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Multiple Schedule Assessment of Competing Items: Effect on Motivating Operations

A Thesis Presented

by

Cassie Herman

The Department of Counseling and Applied Educational Psychology

In partial fulfillment of the requirements

for the degree of

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Cassie Herman

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Multiple Schedule Assessment of Competing Items: Effect on Motivating

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Abstract

Rapp (2007), suggested that, when treating automatically-reinforced behavior using competing stimuli, whether a stimulus is matched or unmatched is a predictor of whether an AO (for matched stimuli) or EO (for unmatched stimuli) effect will be obtained following response competition. Two young males, with an autism spectrum disorder, who engaged in high levels of stereotypic behavior maintained by automatically reinforcement participated. The effects of competing stimuli on levels of stereotypy were assessed using a three-component multiple schedule (i.e., BL - access to stimuli - BL). During the assessment, the competing item was either a matched or unmatched stimulus identified using a competing items assessment (Piazza et al., 1998; Piazza, Adelinis, Hanley, Goh, &Delia, 2000. For both participants, providing access to the matched stimuli suggested no clear pattern of either establishing or abolishing effect. However, for unmatched stimuli the results suggested a clear pattern of a potential abolishing effect for both participants.

Multiple Schedule Assessment of Competing Items: Effect on Motivating Operations

Some individuals with developmental disabilities engage in problem behavior that is maintained by automatic reinforcement. The term automatic reinforcement has been used to describe reinforcement that is produced independent of the social environment (Vaughan & Michael, 1982). Piazza et al. (2000) proposed that automatically reinforced aberrant behavior becomes more probable when levels of environmental stimulation are inadequate. Thus, one potential treatment for automatically reinforced problem behavior is provide noncontingent access to preferred stimuli (e.g., Shore, Iwata, DeLeon, Kahng, & Smith, 1997). Typically, pre-treatment preferences assessments are conducted to identify items for use in noncontingent reinforcement programs (e.g., Vollmer, Marcus & LeBlanc, 1994); these preferred items may or may not matched the purported reinforcer. A matched stimulus appears to provide the same or similar sensory consequence as the automatically maintained problem behavior. An unmatched stimulus provides a sensory consequence but it is neither the same, nor similar to the sensory consequence of the automatically maintained problem behavior (Piazza et al. 1998, 2000). Previous studies (Favell. McGimsey, & Schell, 1982; Fisher, Lindauer, Alterson, Thompson, 1998) found that matched stimuli produced a greater reduction in the persistence of problem behavior than unmatched stimuli. However; functional analyses were not conducted prior to treatment to assess if the problem behavior was automatically reinforced.

Piazza et al. (1998, 2000) furthered the research on the treatment of automatically maintained problem behavior by developing a competing items assessment to identify stimuli that will effectively reduce the persistence of the problem behavior for both matched and unmatched stimuli, an to identify highly preferred stimuli to use in subsequent evaluation. A

functional analysis (Iwata et al. 1984/1992) was conducted prior to conducting the competing items assessment to rule out socially mediated reinforcement. The competing items assessment consisted of identifying matched and unmatched stimuli for a subsequent assessment. Multiple stimuli was used to evaluate the effects of matched and unmatched stimuli rate of problem behavior. All participants' matched stimuli were associated with lower levels of automatically maintained problem behavior, which supported and extended previous research. Piazza et al. (1998, 2000) stated that matched stimuli may function as establishing operation because matched stimuli provide the same (or similar) sensory consequence as the automatically maintained problem behavior. Thus, motivation to obtain the reinforcement produced by the problem behavior may be reduced when an individual is engaged with matched stimuli. With an unmatched stimulus, the establishing operation continues to be present because the item does not provide the same sensory consequence as the automatically maintained problem behavior. Laraway, Snycerski, Michael and Poling (2003) later clarified the term establishing operation. As any event that increases the effectiveness of a given consequence, while an abolishing operation refers to any event that decreases the effectiveness of a given consequence.

Rapp (2006) agreed with Piazza et al. (2000) assertions. Rapp hypothesized that a functionally-matched intervention may serve as an abolishing operation for stimulation generated by the problem behavior whereas an unmatched intervention may serve as an establishing operation for the problem behavior. If the intervention is functionally matched, there should be a decrease or unchanged level of problem behavior relative to baseline levels. A multiple schedule assessment was conducted with all participants (Rapp 2006, 2007). The results confirmed Rapp's hypothesis that non-contingent access to matched competing items would reduce the motivation for engaging in problem behavior. A second assessment was completed with an

unmatched stimulus (Rapp 2007). The results also confirmed the hypothesis that noncontingent access to an unmatched competing item will increase the motivation for engaging in problem behavior. However, there are some studies that have not conformed to Rapp's (2007) hypothesis.

Although providing noncontingent access to competing stimuli may lead to short-term reductions in automatically-maintained problem behavior, it is not clear what long-term effects this intervention may have on the persistence of behavior over time. Ahearn, Clark, Gardenier, Chung and Dube (2003) raised concerns about the long term effects their treatment had on automatically maintained problem behavior. A multiple schedule assessment was conducted for three participants. Two sequences were conducted and reversed. A behavior momentum sequence which consisted for four components: baseline, VT exposures, test and baseline. In baseline no preferred stimulus was available. In the VT exposure only the first preferred stimulus was available and the test condition the second preferred stimulus was available. The control sequence consisted of four components: baseline, baseline, test, and baseline. Only on sequence was conducted on a single day. In all sequences the first component is compared to the fourth components. In two of the participants the fourth component showed higher levels of behavior than the first component. There is a potential pattern of an establishing effect for both participants. The third participant there was neither a potential establishing or abolishing effect once the treatment was removed because four of the sequences the fourth component showed lower levels of behavior than the first and the other four components the fourth component was higher than the first component. It should be noted that the third participant the stimuli selected did not complete as well as it did for the two previous participants.

The results of previous research on using matched stimuli to reduce automatically maintained behavior have been mixed. The purpose of this study is to present a new assessment to compare automatically maintained problem behavior during, and immediately following either a matched or unmatched treatment components. Given the inconsistent findings in the research describe above, we want to further evaluate the effects of matched and unmatched stimuli on automatically maintained problem behavior.

General Method

Participants

The participants were two individuals with autism spectrum disorder (ASD) who were enrolled in a residential program and pre-school program at the New England Center for Children, Inc. (NECC). They had been referred as a result of their high levels of automatically maintained problem behavior which interfered with participation in their educational goals. Fin was 15-years-old male who communicated using a speech generating device and his expressive language was limited to using single words (e.g. , no, yes, olives). He exhibited frequent motor stereotypy (body rocking and nonfunctional figure moments). Tom was a 5-year-old male who exhibited frequent vocal stereotypy that included nonfunctional speech and nonfunctional noises.

Experiment 1: Competing Items Assessment

Data Collection and Interobserver Agreement (IOA)

Competing items sessions were videotaped and scored by a trained graduate student. Data on automatically maintained problem behavior and item engagement were measured using a 10-s momentary time sample procedure. During each 10-s interval the experimenters recorded

whether or not item engagement occurred, and the occurrence or non-occurrence of the problem behavior. A second observer recorded data during least 33% of all sessions for each participant and IOA was calculated. An agreement was recorded when of both recorded observers either the occurrence or nonoccurrence of the problem behavior; a disagreement was scored when one observer recorded the occurrence of the behavior and the other observer recorded the non-occurrence of the behavior. The number of intervals with agreement were divided by the number of intervals with agreement plus disagreements and multiplied by 100%. For Fin, the mean IOA for engagement was 86% (range, 66% - 100%) and 93% (range, 44% - 100%) for problem behavior mean. For Tom, the mean IOA for engagement was 99% (range, 96% - 100%) and 95% (range, 86% - 100%) for problem behavior.

Procedure and Design

A functional analysis on motor stereotypy for Fin and vocal stereotypy for Tom were conducted prior to the competing items assessment. The functional analysis was conducted to show that the function of the problem behavior was not socially mediated. Procedures were similar to those reported by Iwata et al. (1982/1994) but the order of the conditions were modified using the procedures described by Roscoe, Carreau, MacDonald and Pence (2008) to more efficiently assess the function of stereotypy. The order of the conditions was as follows: no interaction, no interaction, attention, no interaction, no interaction, demand. Sessions were 5 min in length and conducted either at school or at the participant's residential home. For both participants the results of the function analysis suggested that problem behavior was not socially mediated.

For the competing items assessment the therapist collected a number of items that both hypothetically matched and did not match the sensory consequences of the participant's

automatically maintained problem behavior. The experimenter considered the items matched if they appeared to match the sensory consequences of their problem behavior (e.g., rocking chair for body rocking). Unmatched items provided sensory consequences but those consequences did not match the hypothesized sensory consequence (e.g., a radio for body rocking). Four matched and eight unmatched stimuli were evaluated for Fin. Four matched stimuli and four unmatched were evaluated for Tom.

Prior to each session the participant sampled each item, which consisted of the therapist engaging with the item and then giving it to the participant or manually guiding him to engage with the item. Sessions was 3 min for Fin and 5 min for Tom. During each session one item was presented to the participant. The order of the items was chosen randomly and each item was presented three times. Each participant was seated at a table with only the item present, although Fin's communication device was also present. The therapist only engaged with the participant during sampling (Piazza et al., 1998; 2000).

Results

For both participants a functional analysis on motor stereotypy for Fin and vocal stereotypy for Tom were conducted prior to the competing items assessment. Procedures were similar to those reported by Iwate, Dorsey, Slifer, Bauman and Richman (1982/1994) but the order of the conditions were modified using Roscoe, Carreau, MacDonald and Pence (2008) to more efficiently assess the function of stereotypy. For both participants the functional analysis showed that the function of the problem behavior was not socially mediated.

Figure 1 shows the results for Finn's the competing items assessment. The slinky was identified as the matched stimulus used in the subsequent assessment because of the high rates of engagement and low rates of the automatically maintained problem behavior. The mean rate of

problem behavior for the slinky was 6% and 100% for engagement mean. The musical phone was identified as the unmatched stimulus and was used in the subsequent assessment due to the high rates of engagement and low rates of automatically maintained problem behavior. The mean rate of problem behavior was 6% and 98% for engagement. Both the musical phone and slinky had the same percentage of stereotypy for the competing items assessment and were further compared in the multiple schedule assessment.

Figure 2 shows the results for Tom's competing items assessment. The leap pad was identified as the matched stimulus due to the high rates of engagement and low rates of stereotypy. The mean rate of problem behavior was 0% and 100% for engagement. Goldfish were identified as the unmatched stimulus due to low levels of stereotypy and high levels of engagement. The mean rate of problem behavior was 2% and 100% for engagement. The leap pad had zero percentage of stereotypy during the competing items whereas goldfish had a slightly higher percentage of stereotypy.

Experiment 2: Multiple schedule assessment

Data Collection and Interobserver Agreement (IOA)

All baseline and treatment sessions were videotaped and scored by a trained graduate student. During baseline the data on problem behavior were measured using a 10-s momentary time sample. Treatment data on the automatically maintained problem behavior and engagement were scored using a 10-s momentary time sample. IOA was calculated for at least 33% of all sessions for each participant by having an independent graduate student score videotapes of sessions. An agreement was scored when both observers recorded either the occurrence or

nonoccurrence of the problem behavior; a disagreement was scored when one observer recorded the occurrence of the behavior and the other observer recorded the non-occurrence of the behavior. The number of intervals with agreement were divided by the number of intervals with agreement plus disagreements and multiplied by 100%. For Fin matched stimulus, the mean IOA for problem behavior was 91% (range, 77% - 100%) and 100% for engagement mean. For Fin's unmatched stimulus, the mean IOA for problem behavior was 87% (range, 77% - 100%) and 100% for engagement. For Tom's matched stimulus, the mean IOA for problem behavior was 88% (range, 72% - 100%) and 100% for engagement mean. For Tom's unmatched stimulus, the mean IOA for problem behavior was 94% (range, 77% - 100%) and 100% for engagement.

Procedure and Design

The competing items assessment identified one matched and one unmatched stimulus that effectively competed with the automatically maintained problem behavior and was a preferred stimulus. These two stimuli were then used in the multiple schedule assessments. The first assessment was conducted with only the matched stimulus. The second assessment was conducted with only the unmatched stimulus. The multiple schedule consisted of three components: baseline, treatment and baseline. This sequence was conducted three times. During baseline the participant was seated at a table with no stimuli present for 3 minutes except for Finn because his communication device was present. The treatment condition was similar to the competing items assessment. One item (matched or unmatched) was presented at a time and the participant had noncontingent access to that item for 3 min. The therapist did not interact with the participant during this condition. The treatment condition was immediately followed by a return to baseline. These conditions were conducted in rapid succession. The first baseline was

then compared to the second baseline for each sequence. A slinky was identified and assessed as a hypothetical matched stimulus and a musical phone was identified and assessed as a hypothetical unmatched stimulus for Fin. A leap pad was identified and assessed as a hypothetical matched stimulus and gold fish was identified and assessed as a hypothetical unmatched stimulus for Tom.

Results

Figure 3 shows the results for Finn's matched stimulus (slinky) multiple schedule assessment. For each sequence the first baseline was compared to the second baseline for each sequence. For five sequences the second baseline showed higher percentage of problem behavior than the first baseline; therefore there was a potential establishing effect when the treatment was removed. However, there were five sequences in which the second baseline showed lower percentage of behavior than the first baseline; therefore there was a potential abolishing effect when the treatment was removed. In two of the sequence there was 0% of stereotypy. Two sequences were excluded due to 0% of stereotypy in the first baseline. There was no consistent establishing or abolishing effect for subsequent behavior once the treatment was removed. The first no-interaction component relatively high percentage of stereotypy occurred (67%); the second component the matched treatment was (39%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (94%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (22%); the second component the matched treatment was (0%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (0%) of problem behavior. The third sequence completed the first no-interaction component percentage of stereotypy was (44%); the second component the matched treatment was (39%) of

problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (28%) of problem behavior.

For the second rapid sequence conducted The first no-interaction component of stereotypy was (0%); the second component the matched treatment was (0%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (66%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (6%); the second component the matched treatment was (0%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (39%) of problem behavior. The third sequence completed the first no-interaction component percentage of stereotypy was (33%); the second component the matched treatment was (17%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (50%) of problem behavior.

For the third rapid sequence conducted The first no-interaction component of stereotypy was (22%); the second component the matched treatment was (6%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (50%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (33%); the second component the matched treatment was (0%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (28%) of problem behavior. The third sequence completed the first no-interaction component percentage of stereotypy was (44%); the second component the matched treatment was (0%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (6%) of problem behavior.

For the fourth rapid sequence conducted The first no-interaction component of stereotypy was (0%); the second component the matched treatment was (0%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (11%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (6%); the second component the matched treatment was (6%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (33%) of problem behavior. The third sequence completed the first no-interaction component percentage of stereotypy was (72%); the second component the matched treatment was (0%) of problem behavior and (83%) of engagement; the third component (no-interaction) of the sequence (33%) of problem behavior.

Figure 4 shows the results for Finn's unmatched stimulus (musical phone) multiple schedule assessment. Three sequences showed was a potential establishing effect for subsequent behavior once the treatment was removed and seven sequences showed that there was a potential abolishing effect for subsequent behavior once the treatment was removed. There were two sequences that were excluded because in one sequence the stimulus did not effectively compete with stereotypy and for the second sequence, the percentages of stereotypy were the same for the first baseline and second baseline. It is important to note that both the matched and unmatched stimulus did compete effectively with motor stereotypy but the matched stimulus was a better competing item.

The first no-interaction component the percentage of stereotypy was (39%); the second component the unmatched treatment was (39%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (67%) of problem behavior. In the second

sequence the first no-interaction component percentage of stereotypy was (61%); the second component the unmatched treatment was (28%) of problem behavior and (94%) of engagement; the third component (no-interaction) of the sequence (56%) of problem behavior. The third sequence completed the first no-interaction component percentage of stereotypy was (78%); the second component the unmatched treatment was (28%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (67%) of problem behavior.

For the second rapid sequence conducted the first no-interaction component of stereotypy was (22%); the second component the unmatched treatment was (0%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (50%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (61%); the second component the unmatched treatment was (22%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (39%) of problem behavior. The third sequence completed the first no-interaction component percentage of stereotypy was (39%); the second component the unmatched treatment was (39%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (22%) of problem behavior.

For the third rapid sequence conducted the first no-interaction component of stereotypy was (50%); the second component the unmatched treatment was (28%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (50%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (61%); the second component the unmatched treatment was (28%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (22%) of problem behavior. The third sequence completed the first no-interaction component percentage of

stereotypy was (44%); the second component the unmatched treatment was (31%) of problem behavior and (94%) of engagement; the third component (no-interaction) of the sequence (78%) of problem behavior.

For the fourth rapid sequence conducted the first no-interaction component of stereotypy was (5%); the second component the unmatched treatment was (39%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (39%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (50%); the second component the unmatched treatment was (11%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (0%) of problem behavior. The third sequence completed the first no-interaction component percentage of stereotypy was (22%); the second component the unmatched treatment was (50%) of problem behavior and (17%) of engagement; the third component (no-interaction) of the sequence (56%) of problem behavior.

Figure 5 shows the results for Tom's matched stimulus (leap pad) multiple schedule assessment. For four sequences there was a potential establishing effect for subsequent behavior and for five sequences there was a potential abolishing effect for subsequent behavior. There is not a consistent abolishing effect or establishing effect for subsequent behavior for the matched stimulus.

The first no-interaction component relatively high percentage of stereotypy occurred (78%); the second component the matched treatment was (0%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (56%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (61%);

the second component the matched treatment was (61%) of problem behavior and (11%) of engagement; the third component (no-interaction) of the sequence (94%) of problem behavior.

For the second rapid sequence conducted the first no-interaction component of stereotypy was (67%); the second component the matched treatment was (0%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (50%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (22%); the second component the matched treatment was (11%) of problem behavior and (89%) of engagement; the third component (no-interaction) of the sequence (33%) of problem behavior. The third sequence completed the first no-interaction component percentage of stereotypy was (67%); the second component the matched treatment was (56%) of problem behavior and (33%) of engagement; the third component (no-interaction) of the sequence (15%) of problem behavior.

For the third rapid sequence conducted the first no-interaction component of stereotypy was (89%); the second component the matched treatment was (17%) of problem behavior and (83%) of engagement; the third component (no-interaction) of the sequence (72%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (72%); the second component the matched treatment was (6%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (44%) of problem behavior. The third sequence completed the first no-interaction component percentage of stereotypy was (72%); the second component the matched treatment was (78%) of problem behavior and (1%) of engagement; the third component (no-interaction) of the sequence (67%) of problem behavior.

For the fourth rapid sequence conducted the first no-interaction component of stereotypy was (100%); the second component the matched treatment was (22%) of problem behavior and (94%) of engagement; the third component (no-interaction) of the sequence (100%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (78%); the second component the matched treatment was (72%) of problem behavior and (17%) of engagement; the third component (no-interaction) of the sequence (94%) of problem behavior. The third sequence completed the first no-interaction component percentage of stereotypy was (39%); the second component the matched treatment was (6%) of problem behavior and (83%) of engagement; the third component (no-interaction) of the sequence (78%) of problem behavior.

Figure 6 shows the results for Tom's unmatched (goldfish) multiple schedule assessment. For one sequence there was a potential establishing effect for subsequent behavior and for eight sequences there was a potential abolishing effect for subsequent behavior. No sequences were excluded from this assessment. Therefore there is a clear potential abolishing effects for subsequent behavior once the treatment is removed. It is important to note that both the matched and unmatched stimuli were effective competing items but the unmatched stimulus produced a lower percentage of stereotypy during the treatment component.

The first no-interaction component relatively high percentage of stereotypy occurred (100%); the second component the unmatched treatment was (6%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (33%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (89%); the second component the unmatched treatment was (6%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (72%) of problem

behavior. In the third sequence the first no-interaction component percentage of stereotypy was (83%); the second component the unmatched treatment was (6%) and (100%) of engagement; the third component (no-interaction) of the sequence (44%) of problem behavior.

For the second rapid sequence conducted the first no-interaction component of stereotypy was (78%); the second component the unmatched treatment was (6%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (67%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (89%); the second component the unmatched treatment was (6%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (67%) of problem behavior. The third sequence completed the first no-interaction component percentage of stereotypy was (94%); the second component the unmatched treatment was (0%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (72%) of problem behavior.

For the third rapid sequence conducted the first no-interaction component of stereotypy was (83%); the second component the unmatched treatment was (0%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (50%) of problem behavior. In the second sequence the first no-interaction component percentage of stereotypy was (61%); the second component the umatched treatment was (6%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (83%) of problem behavior. The third sequence completed the first no-interaction component percentage of stereotypy was (83%); the second component the unmatched treatment was (22%) of problem behavior and (100%) of engagement; the third component (no-interaction) of the sequence (56%) of problem behavior.

Discussion

Piazza et al. (1998, 2000) found that matched stimuli produced greater reduction of automatically maintained problem behavior. In this study, however, providing access to a matched stimulus produced a greater reduction in automatically maintained problem behavior for only one participant. For Tom the unmatched stimulus goldfish produced a greater reduction in stereotypy than the matched stimulus a leap pad. Piazza et al. (1998, 2000) conducted a different assessment and used more than one stimulus during the treatment components which that can account for the difference in findings. This study's findings replicates Ahearn, Clark, DeBar and Florentino (2003) in that they also found that the unmatched stimulus produced greater reduction of automatically maintained problem behavior. Although they conducted a different assessment there was only one stimulus available during treatment. This study extends the findings that an unmatched stimulus can produce lower rates of automatically maintained problem behavior while the treatment is in place. The findings also extend Ahearn, Clark, Gardenier, Chung and Dube (2003) in that two participants results showed a consistent establishing effect for each sequence and one participant's results showed neither a consistent potential establishing or potential abolishing effect. Two of the participants' results for the matched stimulus showed neither a consistent potential establishing nor potential abolishing effect. Both participants' matched stimuli effectively reduced automatically maintained problem behavior whereas in Ahearn, Clark, Gardenier, Chung and Dube (2003) automatically maintained problem behavior did not decrease during treatment.

The main findings of this study do not replicate the findings of Rapp (2007). Rapp (2007) agreed with Piazza et al. (2000) assertion that matched stimuli may function as an establishing operation because matched stimuli provide the same or similar sensory consequence of the automatically maintained problem behavior. Motivation to obtain the reinforcement produced by the problem behavior may be reduced when engaging with matched stimuli. With the unmatched stimulus the establishing operation continues to be present because it does not provide similar sensory consequence of the automatically maintained problem behavior. Rapp's results showed that the matched stimulus produced a consistent potential abolishing effect and the unmatched stimuli produced a consistent potential establishing effect. This study found that both the matched stimuli did not produce a consistent potential establishing or abolishing effect which does not support Rapp's (2007) hypothesis for a matched stimulus according to the response deprivation hypothesis

One limitation for this study was the component time length. In Rapp (2007), each component was 10 mins in length and the component sequence was 30 mins in length. In the current study the component length was 3 mins, the component sequence was 9 mins, and the complete rapid alternation was 27 mins. Because this research was conducted in an academic setting it would be hard to allocate the time needed to replicate Rapp (2007) study and have enough component sequences to compare. Future research could compare matched and unmatched stimuli within one assessment by alternating treatment components or multiple matched and unmatched stimuli can be added to the treatment as in Piazza et al. (1998/2000).

References

Ahearn, W. H., Clark, K. M., DeBar, R., & Florentino, C. (2005). On the role of preference in response competition. *Journal of Applied Behavior Analysis*, 38, 247-250.

Ahearn, W. H., Clark, K. M., Gardenier, N. C., Chung, B. I., & Dube, W. V. (2003). Persistence of stereotypic behavior: Examining the effects of external reinforcers. *Journal of Applied Behavior Analysis*, 36, 439–448.

Favell, J. E., McGimsey, J. F., & Schell, R. M. (1982). Treatment of self-injury by providing alternate sensory activities. *Analysis and Intervention in Developmental Disabilities*, 2, 83-104.

Fisher, W. W., Lindauer, S. E., Alterson, C. J., & Thompson, R. H. (1998). Assessment and treatment of destructive behavior maintained by stereotypic object manipulation. *Journal of Applied Behavior Analysis, 31,* 513–527.

Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis, 27,* 197–209. (Reprinted from *Analysis and Intervention in Developmental Disabilities, 2,* 3–20, 1982)

Larway, S., Snycerski, S., Michael, J., & Poling, A. (2003). Motivating operations and terms to describe them: some further refinements. *Journal of Applied Behavior Analysis*, 36, 407-414.

Piazza, C. C., Adelinis, J. D., Hanley, G. P., Goh, H. L., & Delia, M. D. (2000). An evaluation of the effect of match stimuli on behaviors maintained by automatic reinforcement. *Journal of Applied Behavior Analysis*, 33, 13-27.

Piazza, C. C., Fisher, W. W., Hanley, G. P., LeBlanc, L. A., Worsdell, A. S., Lindauer, S. E., & Keeney, K. M. (1998). Treatment of pica through multiple analyses of its reinforcing functions. *Journal of Applied Behavior Analysis, 31,* 165–189.

Rapp, J. T. (2006). Toward an empirical method for identifying matched stimulation for automatically reinforced behavior: a preliminary investigation. *Journal of Applied Behavior Analysis,* 39, 137-140.

Rapp, J. T. (2007). Further evaluation of methods to identify matched stimulation. *Journal of Applied Behavior Analysis,* 40, 73-88.

Rapp, J. T., Vollmer, T. R., Dozier, C. L., St. Peter, C., & Cotnoir, N. (2004). Analysis of response reallocation in individuals with multiple forms of stereotyped behavior. *Journal of Applied Behavior Analysis*, 37, 481–501.

Roscoe, E. M., Carreau, A., MacDonald, J., & Pence, S. T. (2008). Further evaluation of leisure items in the attention condition of functional analysis. *Journal of Applied Behavior Analysis*, 41, 351-364.

Shore, B. A., Iwata, B. A., Deleon, I. G., Kahng, S., & Smith, R. G. (1997). An analysis of reinforcer substitutability using object manipulation and self-injury as competing responses. *Journal of Applied Behavior Analysis*, 30, 21-41.

Vaughan, M. E., & Michael, J. L. (1982). Automatic reinforcement: An important but ignored concept. *Behaviorism, 10,* 217–228.

Vollmer, T. R., & Iwata, B. A. Established operations and reinforcement effects. *Journal of Applied Behavior Analysis*, 24, 279-291.

Vollmer, T. R., Marcus, B. A., & LeBlanc, L. (1994). Treatment of self-injury and hand-mouthing following inconclusive functional analyses. *Journal of Applied Behavior Analysis*, *27*, 331–344.

Figure Caption

Figure 1. Competing Items Assessment for Finn
Figure 2. Competing Items Assessment for Tom
Figure 3. Multiple Schedule Assessment Matched for Finn
Figure 4. Multiple Schedule Assessment Unmatched for Finn
Figure 5: Multiple Schedule Assessment Matched for Tom
Figure 6: Multiple Schedule Assessment Unmatched for Tom

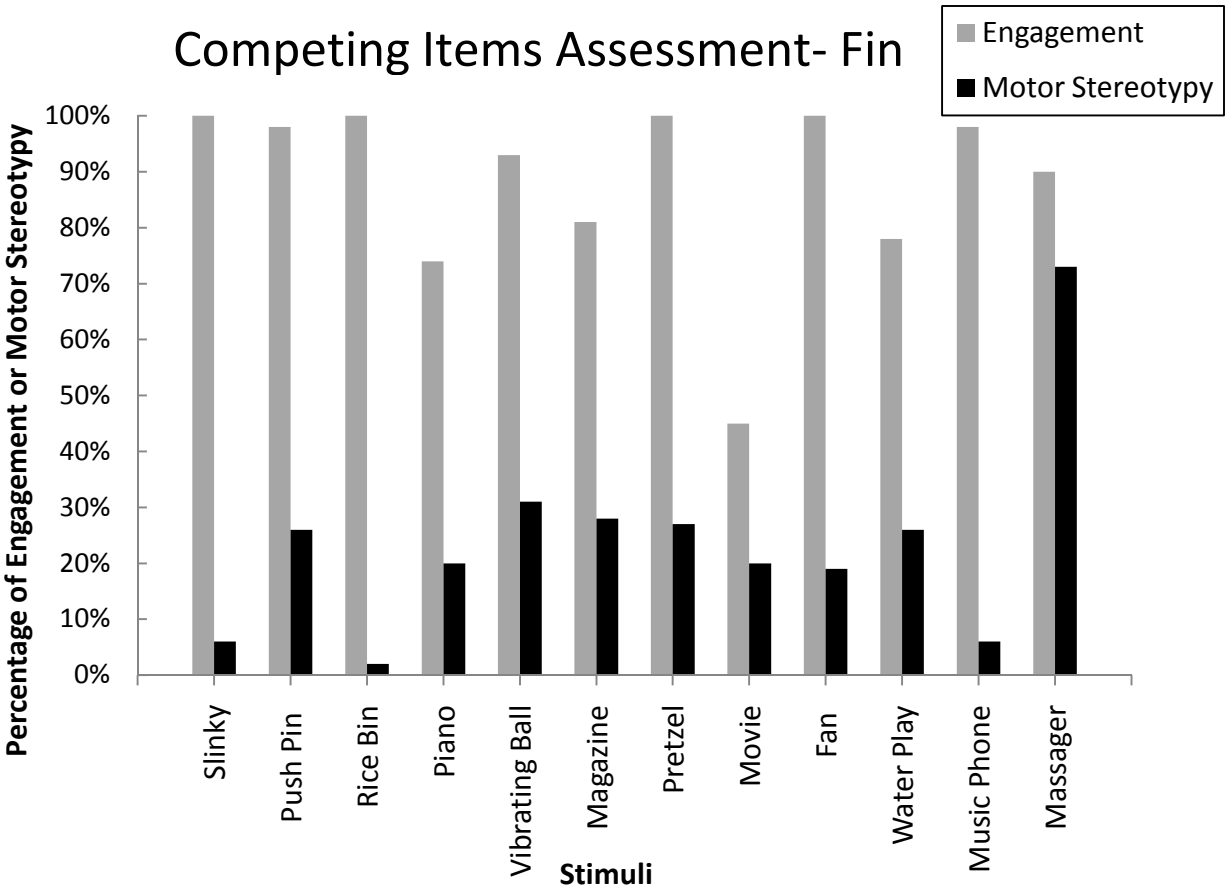

Figure 1: Percentage of automatically maintained problem behavior and percentage of item engagement during a competing items assessment.

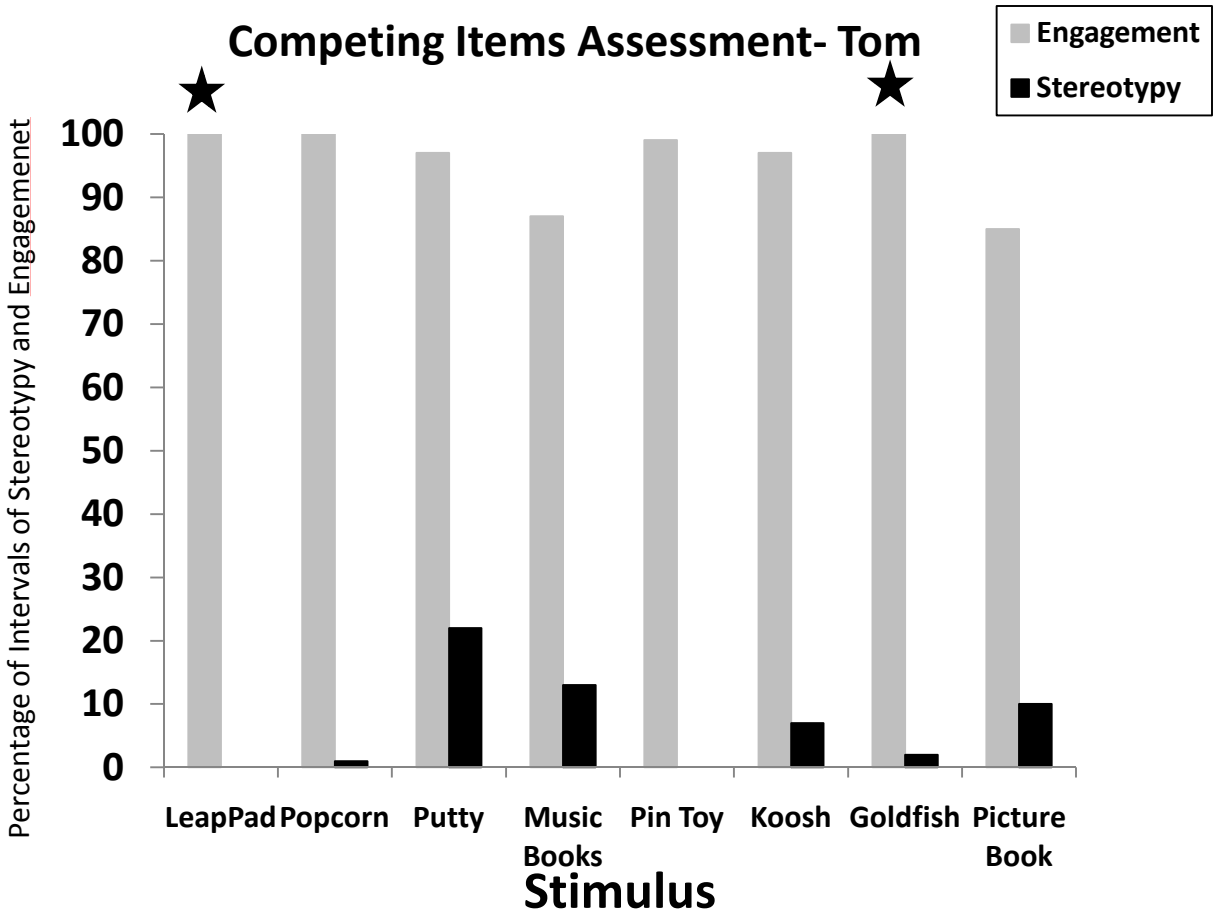

Figure 2: Percentage of automatically maintained problem behavior and percentage of item engagement during a competing items assessment.

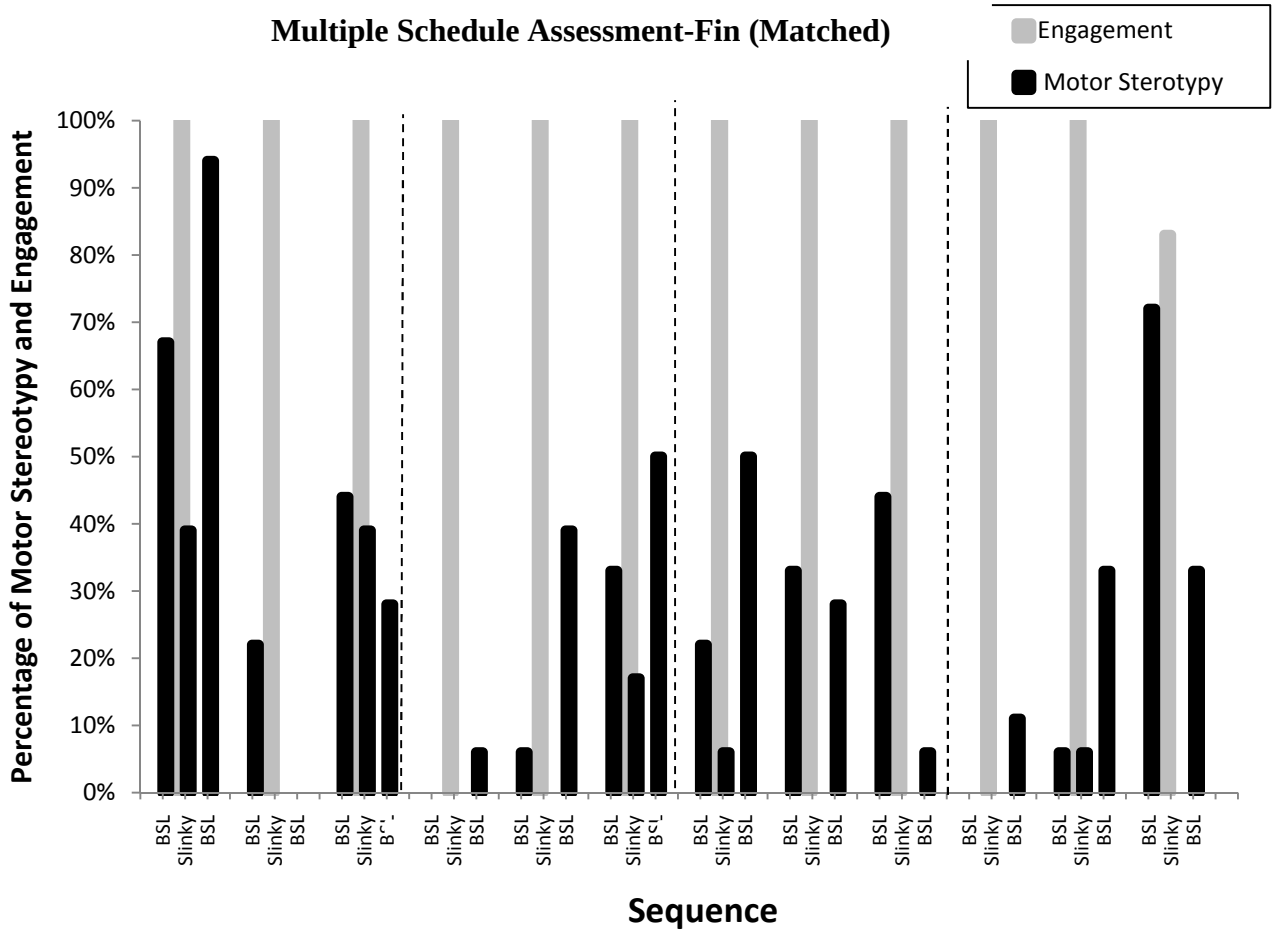

Figure 3: Percentage of motor stereotypy and item engagement in a baseline and treatment component

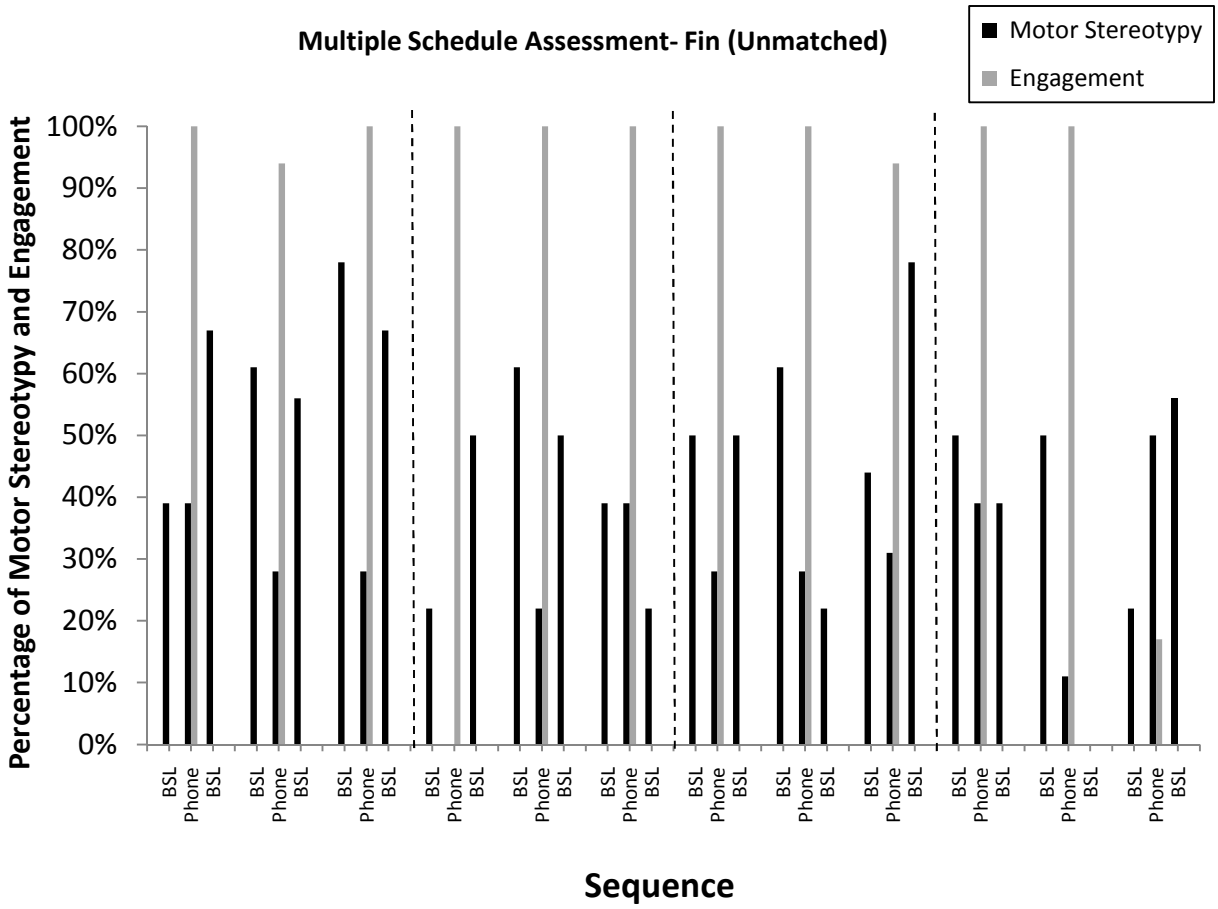

Figure 4: Percentage of automatically maintained problem behavior and percentage of item engagement during a competing items assessment.

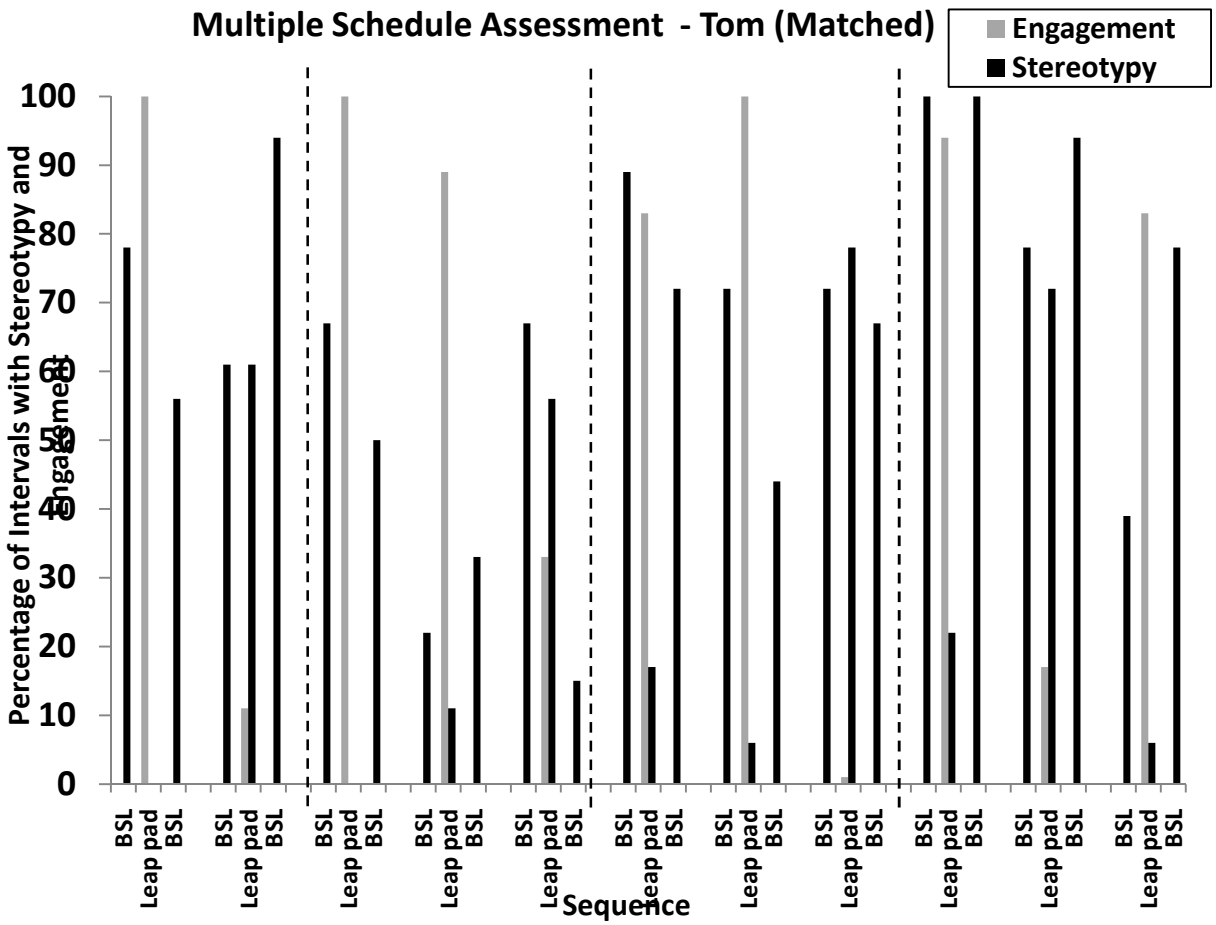

Figure 5: Percentage of automatically maintained problem behavior and percentage of item engagement during a competing items assessment.

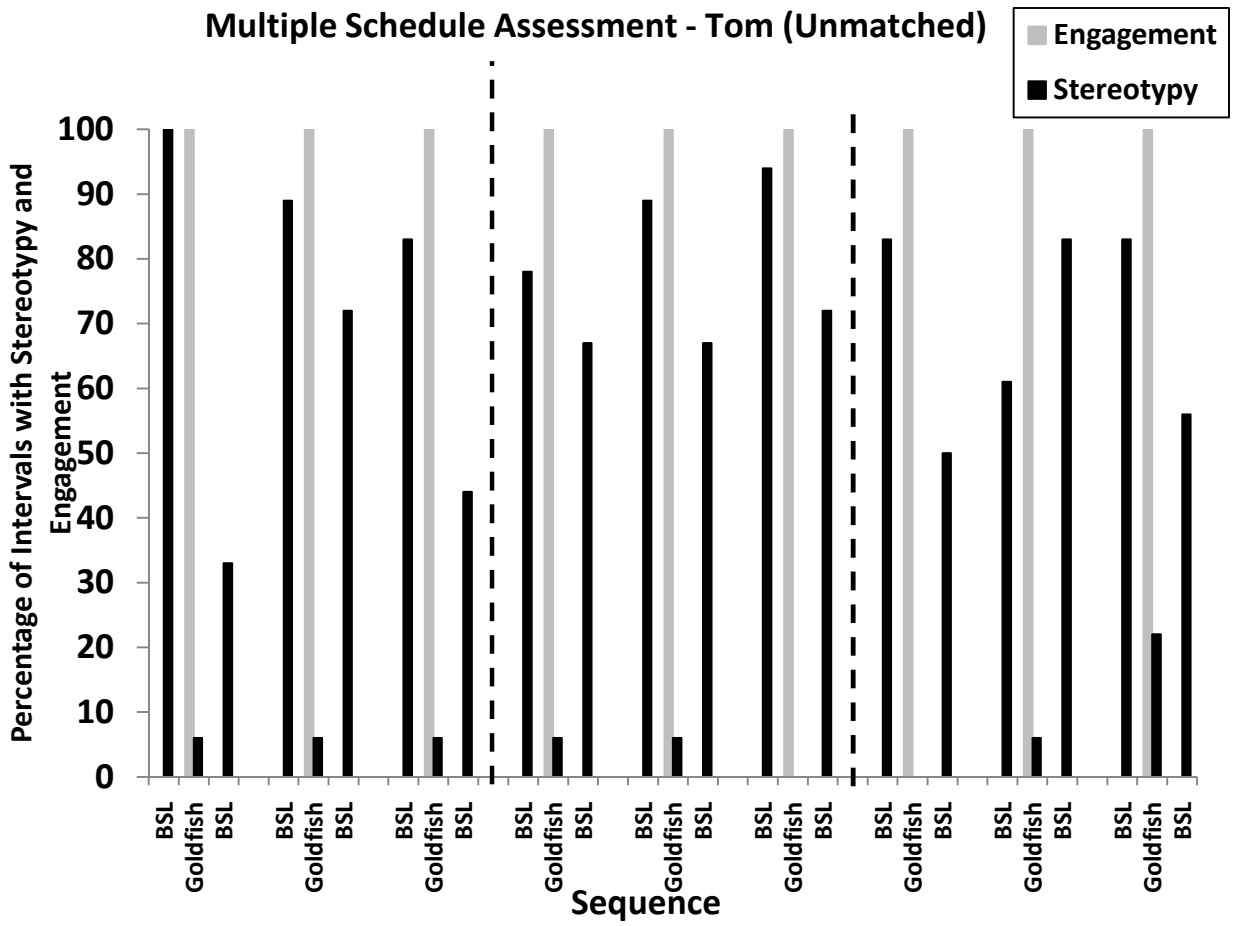

Figure 6: Percentage of automatically maintained problem behavior and percentage of item engagement during a competing items assessment.