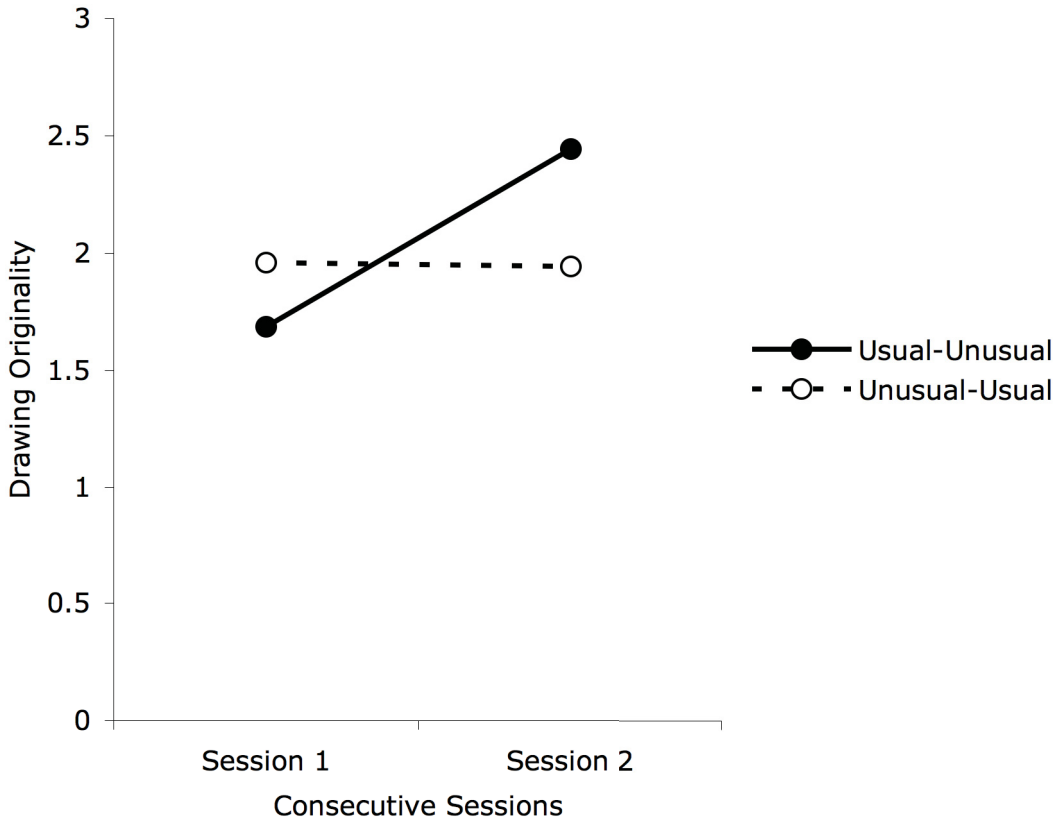


Figure 8. Mean drawing originality scores for Group Usual-Unusual and Group Unusual-Usual for Sessions 1 and 2. Higher scores indicate greater originality.

in Figure 7, participants produced drawings with significantly higher originality scores during the unusual condition ($M = 46.01$, $SD = 28.61$) relative to the usual condition ($M = 55.43$, $SD = 26.75$). Additionally, a significant condition by sequence interaction was determined, $F(1, 18) = 4.79$, $p < .05$. This suggests that, as with story titles in the first generalization task, scores for Group Unusual-Usual were maintained across sessions regardless of the change in reinforcement contingencies (Figure 8). Although Group Unusual-Usual ($M = 51.08$, $SD = 31.15$) produced more original drawings in Session 1 compared to Group Usual-Unusual ($M = 59.36$, $SD = 21.97$), the difference was not significant. Session 2 yielded similar results, with a nonsignificant difference between means for Group Usual-Unusual ($M = 40.94$, $SD = 26.48$) and Group Unusual-Usual ($M = 51.49$, $SD = 31.52$).

Discussion

The present study supports the current behavioral analytic research on creativity, which suggests that repeated reward contingent on creative responding increases creativity (e.g., Campbell & Willis, 1976; Goetz & Baer, 1973; Winston & Baker, 1985). For most participants, social reinforcement contingent on unconventional or creative responses during the object uses task increased creativity in two subsequent, unrelated generalization tasks. As in Maloney and Hopkins (1973), reinforcement contingent on novel responses increased subjective judgments of creativity during the story title task. Contingent social reinforcement also increased the originality of responses provided during the drawing task. This study demonstrated that social reinforcement contingent on creative responses during an initial task can increase originality in unrewarded generalization tasks that do not provide explicit instructions to respond creatively. These

findings extend the current behavioral creativity literature by suggesting that social reinforcement contingent on creative responses can increase both subjective and objective measures of generalized creativity in older adults living in a residential care setting.

While the disuse theory (e.g., Tranter & Koutstaal, 2008), suggests that age-related declines in performance on tasks that require problem solving and creative skills arise from decreased engagement in activities that involve these abilities, the results of this investigation suggest a complementary hypothesis: Increased engagement in activities that require problem solving and creative skills may prevent or even reverse age-related declines in activities that involve these abilities. On the basis of this hypothesis, when older adults engage in creative activities, they should exhibit generalized increases in subsequent measures of creativity. This study demonstrated that older adults who engaged in a brief task that required creative responding (i.e., the object uses task during the unusual condition), and were provided with social reinforcement contingent on creativity displayed increased creativity in two unrelated tasks. For participants who received the unusual condition first, increased levels of creativity continued across sessions, suggesting that gains in creative performance may be maintained. The older participants in this study resided in a residential care facility where opportunities for novel problem solving and creativity in their everyday lives are minimal. However, following the unusual use condition, significant increases in both subjective and objective measures of creativity were observed. Furthermore, the generalization tasks were dissimilar to the initial task and required skills (i.e., making up story titles and drawings) that have likely not been utilized by participants for several decades. These findings provide evidence that increases in generalized creativity can

result from brief engagement in a task involving reinforcement contingent on creative responding, even in older adults currently living in environments that provide few opportunities for such contingencies.

As in previous studies by Eisenberger and colleagues (e.g., Eisenberger, et al., 1999; Eisenberger & Rhoades, 2001), the present study supports learned industriousness theory (Eisenberger, 1992), which states that individuals learn which performance dimensions are rewarded (e.g., creativity) from past histories of reinforcement, and display generalized increases in these performance dimensions on subsequent tasks. When individuals are rewarded for conventional performance, they produce simple, uncreative responses in subsequent tasks (e.g., Eisenberger & Armeli, 1997; Eisenberger & Selbst, 1994). In the present study, participants receiving the unusual condition first produced more story titles and drawings in Session 1 than participants receiving the usual condition. Additionally, relative to Group Usual-Unusual, participants in Group Unusual-Usual received higher subjective creativity scores and higher objective drawing originality scores in Session 1. With the exception of drawing originality scores, all of these differences were found to be statistically significant. Across sessions, the only significant main effect for title creativity scores was for condition. Thus, participants earned higher subjective creativity scores during the unusual condition compared to the usual condition. Similarly, the main effect of condition as well as condition by sequence interaction was found to be significant for the drawing originality scores. As in Eisenberger and Rhoades (2001), reinforcement contingent on creative responses increased subjective measures of creativity, in addition to objective measures of originality.

Participants receiving the unusual condition first produced more titles in Session 1 compared to participants receiving the usual condition. For both groups, the number of titles given during the story title task was significantly higher during the unusual condition. This indicates that social reinforcement contingent on creative responses may also increase unspecified, alternative dimensions of creative performance (e.g., the number of responses produced). Participants who received the unusual condition first also produced a significantly higher number of drawings during Session 1 compared to participants who received the usual condition. The only significant main effect for this measure was sequence, or condition order. Relative to Group Usual-Unusual, participants in Group Unusual-Usual produced a significantly greater number of drawings during both sessions.

The within-subjects design used in this investigation allowed for repeated testing measures, so that each participant completed both experimental conditions in a counterbalanced sequence. An interesting finding was that participants who received the unusual-usual sequence showed little decreases in the mean number of titles, title creativity scores, and drawing originality scores across sessions, and displayed an increase in the mean number of drawings. One possible explanation for these results is that receiving social reinforcement contingent on unusual responses during the first session may have influenced performance during the second session. According to learned industriousness theory (Eisenberger, 1992), reward should increase creativity if the appropriateness of creative performance is indicated by past experience. Thus, for Group Unusual-Usual, task instructions or reinforcement contingencies from the first session may have affected performance to a greater degree than those delivered during

the second session. Conversely, participants who received the usual-unusual sequence displayed consistently lower mean scores relative to Group Unusual-Usual on all measures during Session 1. However, in Session 2, participants in Group Usual-Unusual exceeded the highest scores obtained by Group Unusual-Usual on all measures except the mean number of drawings produced. This suggests that, for Group Usual-Unusual, current task instructions and contingencies may have been stronger determinants of performance than those received during the previous session.

The current findings suggest that older adults living in residential care settings respond similarly to preadolescent student participants in the previously mentioned investigations by Eisenberger and colleagues. However, these findings should be interpreted with some caution. The number of participants in the studies by Eisenberger and colleagues ranged from 72 (Eisenberger & Rhoades, 2001) to 296 (Eisenberger & Armeli, 1997), while the present study had only 20 participants (but used a within-subjects design).

This study adds support to past research suggesting that older adults are capable of behaving creatively (e.g., Stine-Morrow et al., 2008; Tranter & Koutstaal, 2008). Studies that test divergent thinking abilities in older adults (e.g., McCrae et al., 1987; Reese et al., 2001) typically involve time limits, which may contribute to lower performance scores due to age-related decreases in information processing abilities (Foos & Boone, 2008). In a study that examined adult age differences on five tests of divergent thinking, Foos and Boone (2008) found that older adults can think as divergently as young adults, but they require more time to do so. This suggests that the ability to be creative remains intact throughout old age. The present study did not impose time limits

on any of the tasks. Thus, increases in creativity may not have been observed if time limits would have been used.

The unusual condition during the object uses task required novel responses to ill-defined, open-ended problems. As noted by Stine-Morrow et al. (2007), contemporary American culture does not readily afford such opportunities during older adulthood. Therefore, decreased opportunities for creativity, as well as a longer reinforcement history for conventional behavior that is traditionally characteristic of older adults (Skinner & Vaughn, 1983, p. 74) may contribute to perceived or observed decreases in creativity in old age. In particular, residential living environments tend to provide social reinforcement for dependent behavior, while ignoring independent behavior (e.g., Baltes & Wahl, 1992, 1996; Flora, 2004, pp. 207-209). Creative behavior requires active, independent decision making and problem solving. Thus, it is possible that providing reinforcement contingent on creativity in older adults living in residential care settings may result in subsequent increases in measures of independent behavior, such as everyday problem solving.

Although more research in needed on the potential benefits and implications of increasing creativity in older adults, the present results and the current literature suggest that environmental conditions which provide opportunities and reward for creative responding may enhance cognitive abilities thought to be related to creativity (e.g., Stine-Morrow et al., 2008; Tranter & Koutstaal, 2008), and may strengthen problem solving and adaptive skills (e.g., Fisher & Specht, 1999; Flood & Phillips, 2007). This study provides evidence that social reinforcement contingent on creativity can generalize to increases in measures of creativity during subsequent, unrelated tasks completed by older

adults who are currently living in environments that typically present few opportunities for such contingencies. Even if increasing creativity does not generalize to everyday measures (e.g., problem solving), creative activities can provide older adults with additional sources of both naturally occurring reinforcement and social reinforcement. The present findings are encouraging, and the topic of increasing creativity in older adults living in residential care settings is worthy of further investigation.

References

Ball, K., Berch, D. B., Helmers, K. F., Jobe, J. B., Leveck, M. D., Marsiske, M., et al. (2002). Effects of cognitive training interventions with older adults: A randomized controlled trial. *Journal of the American Medical Association, 288,* 2271-2281.

Baltes, P. B., Dittmann-Kohli, F., & Kliegl, R. (1986). Reserve capacity of the elderly in aging-sensitive tests of fluid intelligence: Replication and extension. *Psychology and Aging, 1,* 172-177.

Baltes, M. M., & Wahl, H. W. (1992). The dependency-support script in institutions: Generalization to community settings. *Psychology and Aging, 7,* 409-418.

Baltes, M. M., & Wahl, H. W. (1996). Patterns of communication in old age: The dependence-support and independence-ignore script. *Health Communication, 8,* 217-231.

Brigham, T. A., Graubard, P. S., & Stans, A. (1972). Analysis of the effects of sequential reinforcement contingencies on aspects of composition. *Journal of Applied Behavior Analysis, 5,* 421-429.

Campbell, J. A. & Willis, J. (1978). Modifying components of "creative behavior" in the natural environment. *Behavior Modification, 2,* 549-564.

Eisenberger, R. (1992). Learned industriousness. *Psychological Review, 99,* 248–267.

Eisenberger, R. & Armeli, S. (1997). Can salient reward increase creative performance without reducing intrinsic creative interest? *Journal of Personality and Social Psychology, 72,* 652-663.

Eisenberger, R., Armeli, S., & Pretz, J. (1998). Can the promise of reward increase

creativity? *Journal of Personality and Social Psychology, 74,* 704-714.

Eisenberger, R., Haskins, F., & Gambleton, P. (1999). Promised reward and creativity: Effects of prior experience. *Journal of Experimental Social Psychology, 35,* 308-325.

Eisenberger, R. & Rhoades, L. (2001). Incremental effects of reward on creativity. *Journal of Personality and Social Psychology, 81,* 728-741.

Eisenberger, R. & Selbst, M. (1994). Does reward increase or decrease creativity? *Journal of Personality and Social Psychology, 66,* 1116-1127.

Fisher, B. J. & Specht, D. K. (1999). Successful aging and creativity in later life. *Journal of Aging Studies, 13,* 457-472.

Flood, M. & Phillips, K. D. (2007). Creativity in older adults: A plethora of possibilities. *Issues in Mental Health Nursing, 28,* 389-411.

Flora, S. R. (2004). *The power of reinforcement*. Albany: State University of New York Press.

Foos, P. W., & Boone, D. (2008). Adult age differences in divergent thinking: It's just a matter of time. *Educational Gerontology, 34,* 587-594.

Glover, J. & Gary, A. L. (1976). Procedures to increase some aspects of creativity. *Journal of Applied Behavior Analysis, 9,* 79-84.

Goetz, E. M. & Baer, D. M. (1973). Social control of form diversity and the emergence of new forms in children's blockbuilding. *Journal of Applied Behavior Analysis, 6,* 209-217.

Gregory, T., Nettelbeck, T., & Wilson, C. (2010). Openness to experience, intelligence, and successful aging. *Personality and Individual Differences, 48,* 895-899.

Hannemann, B. T. (2006). Creativity with dementia patients: Can creativity and art stimulate dementia patients positively? *Gerontology, 52,* 59-65.

Horn, J. L. & Cattell, R. B. (1967). Age differences in fluid and crystallized intelligence. *Acta Psychologica, 26,* 107-129.

Hopkinson, J. & Neuringer, A. (2003). Modifying behavioral variability in moderately depressed students. *Behavior Modification, 27,* 251-264.

Maloney, K. B. & Hopkins, B. L. (1973). The modification of sentence structure and its relationship to subjective judgements of creativity in writing. *Journal of Applied Behavior Analysis, 6,* 425-433.

Maltzman, I. (1960). On the training of originality. *Psychological Review, 67,* 229-242.

Marr, M. J. (2003). The stitching and the unstitching: What can behavior analysis have to say about creativity? *The Behavior Analyst, 26,* 15-27.

McCrae, R. R., Arenberg, D., & Costa, P. T., Jr. (1987). Declines in divergent thinking with age: Cross-sectional, longitudinal, and cross-sequential analyses. *Psychology and Aging, 2,* 130-137.

Pryor, K. W., Haag, R., & O'Reilly, J. (1969). The creative porpoise: Training for novel behavior. *Journal of the Experimental Analysis of Behavior, 12,* 653-661.

Reese, H. W., Lee, L., Cohen, S. H., & Puckett, J. M., Jr. (2001). Effects of intellectual variables, age, and gender on divergent thinking in adulthood. *International Journal of Behavioral Development, 25,* 491-500.

Ruth, J. & Birren, J. E. (1985). Creativity in adulthood and old age: Relations to intelligence, sex and mode of testing. *International Journal of Behavioral*

Development, 8, 99-109.

Shahan, T. A. & Chase, P. N. (2002). Novelty, stimulus control, and operant variability. *The Behavior Analyst, 25,* 175-190.

Skinner, B. F. (1953). *Science and human behavior*. New York: Macmillan.

Skinner, B. F. (1974). *About behaviorism.* New York: Knopf.

Skinner, B. F. & Vaughn, M. E. (1983). *Enjoy old age*. New York: Norton.

Sloane, H. N., Endo, G. T., & Della-Piana, G. M. (1980). Creative behavior. *The Behavior Analyst, 3,* 11-21.

Stine-Morrow, E.A.L., Parisi, J.M., Morrow, D.G., Greene, J.C., & Park, D.C. (2007). An engagement model of cognitive optimization through adulthood. *Journal of Gerontology B: Psychological Sciences and Social Sciences, 62,* 62–69.

Stine-Morrow, E. A. L., Parisi, J. M., Morrow, D. G., & Park, D. P. (2008). The effects of an engaged lifestyle on cognitive vitality: A field experiment. *Psychology and Aging, 23,* 778-786.

Torrance, E. P. (1966). *The Torrance Tests of Creative Thinking: Norms-technical manual.* Lexington, MA: Personal Press.

Tranter, L. J. & Koutstaal, W. (2008). Age and flexible thinking: An experimental demonstration of the beneficial effects of increased cognitively stimulating activity on fluid intelligence in healthy older adults. *Aging, Neuropsychology, and Cognition, 15,* 184-207.

Winston, A. S. & Baker, J. E. (1985). Behavior analytic studies of creativity: A critical review. *The Behavior Analyst, 8,* 191-205.

Zimprich, D., Allemand, M., & Dellenbach, M. (2009). Openness to experience, fluid

intelligence, and crystallized intelligence in middle-aged and old adults. *Journal of Research in Personality, 43,* 444-454.

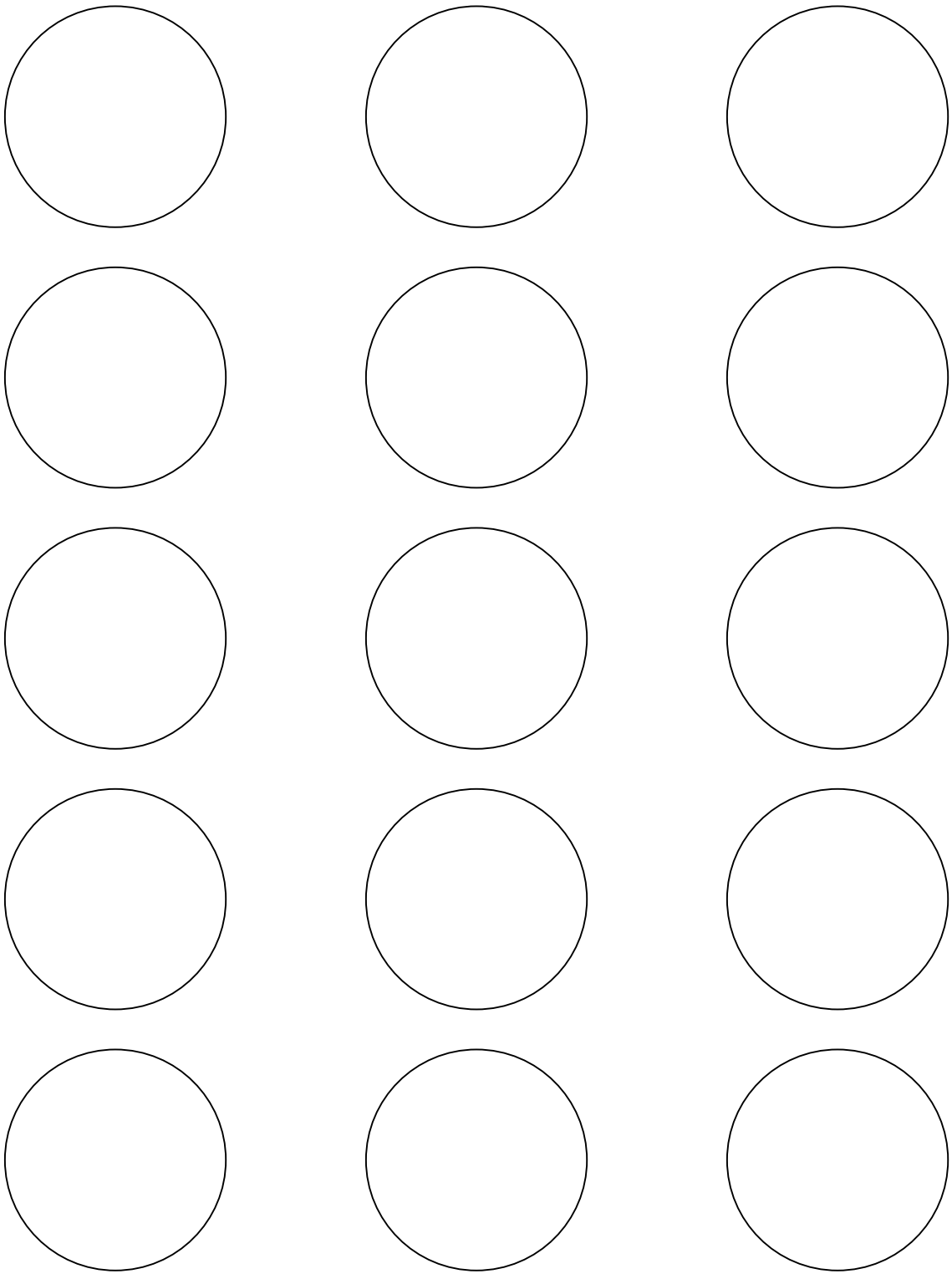
Appendix

Materials

Initial Task: Object Uses

	Object Name	**Standard Use**
1	pencil	making marks on paper (writing or drawing)
2	ruler	measuring items
3	rubber band	holding items together
4	sock	wearing on a foot
5	car keys	opening car door/truck, turning the ignition
6	bed sheet	putting on a bed
7	toothbrush	brushing teeth
8	paper clip	holding papers together
9	drinking glass	containing liquid for drinking
10	spoon	scooping food for eating
11	newspaper	reading
12	hammer	nailing
13	shoe	wearing on a foot
14	screwdriver	rotating screws
15	car tire	putting on the rim of a car
16	sheet of paper	writing or drawing
17	butter knife	spreading butter or other edible spreads
18	brown paper grocery bag	containing groceries

Generalization Task 2: Drawings



September 29, 2010

Dr. Stephen Flora, Principal Investigator
Ms. Courtney Polenick, Co-investigator
Department of Psychology
UNIVERSITY

RE: Human Subjects Research Protocol Number: 026-2011
Title: The Effects of Social Reinforcement on Measures of Generalized Creativity in Older Adults

Dear Dr. Flora and Ms. Polenick:

The Human Subjects Research Committee of Youngstown State University has reviewed the aforementioned Protocol via expedited review, and it has been fully approved.

Any changes in your research activity should be promptly reported to the Human Subjects Research Committee and may not be initiated without HSRC approval except where necessary to eliminate hazard to human subjects. Any unanticipated problems involving risks to subjects should also be promptly reported to the Human Subjects Research Committee. Best wishes in the conduct of your study.

Sincerely,

Peter J. Kasvinsky
Dean, School of Graduate Studies and Research
Research Compliance Officer

c: Dr. Karen Giorgetti, Chair
Department of Psychology