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Bharucha, Delna, "Evaluating the use of a multiple schedule for identifying treatment and motivational effects" (2011). *Applied Behavioral Analysis Master's Theses.* Paper 70. http://hdl.handle.net/2047/d20001174

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Evaluating the Use of a Multiple Schedule for Identifying Treatment and Motivational Effects

A Thesis Presented

By

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The Department of Counseling and Applied Educational Psychology

In partial fulfillment of the requirements

for a degree of

Master of Science

in the field of

Applied Behavior Analysis

Northeastern University

Boston, MA

August 2011

Acknowledgements

I would like to thank The New England Center for Children for allowing me to conduct my research and the participants for their cooperation. I would like to thank Ashley and Mike for scoring IOA. I would also like to thank my thesis committee, Bill Ahearn, Jason Bourret, and Chata Dickson for their assistance in helping me through this process.

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Abstract

Many traditional treatment evaluations such as multiple baseline, alternating treatments, and withdrawal designs are effective but can be time and labor intensive. The purpose of this study was to evaluate the use of a multiple schedule as a method to rapidly identify treatment effects when implementing response interruption for stereotypic behavior. Additionally, given that it has been suggested that response blocking can produce an establishing operation for stereotypy (see, Rapp, 2006), this study also examined whether consistent motivative effects were obtained following response interruption. Participants were two teenage boys diagnosed with autism whose stereotypy was presumably maintained by automatic reinforcement. The multiple schedule analyses were arranged in which BL and response interruption components were alternated. Two types of response interruption were used for each participant. The multiple schedule analyses were then compared to the results of withdrawal design comparison of the same conditions (i.e., ABABACAC). Treatment effects were detected via a proportional analysis of the treatment relative to the baseline conditions for the multiple schedule analysis. More profound treatment effects were obtained during the ABABACAC comparisons. Abolishing operation effects were seen in with the RIRDm and RIRDv components, while establishing operation effects were seen with the RI component.

Evaluating the Use of a Multiple Schedule for Identifying Treatment Effects and Motivational Effects

In applied settings, it is important for clinicians to be able to move from behavioral assessments to treatments quickly and effectively. Traditional evaluation methods for treatment such as withdrawal, alternating treatments, and multiple baseline designs are all effective, however, they are time and labor intensive. These methods of treatment evaluations require more resources on the part of the clinician and more time on behalf of the participant, thus delaying the implementation of a treatment.

There are many studies that have effectively identified brief functional analyses and preference assessments procedures without compromising the validity and integrity of these clinical tools. These have enabled clinicians to move efficiently from behavioral assessment to treatment. There is a multitude of research and progress made in brief analyses and assessments while the field of brief treatment evaluations warrants more research.

Iwata, Dorsey, Slifer, Bauman, and Richman (1994/1982) standardized the use of the multi-element design to identify the functional cause of problem behavior when conducting an analog functional analysis. The target behavior they chose to assess was self-injury, and conditions consisted of attention, escape, alone and control (unstructured play). All sessions were 15 minutes in length and the analysis continued until stable rates of behavior were obtained, unstable levels continued in all conditions, or 12 days of

sessions were completed. The length of subject participant averaged 8 days or 30 sessions. There were nine participants in the study and a distinct maintaining contingency was identified for six of the participants. In 1994, Iwata, Pace, Dorsey, Zarcone, Vollmer, Smith et al., published an extension of this study, in which 152 participants' self-injury was assessed using the above procedure. Only 5 percent of the 152 cases included produced undifferentiated or inconclusive results.

In 1992, Derby et al. adapted functional analysis procedures described by Iwata, et al. (1994/1982) to fit a time limited outpatient clinic. In this study, 79 cases were evaluated in a 3-year period. The assessment method developed utilized the conditions of the Iwata study, however it consisted of a single session of each condition presented in a multi-element design. A replication phase was conducted in which conditions resulting in the highest and lowest levels of behavior were repeated. The time frame for the entire assessment was 90 minutes. A distinct maintaining condition was identified in 74% of cases, demonstrating that the brief functional analysis gave equally valid results in a shorter time frame.

Similar attempts have been made with preference assessments to reduce the time taken to conduct them, while maintaining the integrity of the results obtained. Since the development of the single-stimulus preference assessment (Pace, Ivancic, Edwards, Iwata, & Page, 1985), several studies have been conducted to evaluate and identify preferences more effectively and efficiently. A paired-stimulus assessment was developed, which resulted in better differentiation among stimuli and better prediction as to which stimuli would function as reinforcers when presented contingently (Fisher, Piazza, Bowman, Hagopian, Owens, & Slevin, 1992). There were preference assessments

conducted using multiple stimuli (DeLeon, & Iwata, 1996; Windsor, Piche, & Locke, 1994) that were less time consuming than the single or paired stimulus assessments. Deleon and Iwata (1996) compared paired stimulus, multiple stimulus with replacement and multiple stimulus (MS) without replacement formats (MSWO). They found that MSWO produced results that were comparable to the paired stimulus assessment in less time.

Repetitive behaviors, that do not serve a function in the environment, while not unique to individuals on the autism spectrum (Lewis & Bodfish, 1998), are one of its defining characteristics (Lewis & Bodfish; Rincover, 1978). Stereotypic behaviors can often interfere with skill acquisition and play and are socially stigmatizing (Rincover, 1978).

Stereotypic behaviors are considered to be operant behaviors maintained sensory consequences automatically produced by the behavior (Ahearn et al., 2003; Vollmer, 1994). Stereotypic behavior occurs independently of social consequences and can be hard to treat (Ahearn et al., 2007; Lovaas et al., 1987; Rapp & Vollmer, 2005; Vollmer, 1994). Since stereotypy is automatically maintained, and its consequences controlled by the individual emitting the behavior, stereotypy is often resistant to external consequences and processed such as extinction, punishment, and differential reinforcement (Vollmer, 1994). Despite such difficulties, treatments have been developed to successfully decrease rates of stereotypy.

Many treatments have been developed which were successful in decreasing rates of behavior maintained by automatic reinforcement. Response blocking with or without the use of redirection, differential reinforcement and interruption have all been shown to

successfully decrease stereotypy. In 1984, Fellner, Laroche and Sulzer-Azaroff conducted a study to evaluate the use of differential reinforcement and interruption in decreasing motor stereotypy. Their participant was a 6-year old girl diagnosed with a developmental disability. Results showed that DRO and DRI combined with interruption were more effective at decreasing stereotypy than DRO and DRI alone. In 2001, Hagopian and Adelinis used response blocking with and without redirection to successfully decrease pica. When they used response blocking to decrease pica they found that aggressions in the participant increased. When they added redirection to an acceptable food item pica was successfully treated and aggressions reduced to zero levels. In 2007, Ahearn, Clark, MacDonald and Chung used response interruption and redirection (RIRD) to decrease vocal stereotypy. Effects of RIRD were evaluated in an ABAB design, and results showed that RIRD successfully decreased stereotypy for all participants.

In 2006, Rapp evaluated the effects of noncontingent matched stimulation (NMS) and response blocking on the stereotypic behavior of one participant using a multiple schedule that consisted of three 15 min components. The components of the multiple schedule were preintervention, intervention and postintervention. This three component sequence was conducted thrice for both NMS and response blocking. Results showed that stereotypy always occurred at higher levels after response blocking relative to before response blocking. These results suggest that response blocking provides an establishing operation for stereotypy. When noncontingent matched stimulation was used, stereotypy would always occur at lower levels after NMS than before NMS, suggesting that NMS provided an abolishing operation for stereotypy.

The primary purpose of this study was to determine whether a multiple schedule design would predict treatment outcome. The secondary purposes of this study was assess the relative efficacy of different forms of response interruption to decrease stereotypy and to compare various forms of response blocking to assess whether they serve as establishing operations for stereotypy.

Method

Participants

There were two participants in this study. Both participants were 15-year old males diagnosed with an autism spectrum disorder and received clinical and educational services in a residential setting. Ike and Ken communicated vocally using full sentences. They were also able to answer a variety of social questions and participated in various academic and vocational activities through the day. For Ike motor stereotypy was measured, consisting of non-functional and repetitive movements of the jaw and mouth, almost like an exaggerated chewing motion. For Ken measured vocal stereotypy was measured, termed as stereotypic self-talk. This consisted of Ken engaging in self- talk not pertinent to the ongoing task or conversation, without making eye contact.

Ike and Ken were included in this study because educational and clinical service providers noted that their stereotypy was socially stigmatizing and interfered with educational services and persisted across environments and activities.

Settings and Materials

Functional analysis sessions were conducted in a room (1.5 m by 3 m) equipped with wide-angle video camera, microphone, video equipment, materials necessary to conduct the experimental conditions, and a table with two chairs.

All assessment and treatment sessions were conducted in the student's classroom cubicles. Sessions were videotaped using a digital video recorder places on a tripod. A timer was used during the baseline and treatment sessions.

Response Measurement and Interobserver Agreement

Motor stereotypy was defined as any instance of non-contextual and non-functional mouth motor movement, similar to but not limited exaggerated chewing motions. This definition did not include the participant chewing any edibles. *Vocal stereotypy* was defined as any instance of non-contextual and non-functional self -talk that could or could not be paired with eye contact. This definition did not include if the participant asked a relevant question (paired with eye contact), such as "What is the time?" or made a relevant comment (paired with eye contact), such as "I am hungry. I can't wait for lunch." During functional analysis sessions, data on stereotypy were collected using 10-s momentary time sampling. During treatment sessions, stereotypy data were collected using continuous duration recording, and were converted into a percentage of occurrences per session by dividing the total number of seconds of stereotypy by the total number of seconds in the session and multiplying by 100.

Two independent observers recorded responding for 33% of the sessions across all phases, conditions, and participants. For the functional analysis, interobserver agreement was calculated by dividing the number of interval agreements by the number of agreements plus disagreements and multiplying by 100. Mean total agreement for motor stereotypy for Ike was 90% (range, 75%-95%) and for vocal stereotypy for Ken was 100%. For treatment phases, exact agreement (total seconds of stereotypy in a session recorded by each observer) was calculated and mean agreement was 90% for Ike

(range, 70%-95%) and 95% for Ken (range, 85% - 100%) for the brief treatment analysis; and 92% for Ike (range, 75% -95%) and 93% for Ken (range, 80-95%) for the extended treatment analysis.

Paired Stimulus Assessment

A paired stimulus assessment for leisure items was conducted based on the Fisher et al. (1992) method for identifying preference. For each participant eight leisure activities were assessed. Each leisure activity was paired once with every other activity in a randomized order for a total of 52 stimulus-paired presentations. If the participant approached one of the leisure activities they had access to it for 5 s. If the participant approached both the leisure activities it was blocked. For Ike, coloring, drawing, discovery viewer, magna doodle, play dough, books, legos and puzzles were assessed. For Ken, DVD, comic book, discovery viewer, magna doodle, coloring book, story book, legos, puzzle were assessed.

Functional Analysis

For Ike's functional analysis of motor stereotypy, alone, attention, demand and toy play (control) conditions were alternated using a multi-element design. While for Ken's functional analysis of stereotypic self-talk, alone, attention and demand conditions were assessed. The sequence of conditions was alone, alone, attention; alone, alone, demand (Roscoe, Carreau, MacDonald, & Pence, 2008). Each session lasted for 5 min.

During the alone condition, the participants' were left alone in a room equipped only with two chairs and a table, and was monitored using a two- way mirror. During the alone condition, the therapist presented moderately preferred leisure activities, identified from a recent preference assessment to the participant and delivered verbal attention (e.g.,

"Ken, stop that.") contingent on the occurrence of stereotypy. During the demand condition, the therapist presented academic demands which were removed for 15 s contingent on the occurrence of stereotypy. Demands were those typically seen in the participants' regular academic programming and were not mastered (80% or less accuracy and independence). During the toy play (control) condition for Ike, the room was equipped with moderately preferred toys and activities. The therapist interacted with Ike (delivered toys or spoke to Ike). Ike's clinical specialist wanted to include this condition.

Procedure

Baseline. During baseline sessions, a moderately preferred item was presented to the participants. When the participants emitted stereotypy, the therapist neutrally removed the item. The therapist redelivered the item contingent on the participants' mands (i.e., 'I want X.') for the item in the absence of vocal stereotypy. This condition approximated contingencies that typically occurred in the natural environment. If the participant manded for an item other than the moderately preferred item presented at the start of the session, the therapist would respond, 'nice asking, you can have X later.' If the participant tacted (i.e., 'That's an X.') an item in the room the therapist would respond, 'that's right, that's a(n) X." All other behaviors were ignored.

Response Interruption and Redirection – motor (RIRDm). During response interruption and redirection- motor (RIRDm) sessions conducted with Ike, a moderately preferred item was present, but out of the participant's reach. Least to most prompting was used to prompt the participant to mand for the item. If the participant manded for the item it was delivered by the therapist. When the participant emitted stereotypy, the

therapist neutrally removed item, then prompted known motor responses (e.g., touch nose, touch mouth, clap hands, etc.) until the participant independently complied with 3 consecutive motor responses in the absence of stereotypy. Immediately following the procedure, the therapist again prompted the participant to mand for the item. In order to allow the participant equal opportunities to engage in vocal stereotypy across baseline and treatment sessions, the session timer was stopped at the onset of the RIRDm procedure and was started following the participant independently complying with 3 consecutive motor responses. All other conditions remained the same from baseline.

Response Interruption and Redirection – vocal (RIRDv). Response interruption and redirection- vocal (RIRDv) sessions were conducted in the same manner as RIRDm sessions with one modification: following stereotypy the therapist would present vocal compliances (e.g., "What is your name?", "How old are you?") until the participant independently complied with 3 consecutive vocal responses in the absence of stereotypy.

Response Interruption – (RI). Response interruption (RI) sessions conducted with Ken were conducted in the same manner as RIRDm sessions with one modification: following the Ken's vocal stereotypy the therapist would make comments (e.g., "It is hot today.", "Today the school lunch is pizza") until Ken would reciprocate a comment, statement or question pertaining to the topic, for 3 consecutive statements, in the absence of stereotypic self- talk.

Experimental Design

Brief Treatment Analysis. A multiple schedule was used in order to rapidly detect the effect of different conditions on the rate of behavior. Multiple schedule

sessions were conducted once per day and lasted for 15 minutes. Sessions were composed of a 5-component sequence which alternated baseline and treatment conditions. Each sequence component was 3 min. One multiple schedule sequence was conducted each day, across 5 days.

There were two sequences run for each participant. For Ike the first sequence was a RIRDm sequence that consisted of baseline, RIRDm, baseline, RIRDm, and baseline. The second was a RIRDv sequence, which consisted of baseline, RIRDv, baseline, RIRDv, and baseline. Ken's clinician wanted to compare response interruption (RI) with response interruption and vocal redirection (RIRDv) for his vocal stereotypy. The first sequence run for Ken was baseline, RI, baseline, RI, and baseline. The second sequence run was baseline, RIRDv, baseline, RIRDv, and baseline. Three RIRDm/RI sequences were run followed by three RIRDv sequences.

Extended Treatment Analysis. An ABABACAC design in which baseline (A), RIRDm (B_1)/RI (B_2), and RIRDv (C) were alternated to determine the effects of the treatment procedures on motor and vocal stereotypy. Between 2-5 sessions were conducted each day, each lasting 5 min.

Results

Results of Ike's functional analysis are seen in Figure 1. Motor stereotypy occurred in all conditions and was highest in the alone condition indicating that Ike's motor stereotypy was automatically maintained. Figure 2 shows the functional analysis for Ken. Vocal stereotypy did not occur in demand condition, was low in the attention condition and highest in the alone condition indicating that it was automatically maintained. Figure 3 shows the results for Ike's preference assessment. Book was the

moderately preferred leisure item that was used during treatment conditions. Results for Ken's preference assessment can be seen in Figure 4. For Ken magna doodle was the moderately preferred leisure item used during treatment conditions.

Results for Ike's brief multiple schedule analyses along with depiction of motivational operations are seen in Figures 5 and 7. Figure 5 shows results from the RIRDm component sequences. From the graph it can see that there was variable occurrence of motor stereotypy through the baselines and treatments across the component sequence 1. There was an increase in stereotypy from the last baseline to the first baseline indicating that there was an establishing operation in effect. In component sequence 2, motor stereotypy in the treatment conditions was less than the motor stereotypy in baseline conditions, however in the last baseline there was no responding. Since there was no responding in the last baseline, there was an abolishing effect seen from the first baseline to last. In component sequence 3, motor stereotypy in the treatment conditions was less than the motor stereotypy in baseline conditions. There was a decrease in stereotypy from the first baseline to the last baseline indicating that there was an abolishing operation in effect. Across the 3 component sequences an establishing operation was seen since there was no responding in the first baseline of component sequence 1 and there was a moderate level of responding in the last baseline of component sequence 3.

Proportional data were calculated by dividing the average percent occurrence of stereotypy during treatment by the average percent occurrence of vocal stereotypy during baseline for each component sequence. If proportions were equal to, or greater than one, this would indicate that no treatment effect was obtained. Proportional data for Ike's

RIRDm multiple schedule analysis can be seen in Figure 6. Stereotypy occurred 9.84, 0.77, and 0.41 (M=3.67) of baseline across the three RIRDm component sequences. This indicates that there was no treatment effect overall. However component sequence 1 skews the mean data.

Figure 7 shows results from the RIRDv component sequences. In each of the 3 component sequences the motor stereotypy in treatment is less than the motor stereotypy in the baseline preceding it. There is an exception in component sequence 3 where the motor stereotypy in the first treatment condition is more than the stereotypy in the baseline preceding it. In component sequence 1 and 2 the stereotypy in the last baseline is less than the stereotypy in the first baseline indicating an abolishing operation effect. While in component sequence 3 the stereotypy in the last baseline is more than the stereotypy in the first baseline indicating an establishing operation effect. Across the 3 component sequences there was an abolishing operation since the stereotypy in the last baseline of component sequence 3 was less than the stereotypy in the first baseline of component sequence 1.

Table 1 depicts Ike's averages for baselines and treatments for the multiple schedule and withdrawal designs, along with the motivation operations effect. The averages for each component sequence in the multiple schedules were calculated in the following manner; average of first baselines, average of first treatments, average of second baselines, average of second treatments and average of third baselines. The averages for the withdrawal design were calculated in the following manner; average of first sequence of baselines, average of first sequence of treatment 1(e.g,. Ike=RIRDv and Ken=RI), average of second baselines, average of second sequence of treatment 1,

average of third baselines, average of first sequence of treatment 2 (e.g., Ike=RIRDm, Ken=RIRDv), average of fourth baselines, and average of second sequence of treatment 2. From Table 1, for the withdrawal design, we can see that for the RIRDv component (Baseline 1 M=36.25, Baseline 2 M= 23.6) there is an abolishing effect seen while for the RIRDm component (Baseline 3 M=10.8, Baseline 4 M=30.67) there is an establishing effect seen. In the withdrawal design from the first baseline (M=36.25) to the last baseline (M=30.67) there is an abolishing effect seen.

Proportional data for Ike's RIRDv multiple schedule analysis can be seen in Figure 8. Treatment effect across sequences was variable with treatment levels of motor stereotypy occurring 0.63, 0.48, and 0.66 (M=0.59) those seen in baseline. Overall M=0.59 of baseline indicates a 41% treatment effect.

Figures 9 and 11 are results for Ken's multiple schedule analyses along with depiction of motivational operations. Figure 9 shows results from the RI component sequences. Vocal stereotypy in each treatment component was less than vocal stereotypy in each baseline preceding it, across all 3 component sequences. In component sequence 1 there was a decrease in vocal stereotypy from the first baseline to the last baseline indicating an abolishing operation effect. In component sequences 2 and 3 there was an increase in vocal stereotypy from the first baselines to the last baselines indicating establishing operation effects. Across the 3 component sequences there was an abolishing operation since the stereotypy in the last baseline of component sequence 3 was less than the stereotypy in the first baseline of component sequence 1. Proportional data for Ken's RI multiple schedule analysis can be seen in Figure 10. Treatment levels of motor

stereotypy occurring 0.21, 0.32, and 0.21 (M=0.25) those seen in baseline. Overall M=0.25 of baseline indicates a 75% treatment effect.

Figure 11 shows results from the RIRDv component sequences. Vocal stereotypy in each treatment component was less than vocal stereotypy in each baseline preceding it, across all 3 component sequences. In each of the component sequences the stereotypy in the last baselines was less than the stereotypy in the first baselines indicating abolishing operation effects for each of the 3 components. There was also an abolishing operation effect across the 3 components. Table 2 depicts Ken's averages for baselines and treatments for the multiple schedule and withdrawal designs, along with the motivation operations effect. From Table 1, for the withdrawal design, we can see that for the RI component (Baseline 1 M=15.22, Baseline 2 M= 8.56) there is an abolishing effect seen while for the RIRDv component (Baseline 3 M=6.25, Baseline 4 M=12.22) there is an establishing effect seen. In the withdrawal design from the first baseline (M=15.22) to the last baseline (M=12.22) there is an abolishing effect seen.

Proportional data for Ken's RIRDv multiple schedule analysis can be seen in Figure 12. Treatment effect across sequences was variable with treatment levels of motor stereotypy occurring 0.27, 0.25, and 0.64 (M=0.39) those seen in baseline. Overall M=0.39 of baseline indicates a 61% treatment effect.

Results of Ike's extended withdrawal design analysis are seen in Figure 13. From Ike's multiple schedule proportional data analysis we infer that vocal compliances were more effective so the withdrawal design was started with RIRDv sequence. During initial baseline motor stereotypy occurred at moderately high levels, followed by an immediate decrease to low levels when RIRDv was introduced. During return to baseline, there was

an increase in levels of stereotypy with immediate decrease to low levels during the reversal to RIRDv. During the third return to baseline, there was a gradual increase in levels of stereotypy. When RIRDm was introduced there was a gradual decrease in levels of motor stereotypy. During the final return to baseline there was an increase in levels of stereotypy with a decrease in levels of stereotypy during reversal to RIRDm.

Ken's withdrawal design is depicted in Figure 14. From Ken's multiple schedule proportional data analysis we infer that response interruption without redirection was more effective so the withdrawal design was started with RI sequence. During initial baseline vocal stereotypy occurred at moderate levels, followed by an immediate decrease to low levels when RI was introduced. During return to baseline, there was a gradual increase in levels of stereotypy with immediate decrease to low levels during the reversal to RI. During the third return to baseline, there was a gradual increase in levels of stereotypy. When RIRDv was introduced there was a decreasing trend in levels of vocal stereotypy. During the final return to baseline there was an increasing trend in levels of stereotypy with a decrease in levels of stereotypy during reversal to RIRDv.

Figure 15 shows the comparison between proportional data for the multiple schedule and withdrawal designs for both participants. For Ike, the multiple schedule did not predict treatment effect for his RIRDm sequence. However keep in mind that component sequence 1 which was 9.84 skewed the mean (M=3.67). If we were to take that component sequence out of the mean calculation the remaining two component sequences (M=0.59) were predictors of treatment effect. Proportional data for Ike's RIRDm withdrawal treatment (M=0.5) showed that there was a 50% treatment effect. For Ike, the multiple schedule for the RIRDv sequence (M=0.59) demonstrated 41%

treatment effect, while the withdrawal RIRDv sequence (M=0.24) demonstrated a 76% treatment effect. . For Ken, the multiple schedule (M=0.25) predicted 75% treatment effect for the RI sequence. Proportional data for Ken's RI withdrawal treatment (M=0.18) showed that there was 82% treatment effect. For Ken, the multiple schedule for the RIRDv sequence (M=0.39) demonstrated 61% treatment effect, while the withdrawal RIRDv sequence (M=0.17) demonstrated 83% treatment effect.

Discussion

The multiple schedule design used for the brief treatment analysis was a predictor for treatment effect for Ken's response interruption (RI) and Ken and Ike's response interruption with vocal redirection (RIRDv). If we do not include component sequence 1 (M=9.84) of Ike's motor interruption procedure, which skewed the mean then the multiple schedule design was also a predictor for Ike's response interruption with motor redirection (RIRDm) sequence. The withdrawal design used for the extended treatment analysis demonstrated higher rates of treatment effect across both participants and across all sequences.

For Ike the vocal interruption (Brief M=0.59, Extended M=0.24) was a better response interruption treatment than the motor interruption (Brief M=3.67, Extended M=0.5). For Ken the response interruption (Brief M=0.25, Extended M=0.18) was a slightly better treatment than the response interruption with vocal compliances (Brief M=0.29, Extended M=0.17). Hence for different individuals different response interruption procedures may prove to be more effective treatments.

For Ike, during the multiple schedule and withdrawal design analyses there was an overall consistent abolishing operation effect observed, while using vocal and motor

compliances. For Ken, when RI was used during the multiple schedule design an establishing operation effect was seen. However, when using RIRDv during the multiple schedule design an abolishing operation effect is observed. Ken's withdrawal design depicts an overall abolishing operation effect.

This study is an extension of previous literature in two ways. First, it supports the findings of Ahearn et al. (2007), in that both participant's motor and vocal stereotypy were decreased using response interruption and redirection. Second it supports the use of brief treatment analysis as a means to identify treatment effects (Rapp, 2006). However further research with more participants and different types of response interruption procedures is needed to determine whether the brief treatment analysis is a reliable way in which to identify treatment effects.

The methods used in this study are just one way to identify potential motivating operations; this study is not an assertion of motivating operations. The motivating operations results in this study are opposite Rapp's 2006 results. In Rapp's study there are establishing operations observed, while in this study there are abolishing effects observed. One reason could be that the methodology in the current study was slightly different from Rapp's in two ways; the duration of each multiple schedule component in our study was 3 min long while the duration of each multiple schedule component in the Rapp study was 5 min long, in Rapp' study there were only 3 components to each sequence (preintervention, intervention, post intervention) while in the current study we had a 5 component sequence (BL, TX, BL, TX, BL). A question to consider for future research into motivating operations; is there a way to determine a criterion baseline for stereotypy that can be set to compare the deviation of stereotypy from the overall mean

(e.g. levels of stereotypy in the participant's alone condition could serve as a criterion baseline for that participant).

The language of motivating operations is one way of looking at the results of the study. Another way to understand the results of the study could be through extinction or punishment processes (Lerman & Iwata, 1996; Smith, Russo & Le, 1999). What is an abolishing effect can also be understood in terms of punishment. The response interruption procedure may be punisher for stereotypy thus reducing levels of stereotypy in baselines subsequent to treatment, thus showing a punishment effect. An establishing effect can be understood in terms of extinction whereby if the response interruption procedures represented an extinction effect then in the baselines following the procedure there would be higher levels of stereotypy showing an extinction burst. Further research must be conducted to better understand the underlying processes and operations during response interruption procedures.

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Windsor, J., Piché, L.M., & Locke, P.A. (1994). Preference testing: A comparison of two presentation methods. *Research in developmental disabilities, 15,* 439-455.

Table 1

Ike's establishing operations table showing average baseline and treatment data for each component sequence of the multiple schedule and withdrawal designs.

BL(R	TX	BL	TX	BL							
IRD											
m)											
5.67	3.16	4.4	***AO***	3.5	3.5	***AO***	**AO**				
BL(R	TX	BL	TX	BL							
IRDv											
)											
16.67	6.67	9.3	***AO***	6.67	9.3	**-**	**AO**				
BL	RIR	BL	RIR	BL	RIR	BL	RIRDm				
	Dv		Dv		Dm						
36.25	13	23.	***A***	2.67	10.8	***AO***	8.63	30.6	***E***	**A**	6.2
		6	***O***					7	***O***	**O**	

Table 2

Ken's establishing operations table showing average baseline and treatment data for each component sequence of the multiple schedule and withdrawal designs.

BL(RI)	TX	BL	TX	BL			
29.33	7.17	16	***AO***	5.33	30.67	***EO***	**EO**
BL(RIRDv)	TX	BL	TX	BL			
14.61	4.19	4.07	***AO***	0.72	1.11	***AO***	**AO**
BL	RI	BL	RI	BL	RIRDv	BL	RIRDv
15.22	2.44	8.5	***A***	1.67	6.25	***AO***	1.67
		6	***O***				
12.2	***E***	**A**	0.89				
2	***O***	**O**					

Figure Captions

Figure 1. Results of Ike's functional analysis. Motor stereotypy occurred at highest levels during alone condition, suggesting that it was automatically reinforced.

Figure 2. Results of Ken's functional analysis. Vocal stereotypy occurred at highest levels during the alone condition, suggesting the behavior was automatically reinforced.

Figure 3. Results of Ike's paired-stimulus preference assessment. Book was chosen as the moderately preferred item during sessions.

Figure 4. Results of Ken's paired-stimulus preference assessment. Magna doodle was chosen as the moderately preferred item during sessions.

Figure 5. Results of Ike's RIRDm multiple schedule analysis along with depiction of motivational operations.

Figure 6. Proportional data for Ike's RIRDm brief treatment analysis.

Figure 7. Results of Ike's RIRDv multiple schedule analysis along with depiction of motivational operations.

Figure 8. Proportional data for Ike's RIRDv brief treatment analysis.

Figure 9. Results for Ken's RI multiple schedule analysis along with depiction of motivational operations.

Figure 10. Proportional data for Ken's RI brief treatment analysis.

Figure 11. Results for Ken's RIRDv multiple schedule analysis along with depiction of motivational operations.

Figure 12. Proportional data for Ken's RIRDv brief treatment analysis.

Figure 13. Results for Ike's withdrawal treatment analysis.

Figure 14. Results for Ken's withdrawal treatment analysis.

Figure 15. Comparison of Ike and Ken's proportional data for multiple schedule and withdrawal analysis.

Figure 1

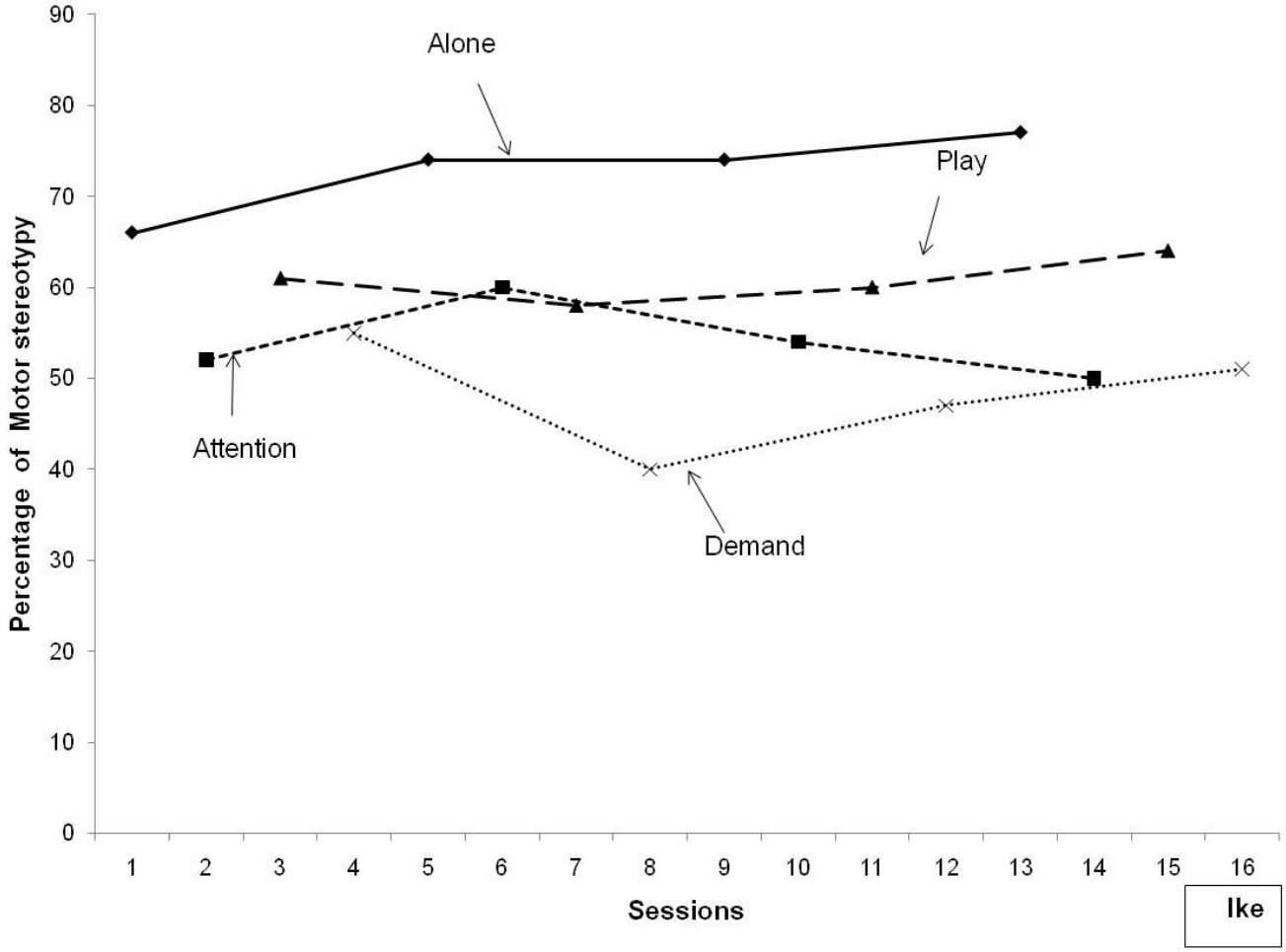

Alone
Play
Attention
Demand
Percentage of Motor stereotypy
Sessions
Ike
0
10
20
30
40
50
60
70
80
90
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

Figure 2

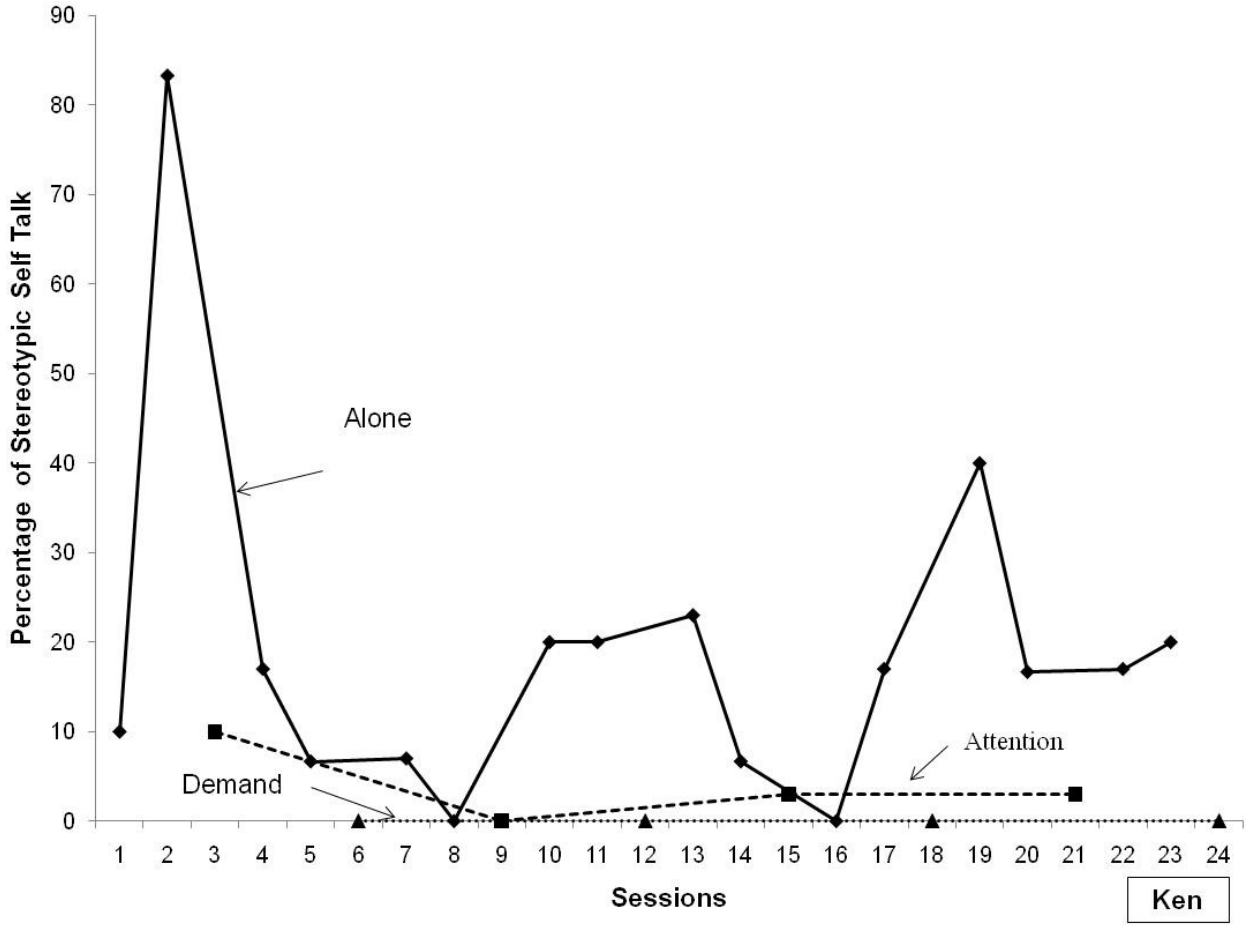

Percentage of Stereotypic Self Talk
90
80
70
60
50
40
30
20
10
0
Alone
Demand
Attention
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Sessions
Ken

Figure 3

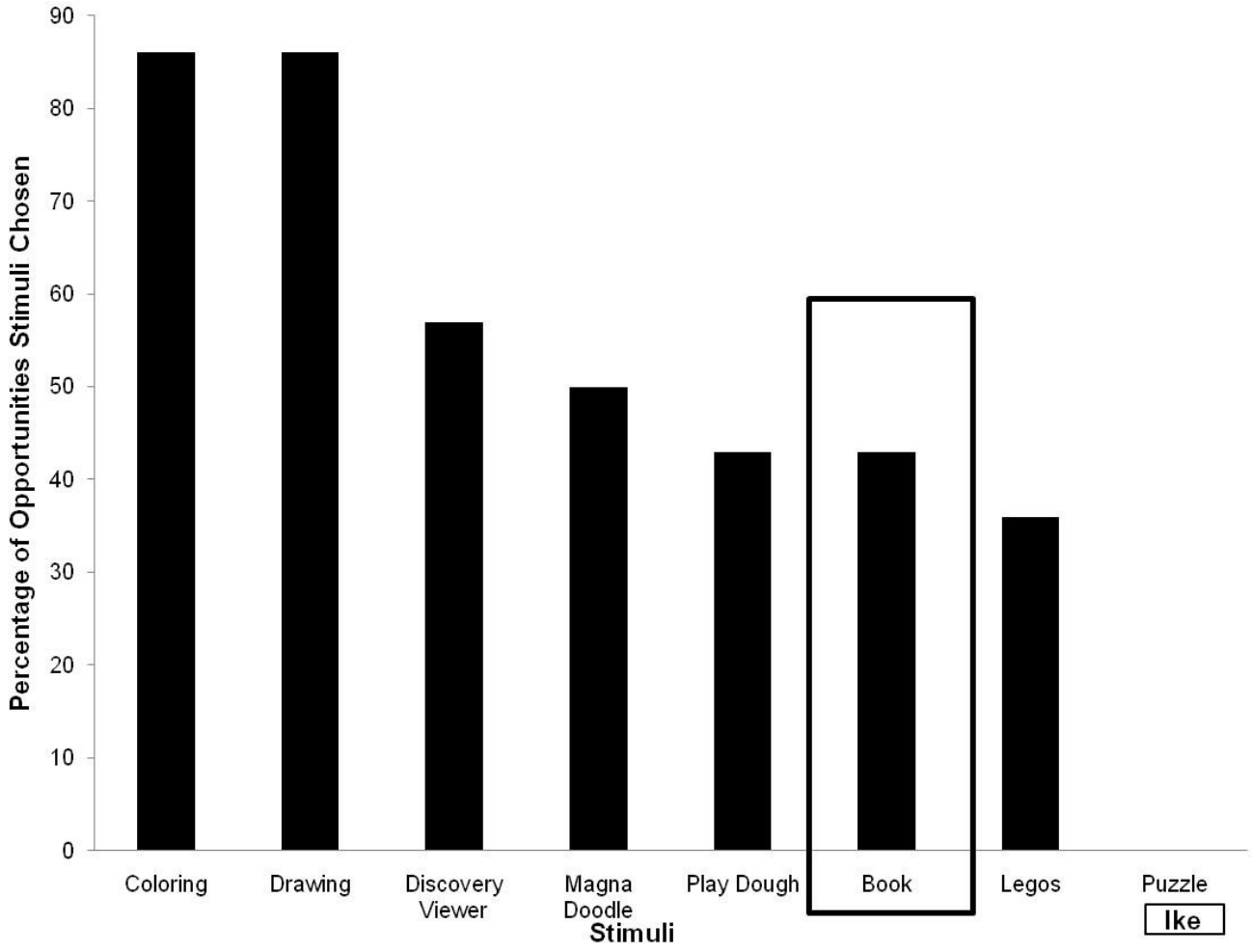

Percentage of Opportunities Stimuli Chosen
90
80
70
60
50
40
30
20
10
0
Coloring
Drawing
Discovery Viewer
Magna Doodle
Play Dough
Book
Legos
Puzzle
Ike
Stimuli

Figure 4

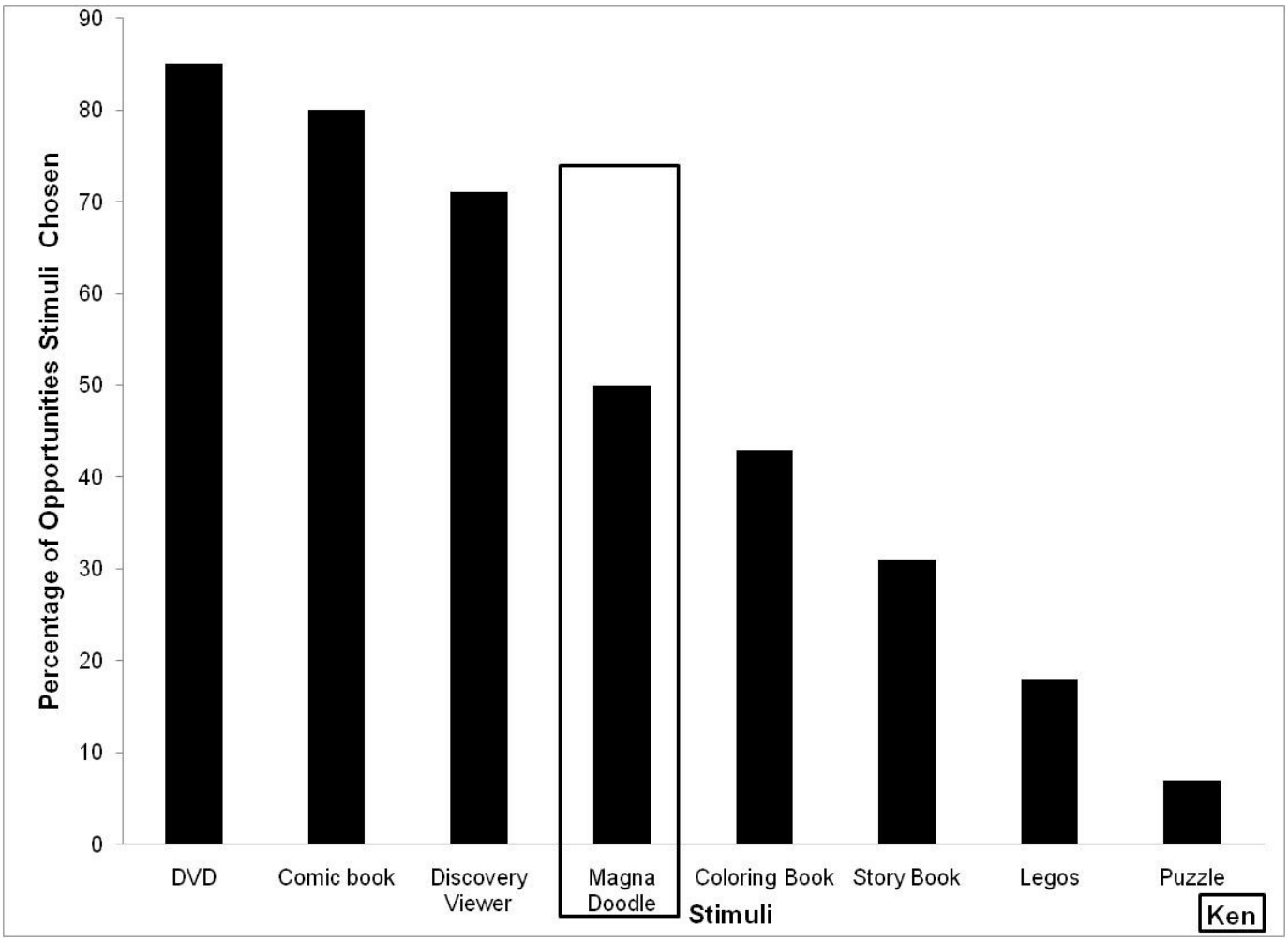

Percentage of Opportunities Stimuli Chosen
90
80
70
60
50
40
30
20
10
0
DVD
Comic book
Discovery Viewer
Magna Doodle
Coloring Book
Story Book
Legos
Puzzle
Stimuli
Ken

Figure 5

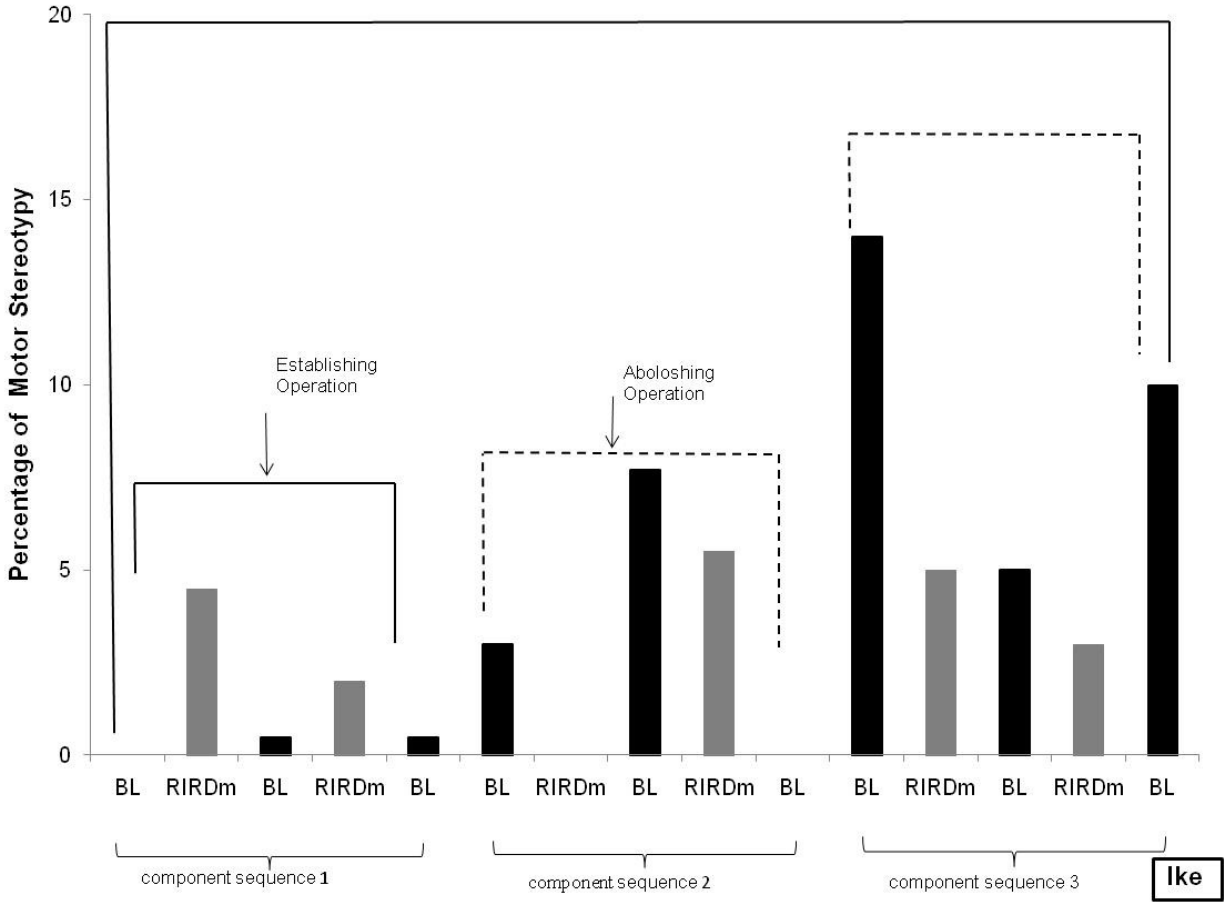

20
15
10
5
0
Percentage of Motor Stereotypy
Establishing Operation
Aboloshing Operation
BL
RIRDm
BL
RIRDm
BL
BL
RIRDm
BL
RIRDm
BL
BL
RIRDm
BL
RIRDm
BL
component sequence 1
component sequence 2
component sequence 3
Ike

Figure 6

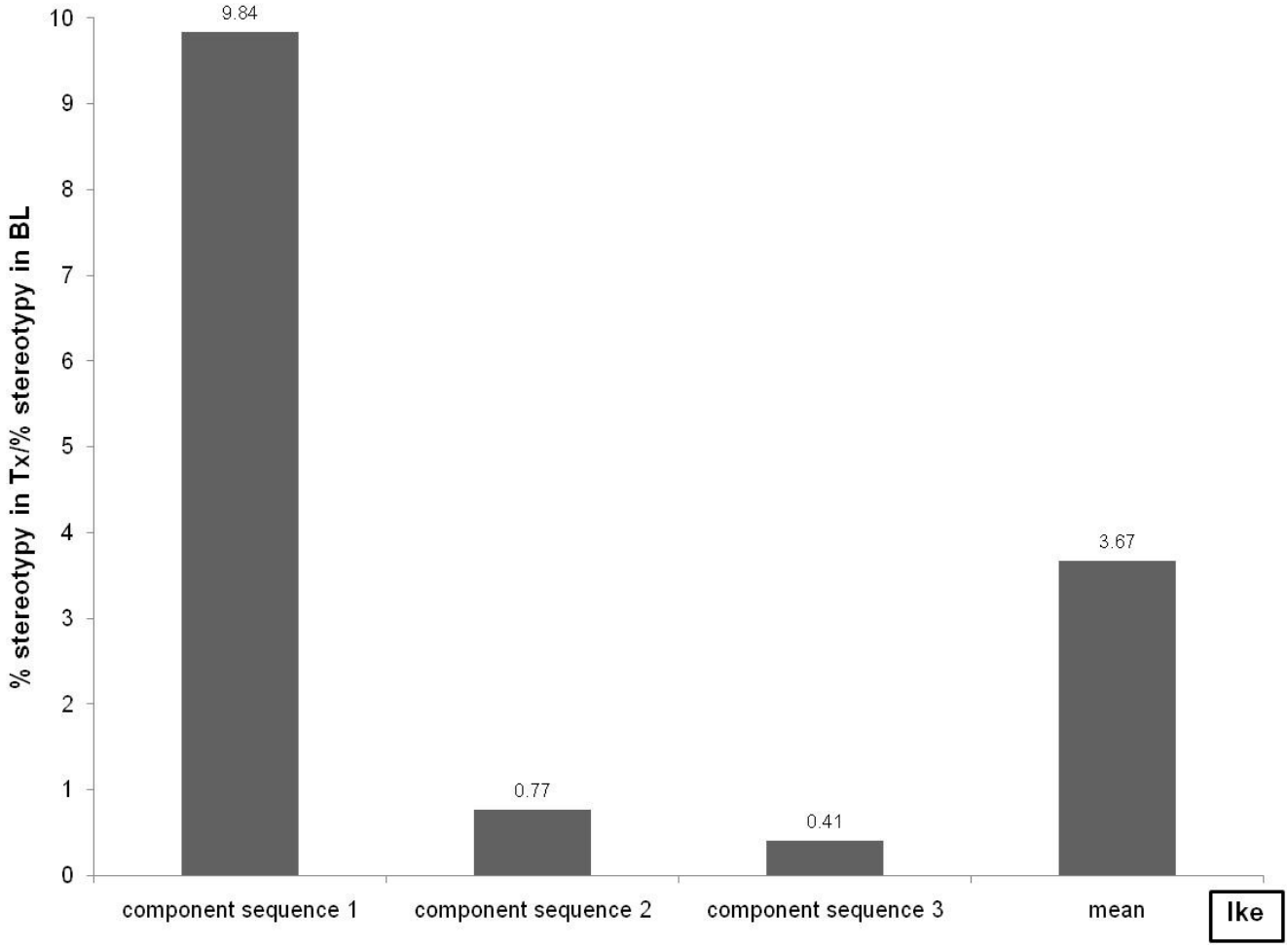

% stereotypy in Tx/% stereotypy in BL
10
9
8
7
6
5
4
3
2
1
0
9.84
0.77
0.41
3.67
component sequence 1
component sequence 2
component sequence 3
mean
Ike

Figure 7

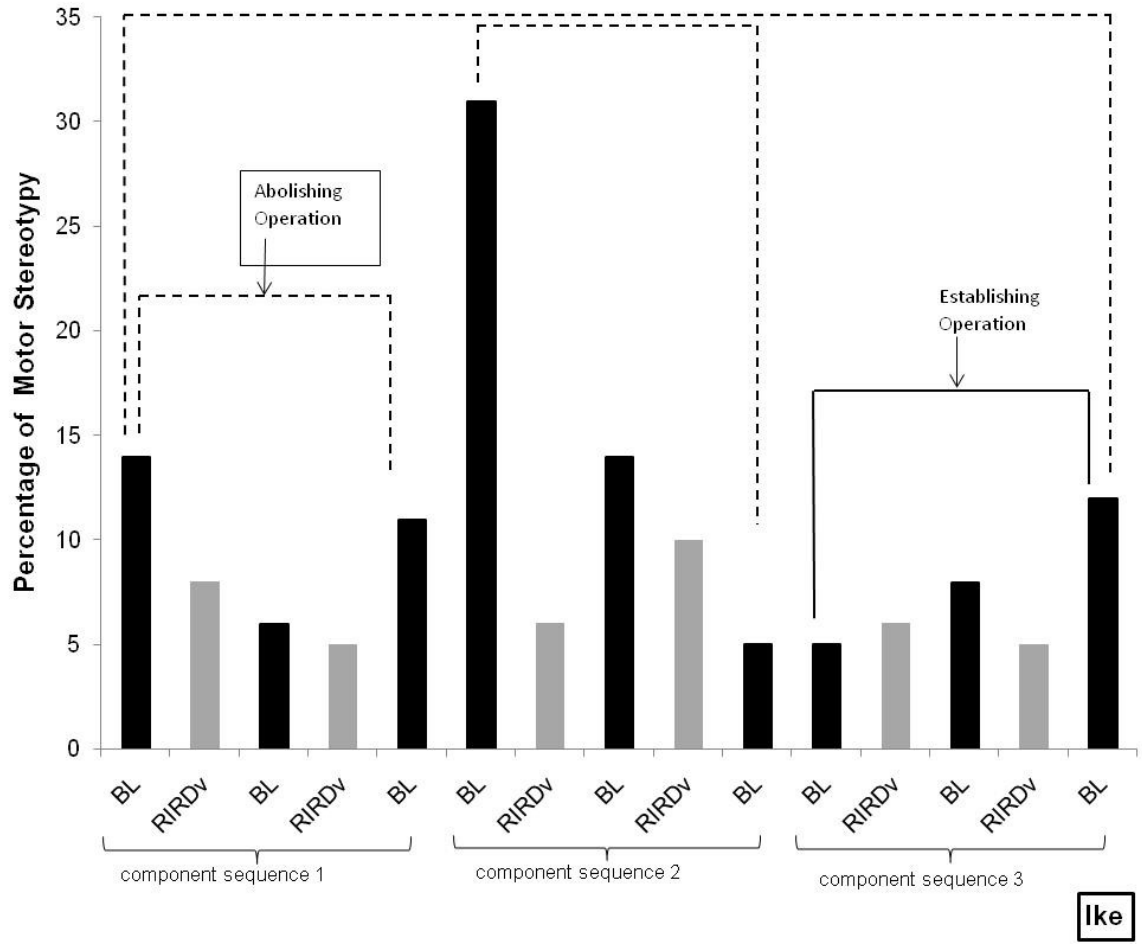

Percentage of Motor Stereotypy
35
30
25
20
15
10
5
0
Abolishing Operation
Establishing Operation
BL
RIRDv
BL
RIRDv
BL
BL
RIRDv
BL
RIRDv
BL
BL
RIRDv
BL
RIRDv
BL
component sequence 1
component sequence 2
component sequence 3
Ike

Figure 8

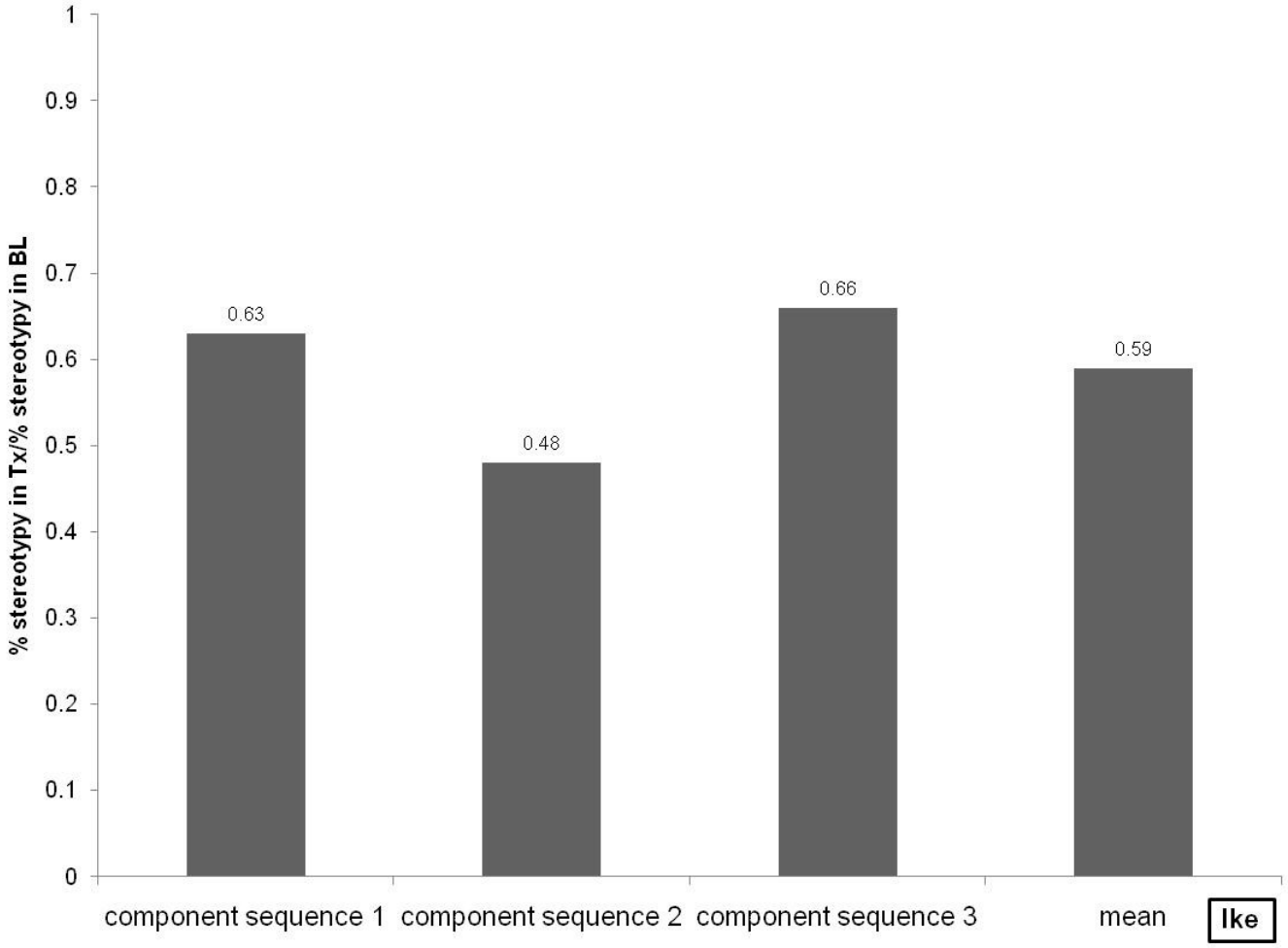

% stereotypy in Tx/% stereotypy in BL
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.63
0.48
0.66
0.59
component sequence 1
component sequence 2
component sequence 3
mean
Ike

Figure 9

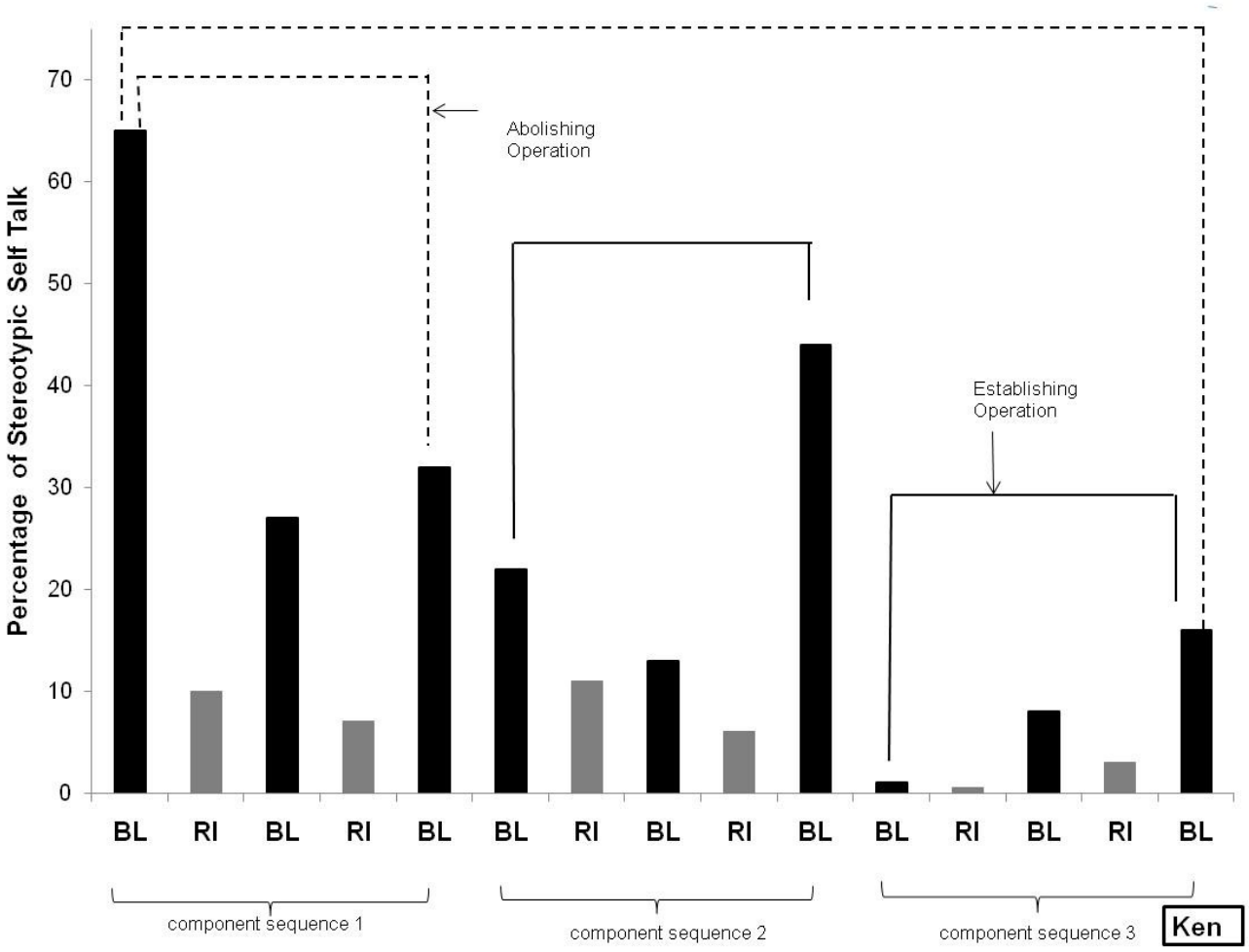

Percentage of Stereotypic Self Talk
70
60
50
40
30
20
10
0
Abolishing Operation
Establishing Operation
BL
RI
BL
RI
BL
BL
RI
BL
RI
BL
BL
RI
BL
RI
BL
component sequence 1
component sequence 2
component sequence 3
Ken

Figure 10

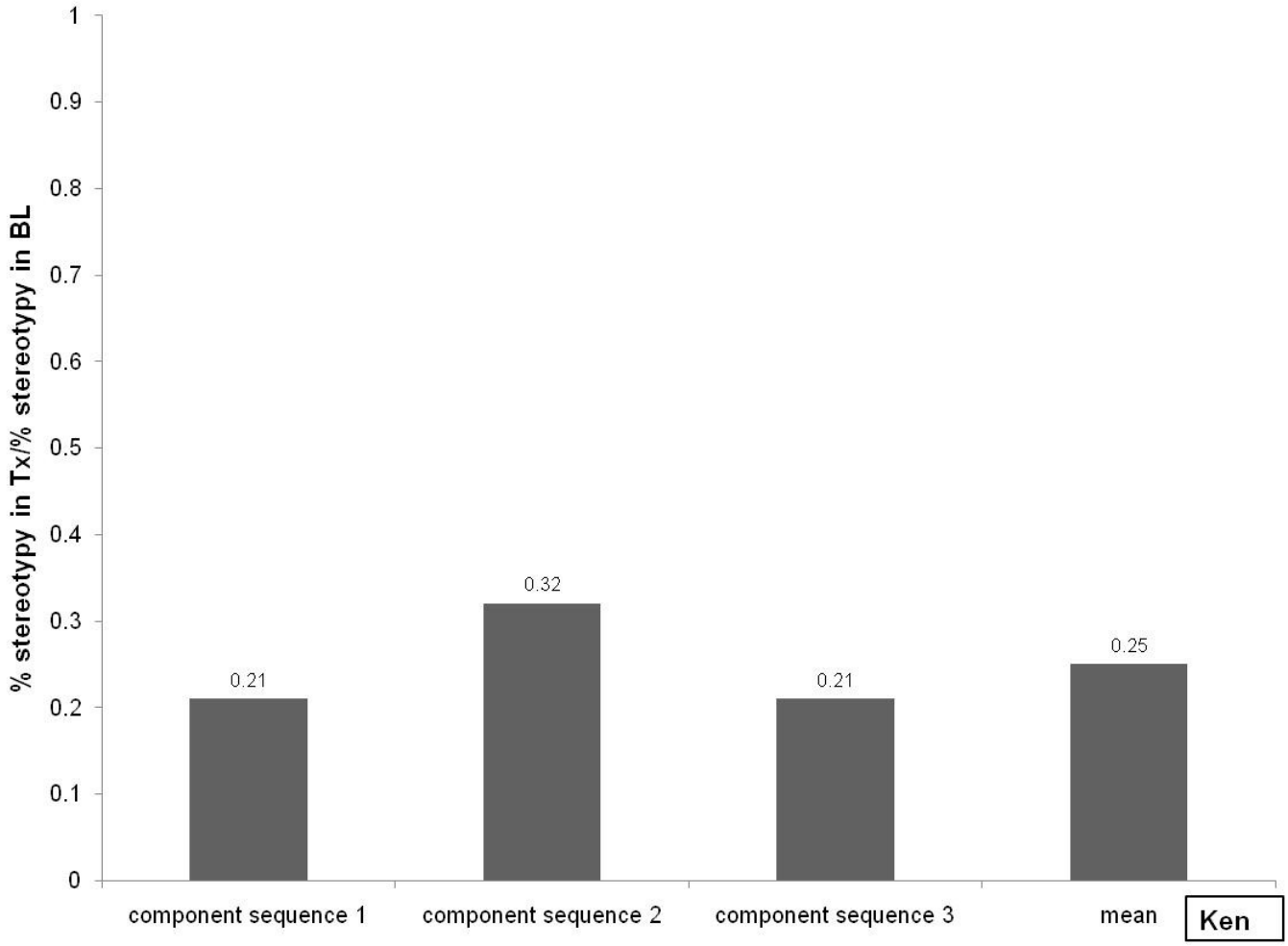

% stereotypy in Tx/% stereotypy in BL
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.21
0.32
0.21
0.25
component sequence 1
component sequence 2
component sequence 3
mean
Ken

Figure 11

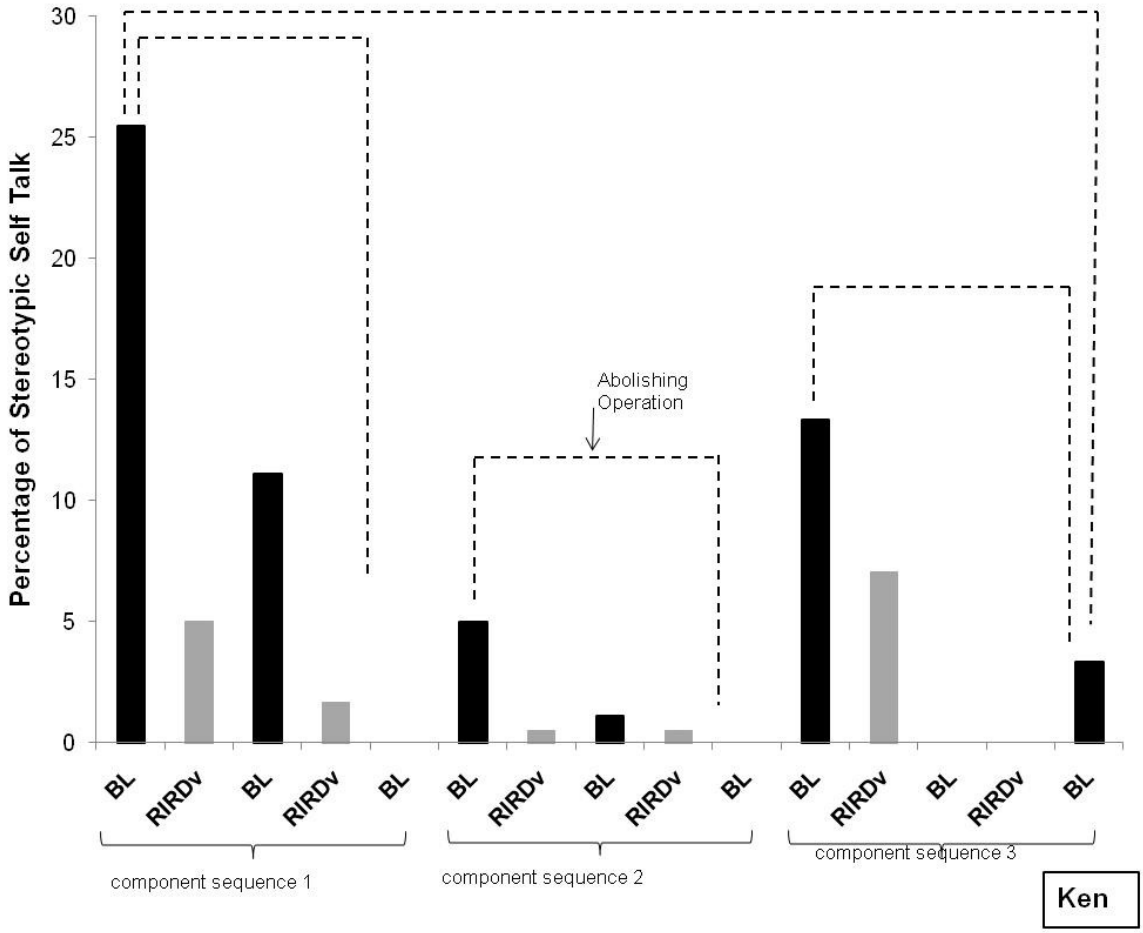

Percentage of Stereotypic Self Talk
30
25
20
15
10
5
0
Abolishing Operation
BL
RIRDv
BL
RIRDv
BL
BL
RIRDv
BL
RIRDv
BL
BL
RIRDv
BL
RIRDv
BL
component sequence 1
component sequence 2
component sequence 3
Ken

Figure 12

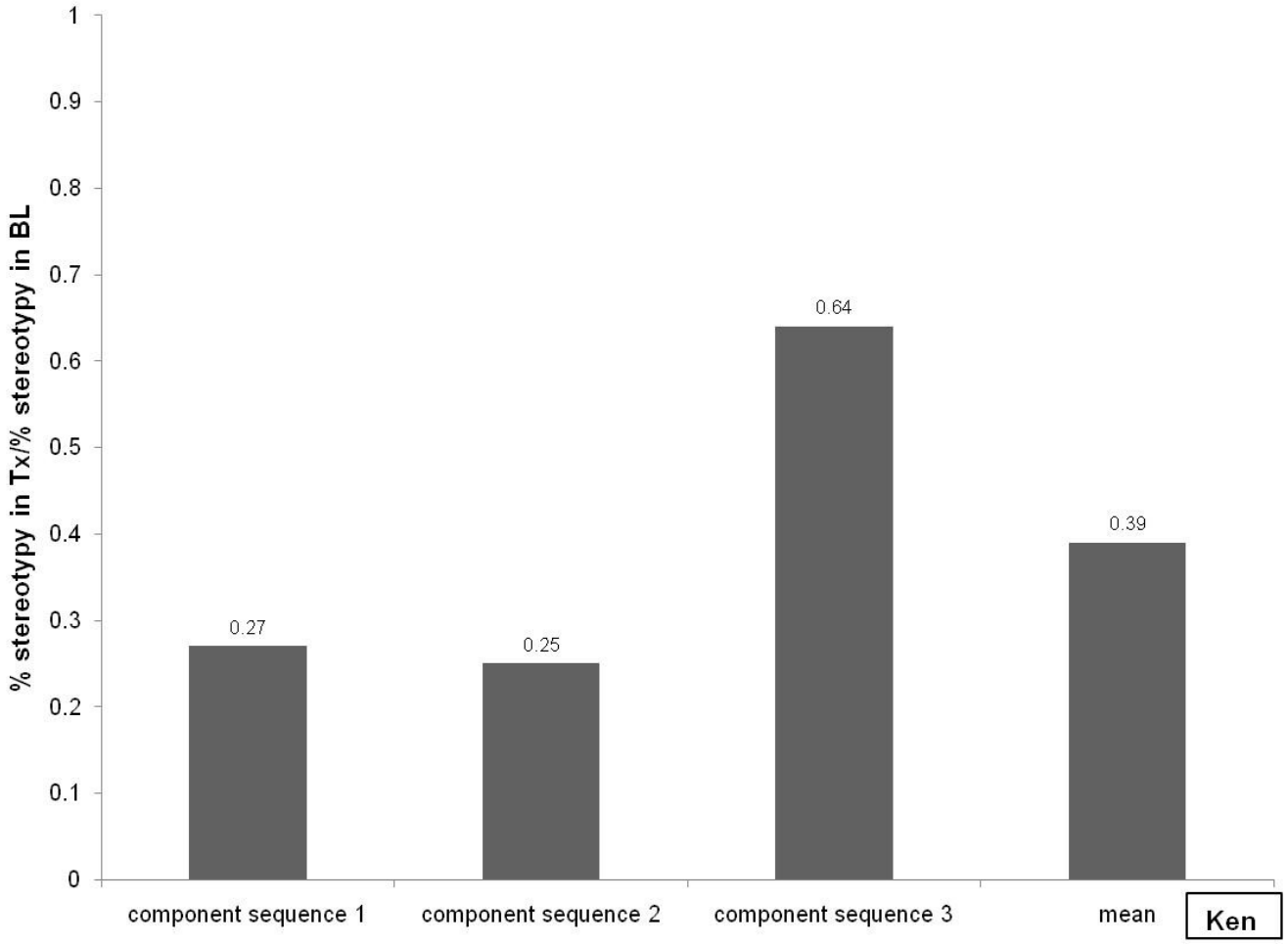

% stereotypy in Tx/% stereotypy in BL
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.27
0.25
0.64
0.39
component sequence 1
component sequence 2
component sequence 3
mean
Ken

Figure 13

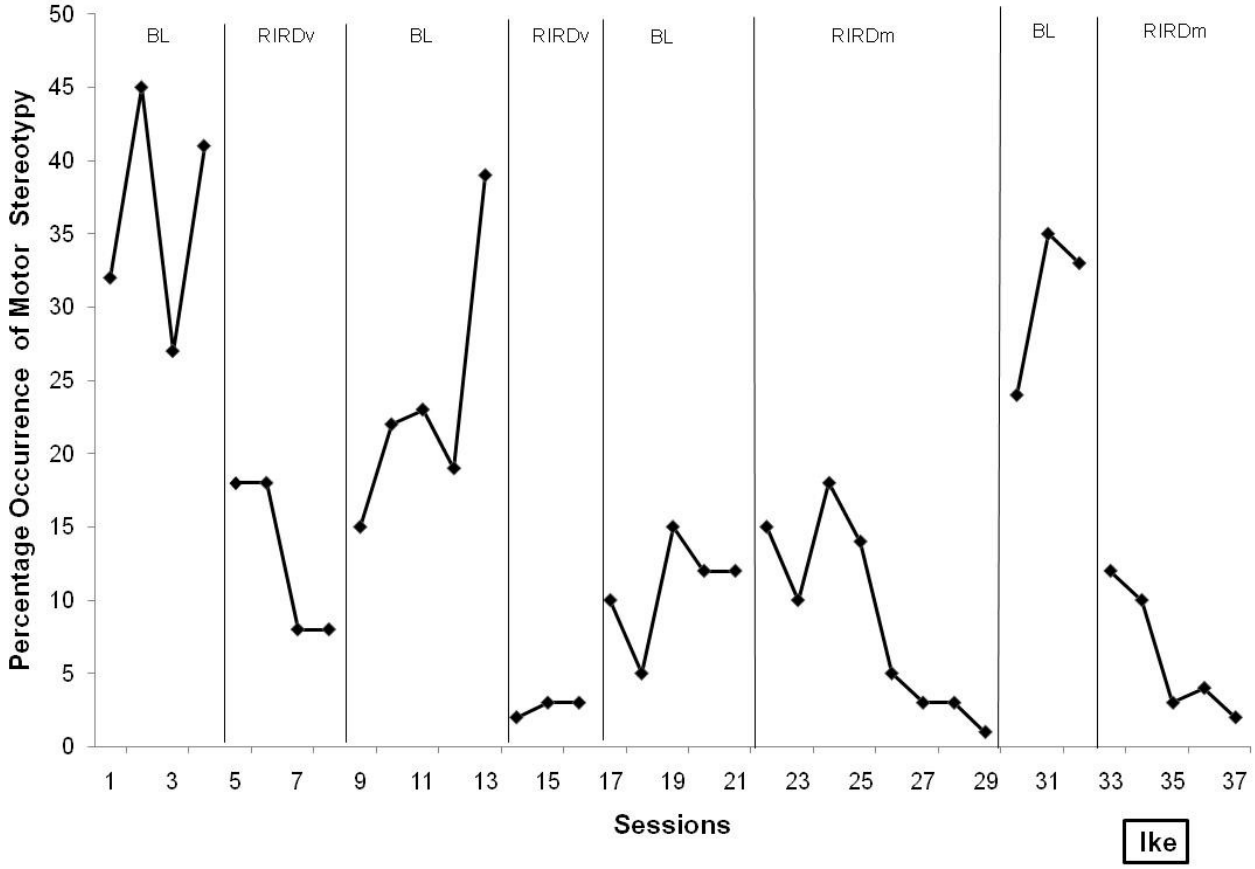

BL
RIRDv
BL
RIRDv
BL
RIRDm
BL
RIRDm
Percentage Occurrence of Motor Stereotypy
Sessions
Ike

Figure 14

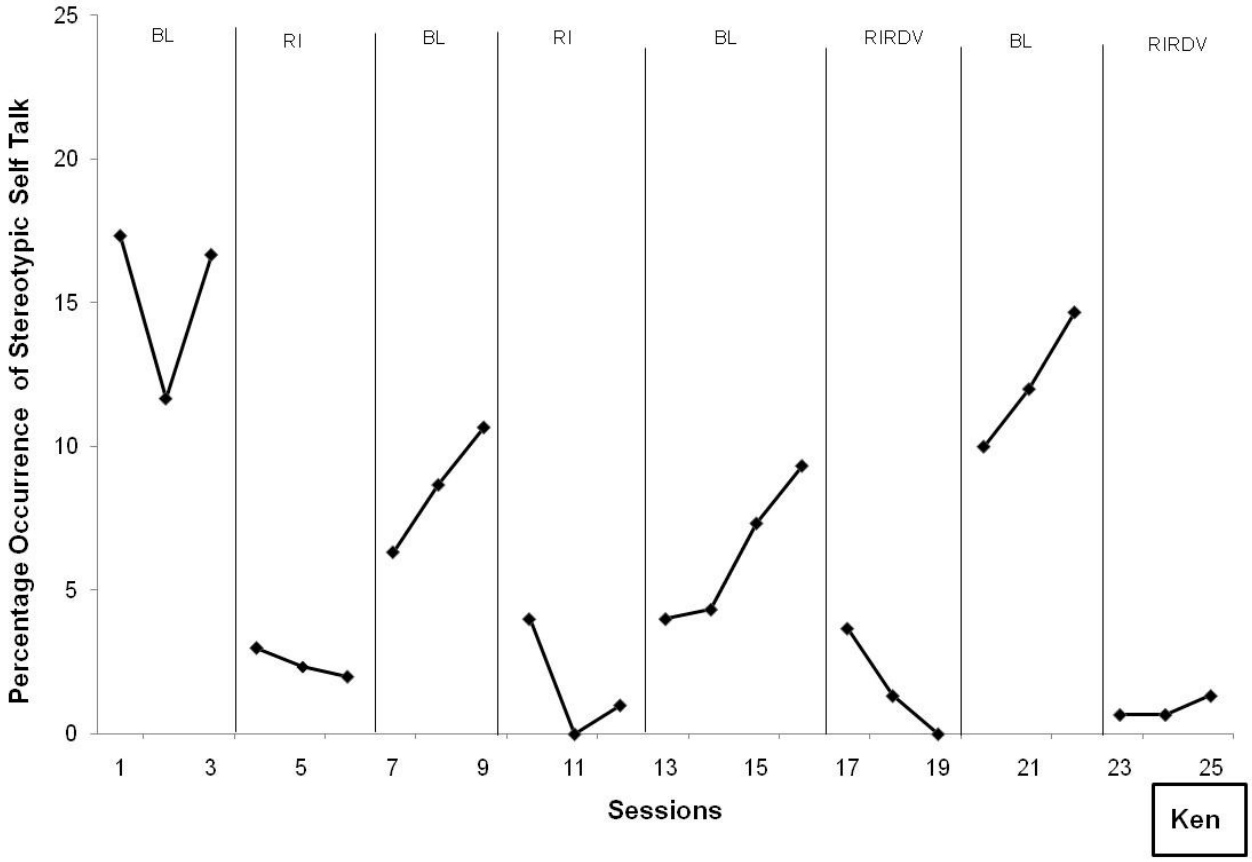
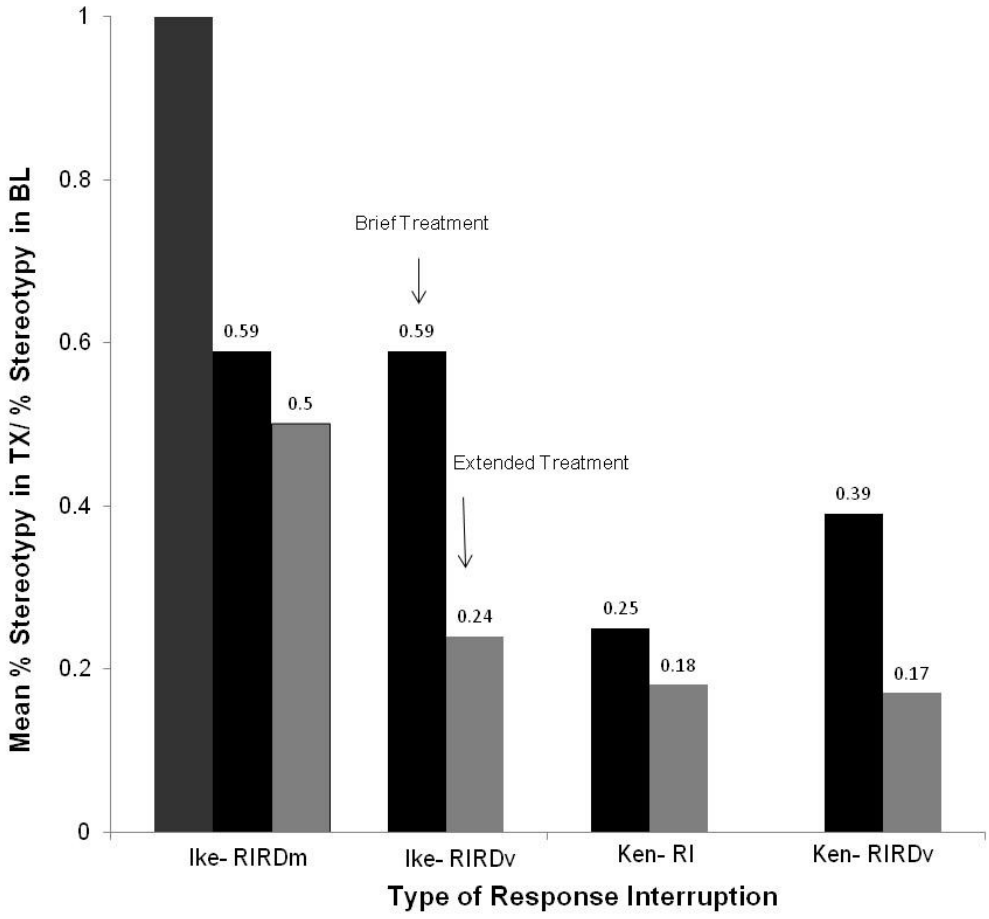

BL
RI
BL
RI
BL
RIRDV
BL
RIRDV
Percentage Occurrence of Stereotypic Self Talk
0
5
10
15
20
25
1
3
5
7
9
11
13
15
17
19
21
23
25
Sessions
Ken

Figure 15


Mean % Stereotypy in TX/ % Stereotypy in BL
1
0.8
0.6
0.4
0.2
0
Brief Treatment
Extended Treatment
0.59
0.5
0.59
0.24
0.25
0.18
0.39
0.17
Ike- RIRDm
Ike- RIRDv
Ken- RI
Ken- RIRDv
Type of Response Interruption