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The effects of behavioral momentum on social skills

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by

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Abstract

The effects of a high-probability request sequence on compliance with social requests was examined. The participant was a 14 year-old boy diagnosed with autism who frequently avoided social interaction. Assessments of hypothesized low and high-probability requests were conducted and resulted in four requests being included as the high-probability requests and three requests were included as the target low-probability responses. A multiple baseline across responses design was used. Compliance was at or near zero levels during baseline and increased for all three responses when the intervention was applied. Responding remained variable so an intervention plus reinforcement condition was added making reinforcers available contingent on compliance with a low-probability response. Compliance increased further and for all responses once this component was added.

Nevin , J.A., Mandell, C., & Atak, J.R. (1983) described behavioral momentum as the tendency of a behavior to be resistant to change following a change in environmental conditions. Nevin, et al. explained behavioral momentum in terms relating to Newton's Laws of Motion, which predict the behavior of objects. Simply put, the First Law of Motion states that a body (mass) at rest will stay at rest, while a body in motion will stay in motion until it comes into contact with another force. The Second Law of Motion states that the velocity of a body, or mass, will change if it is pushed or pulled and the amount of force associated with the push or pull will directly affect a change in velocity (speed) of the body.

One applied intervention that is based on the basic experimental research of behavioral momentum is the high-probability (high-p) request sequence. In this procedure a rapid series of requests the participant is likely to comply with is presented immediately before administering a request that the participant is not likely to comply with. Presenting requests with which the participant is likely to comply establishes a high rate of reinforcement before introducing a request which the participant is unlikely to comply; that is, a low-probability request. Mace et al. (1988) used this intervention to increase compliance with a variety of different requests and it has been demonstrated to be effective in decreasing latency to initiate tasks (Belfiore, P.J., Lee, D.L., Vargas, A.U., & Skinner, C.H., 1997).

People with developmental disabilities are commonly reported as engaging in noncompliant behavior. Decreasing this noncompliance is important because noncompliance often co-varies with other aberrant behavior (aggression, SIB, tantrums etc.) and is associated with decreased academic learning. Mace & Belfiore (1990)

investigated the use of the high-p sequence as a treatment for the escape-maintained stereotypy of a 38-year old woman with severe mental retardation. In this study, the participant frequently engaged in stereotypic touching when asked to complete a household chore. This behavior sometimes resulted in damage to property or injury to others. When compliance to three high-p requests was reinforced prior to the delivery of the low-p request, stereotypy decreased from 2.8 per minute in baseline to 1.4 per minute during intervention. Additionally, compliance increased from 22% in baseline to 52% during intervention. The results of this study suggest that the high-p sequence can effectively increase compliance and may also decrease co-varying aberrant behavior by establishing a high response rate and rate of reinforcement immediately prior to the low-p request.

The results of some studies suggest that it may be necessary to include additional procedures in a high-p treatment package. Zarcone, J.R., Iwata, B.A., Mazaleski, J.L., & Smith, R.G. (1994), investigated the use of a high-p sequence with and without extinction components on the escape-maintained SIB of two adult men diagnosed with developmental disabilities. When the high-p sequence was implemented alone, SIB increased and compliance decreased. Conversely, when escape-extinction was added to the high-p treatment package, SIB decreased and compliance increased. The results of this study suggest that the high-p sequence may not be effective in increasing compliance or concomitantly decreasing aberrant behavior in the absence of an extinction component.

Ardoin, S.P., Martens, B.K., & Wolfe, L.A. (1999), examined the use of a high-p request sequence on compliance with requests to transition. Excessive transition duration is a common problem in schools that can lead to a loss of time devoted to academics.

Efficient transitions have been associated with increased academic learning. This study was conducted in a typical classroom with three typical children whose ages ranged from seven to eight years old and who had a history of non-compliance with requests to transition. The high-p sequence was administered to the class as a group intervention, although the effects were only measured for the three participants. Results suggested the high-p sequence was effective in increasing transitional compliance in 2 out of 3 participants, For the third participant, the intervention had no effect possibly due to integrity data for reinforcement of appropriate transitions only averaging 56%. Experimenters may have seen different results if this mean were higher. This study demonstrated that the high-p sequence can be an effective group-administered treatment that can be easily implemented by teachers. It suggests that the use of high-p in the school classroom has the potential to decrease negative teacher-student interactions as the teacher attempts to gain compliance in the classroom. In addition, the teacher in the study rated the high-p intervention as highly acceptable and was reported to use the sequence during other times of the day when data were not being collected for research purposes. This procedure uses a positive antecedent approach to non-compliance that may be viewed as more acceptable by parents, educators, and treatment specialists in variable settings because it is not associated with many of the negative side effects that some aversive procedures may produce.

Few studies have been devoted to demonstrating a relationship between the application of a high-p sequence and compliance with social skills. Davis, C.A., Brady, M.P., Hamilton, R., McEvoy, M.A., & Williams, R.E. (1994), evaluated the applicability of the high-p sequence to social skills. The participants in this study were three boys with

ages ranging from 5 to 6-years old. All three boys had been diagnosed with autism and various other learning or developmental disabilities. Experimenters administered 3-5 high-p requests and delivered praise for compliance before presenting the social request. Social requests included requests to initiate an interaction with a peer ("give ___ the ball,"). All participants demonstrated low levels of responding and low percentages of unprompted initiations during baseline. When the high-p request sequence was implemented, responding increased and small increases in unprompted initiations were seen. The high-p sequence increased responsiveness to low-p requests to initiate social behavior for all three participants. Children with disabilities often have difficulty interacting with others and most interventions at the time the study was conducted relied on the underlying theory that social interaction is reciprocal and becomes mutually reinforcing. Programmed interventions that are aimed at teaching disabled children functional social skills are of importance because simply having access to active peers or social environments does not ensure that withdrawn children will interact.

The applicability of the high-p sequence to social skills has been an area of the intervention that has been understudied. In addition, many studies have reported reinforcing the low-p response which creates a confounding variable. It is difficult to interpret the results of these studies because of this limitation. The purpose of the present study was to examine the effects of a high-p request sequence on compliance with social requests. Reinforcement procedures were systematically arranged in the present study in order to examine the role of reinforcement in behavioral momentum.

Method

Participants

The participant was Nick, a 14 year-old boy who was diagnosed with autism and a seizure disorder. Nick had a history of noncompliance with most requests; however he was more likely to be non-compliant with requests to engage in social interactions. Nick was referred for this study because of an increase in his avoidance of peers. When in close proximity to a peer he covered his face with his hands, slouched, and moved away from the peer. At the start of the study, Nick's mother reported that he had been taking the medication Risperdal to aid with behavioral control.

A 12-year-old typically developing girl named Amy served as the peer model. At the beginning of each session, Amy was instructed to sit within 1 meter of the participant and appear to be playing with blocks. She was also told to ignore the participant as much as possible in order to avoid inadvertently reinforcing low-probability responses and to provide only the amount of interaction necessary for the participant to complete the demand. For example when the participant attempted to give Amy a high-5, Amy would lift her hand but would not interact further.

Setting/Materials

The study took place in an early intervention playroom in an office building. The room was approximately 4 m by 4 m and included various play materials. The participant's access to toys and materials was restricted during sessions and he only had access to those toys necessary for data collection. Materials included a bin of small wooden blocks, a laminated 12 cm x 12 cm picture of a cow, and edibles to be used as reinforcers. A formal reinforcer assessment was not completed however an informal

assessment was conducted during which the participant verbally identified different foods

that he wanted to earn. He chose chips and chocolate. A small stopwatch was used to

ensure that the requests and reinforcers were delivered at the correct intervals.

Measurement and Interobserver Agreement

An observer sat approximately one meter away from the participant and recorded

his compliance with all requests. Data were collected using a paper and pencil method;

data collection sheets were similar to structured Antecedent, Behavior, Consequence

sheets and recorded whether or not the participant complied with each of three high-p

requests, if reinforcement was received, which low-p request was delivered, whether or

not he complied, and if reinforcement was delivered. A response was scored as compliant

if the participant initiated the task within 3 seconds of the instruction being delivered.

Non-compliance was scored if the participant did not initiate the task or initiated the task

more than 3 seconds after the instruction was delivered.

For the request to give the peer a high-5, correct responding included any attempt

the participant made to raise either one of his hands and to then move his hand towards

the peer in order to come into contact with the peer's raised hand. Contact with the peer's

hand was necessary for the response to be scored as compliance. For the second request

to build a block tower with peer, correct responding included any attempt to place a block

on top of the peer's already assembled block tower. It was not necessary for the block to

remain on the tower as this often resulted in the tower falling over. Attempts to throw the

block or otherwise hand the block to peer were scored as incorrect. For the third response

to ask the peer to play, correct responding included any verbal response to initiate any

form of play. For example, the verbal response "Amy, wanna play?" was scored as correct as well as "Amy, play?" and so on. All non-verbal responses were ignored.

A second observer was present during all sessions and simultaneously but independently collected data during 83% of sessions. Interobserver agreement (IOA) was calculated by adding the total number of agreements divided by total number of agreements plus disagreements and multiplying by 100. IOA was 100% for all sessions. In addition procedural integrity was calculated using the same method and was determined to be 100%.

Procedure

Design. A multiple baseline across responses design was used. Three low-probability responses were included as the targets to be increased.

Assessment. A list of hypothesized high-probability and low-probability responses was developed based on staff and parent reports and assessed empirically before baseline data were collected. During the assessment, requests were delivered every 10 seconds. No consequences were delivered for compliance or non-compliance. If the participant engaged in noncompliance, the experimenter waited 10 seconds before delivering the next request. Each request was delivered 10 times each and the percentage of compliance with each request was calculated.

Baseline. During baseline, a low-probability request was delivered every 10 seconds. No consequences were provided for compliance and non-compliance resulted in the experimenter waiting 10 seconds before delivering the next request.

Intervention.   During the intervention phase, three high-probability requests were delivered and compliance with each was reinforced with a small edible. A low-

probability request was delivered within five seconds of the reinforcement for the last high-probability response. Compliance with the low-probability request did not result in reinforcement. This arrangement allowed the effects of behavioral momentum to be determined without reinforcement confounding the results.

Intervention Plus Reinforcement. This condition was identical to the intervention phase except that compliance with low-probability requests resulted in reinforcement in the form of a small edible and verbal praise.

Results

Assessment. The results of the assessment are summarized in Figures 1 and 2. The participant complied most often with the requests to make a block tower, knock a block tower over, and give the experimenter the picture of a cow. The participant complied least often with the requests to give a peer a high-5, build a block tower with peer, color with peer, and ask peer to play. Based on the results of the assessment, three low-probability requests and three high-probability requests were chosen for inclusion in the study. The request to color with peer was not included as a target because of time constraints. Only activities with a clear ending were included. The requests that were used are presented in Table 1.

Baseline. Compliance with low-probability requests was negligible during baseline. For the first request (give peer a high-5) compliance was stable at 0% during each baseline session. For the second response (build a block tower with peer) compliance averaged 5% during baseline sessions. Compliance with the third response (ask peer to play) averaged 1% during baseline.

Intervention. Overall, compliance averaged 71% during the intervention phase. Typically, compliance increased as the intervention was applied to each request, but remained somewhat variable throughout the phase. When the intervention was applied to the first request, compliance to that request increased immediately while compliance to the second request remained at baseline levels. When the intervention was implemented for the second request, compliance increased slightly to 55%, but also remained variable. For the third request, the intervention was implemented and compliance remained at baseline levels. The intervention was in place for one session due to clinical implications that will be reviewed in the discussion section of this paper. Significant decreases were seen during session 11 across all responses and also will be reviewed in the following section of this paper.

Intervention plus reinforcement. Because compliance remained variable during the intervention phase, a second phase was added that included reinforcement for the low-probability behaviors. When this was included to the treatment, compliance for all three responses immediately increased. Compliance during this phase averaged 97% for all three responses.

<div align="center">Discussion</div>

The results of this study suggest that a reinforcement component may be necessary in a treatment package aimed at increasing compliance with social requests. Presenting the high-probability request sequence alone did result in increases in compliance; however, the levels of compliance remained variable throughout the duration of the first treatment phase. Responding stabilized only after the low-probability response was reinforced. Although previous research has examined the role of extinction

procedures in treatment packages (Zarcone, J.R., Iwata, B.A., Hughes, C.E., & Vollmer, T.R.,1993), the role of reinforcement seems understudied. Some studies describe reinforcing the low-probability response (Ardoin et al., 1999), whereas others are unclear about reinforcement procedures. It should be noted that when using a high-probability request sequence in an applied setting, reinforcing low-probability responses may be desirable to enhance the effects of the sequence. It becomes problematic only in an experimental setting due to the problems it presents with confounding variables. In fact, the more reinforcement that is available, the greater the push or velocity of response change. The greater the rate of reinforcement, the greater the behavioral momentum (Mace, F.C., Hock, M.L., Lalli, J.S., West, B.J., Belfiore, P., Pinter, E., & Brown, D.K. (1988).

The limitations of the study should also be discussed. The participant underwent a medication change following session eight. Due to his large size, aggressive episodes were extremely dangerous. Because of the risk of injury to staff and family members, the participant had previously been taking the medication Risperdal to aid with behavioral control. The medication was discontinued suddenly by his parent because of the presence of negative side effects. The participant's doctor reported that it would take one week for the absence of the medication to begin to effect the participant's behavior. During session 11, the frequency of inappropriate vocalizations increased dramatically although no actual data were recorded. The participant began screaming and laughing so loudly that it became impossible for the experimenter to deliver requests because of the noise level in the room. The participant was unable to hear the request and this lasted the duration of the session which was ultimately cut short to prevent an escalation in problem behavior.

This was the only session during which the intervention alone was applied to the third response. The intervention plus reinforcement condition was implemented quickly for clinical reasons. The third request was the only one to demand a verbal response and the participant consistently refused to reciprocate verbal interactions with the peer. Experimenters concluded that the effect of the high-probability sequence was not salient enough to match the response effort. It would have been desirable to demonstrate a second session at the same level before the intervention was implemented.

It should also be mentioned that a fixed number of high-probability requests was used during each sequence in the study. Three high-probability requests were delivered each time with no variability. If the number of high-probability requests had been delivered on a variable schedule, different results may have been seen. Variable schedules are associated with steadier rates of responding than are fixed schedules likely due to the absence of information about when the next response will result in reinforcement (Cooper, J. O., Heron, T. E., & Heward, W. L. 2007). This is an area that should be researched further in the future.

It should also be mentioned that the tasks chosen for inclusion in the present study were basic and not age appropriate. They were selected based on the current functioning level of the participant and were simple discreet responses that could be presented in rapid succession. Future research on the high-probability request sequence should focus on more age appropriate tasks.

It is interesting to note anecdotally that a momentum of social behavior was observed to be building within a session. The participant arrived for each session with his regular staff member and upon seeing the experimenter or the peer would immediately

cover his face with his hands or attempt to pull his coat over his head. He would not respond to greetings and was non-verbal throughout most of the sessions although his verbal skills are sufficient to hold a conversation. The avoidant behavior was consistent throughout the study. During several sessions, the participant was observed to independently move closer to the peer and would sustain long period of eye contact with her. At the end of many sessions, the participant attempted to hug the peer and at one point, the participant needed to be reminded of his boundaries training and was prompted to stop invading the peer's personal space when saying goodbye. The difference between the behavior at the beginning of a session and the behavior at the end of a session was significant, suggesting that a momentum of social behavior was building within sessions.

Behavioral momentum was somewhat effective at increasing social responding however responding did not become stable until reinforcement became available for low-probability responses. Future research should focus on the role reinforcement plays in behavioral momentum. The results of the present study also support arguments for behavioral intervention as opposed to medical intervention. The participant was suddenly taken off his medication during the study and although problem behaviors did occur and hindered data collection for at least one session, once reinforcement was made available for low-probability responses compliance increased to 100%. Compliant behavior increased even in the absence of the medication.

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Table 1

Summary of the requests chosen to be included in the present study based on the results

of the assessment.

Low-Probability Requests	High-Probability Requests
Give peer a high-5	Give me (experimenter) the block
Build a block tower with peer	Build a block tower
Ask peer to play	Knock the block tower over
	Give me the picture of the cow

Figure Caption

Figure 1. Results of the assessment of high-probability behaviors. The three high-probability responses to be included in the study were chosen based on these results.

Figure 2. Results of the assessment of low-probability behaviors. The three low-probability responses to be targeted were chosen based on these results. The fourth response included on this figure (color with peer) was not used due to time constraints.

Figure 3. The results of the present study presented in multiple baseline formats. Baseline, intervention, and intervention plus reinforcement conditions are shown for all three target responses.
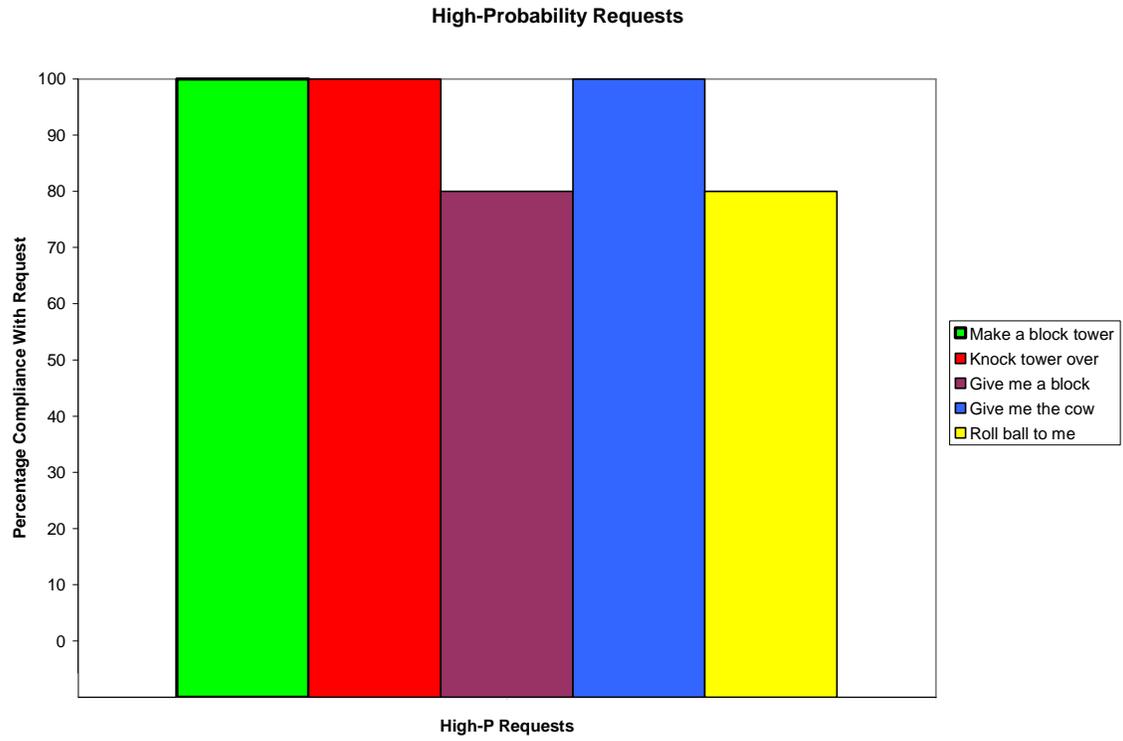
High-Probability Requests

Figure 1.

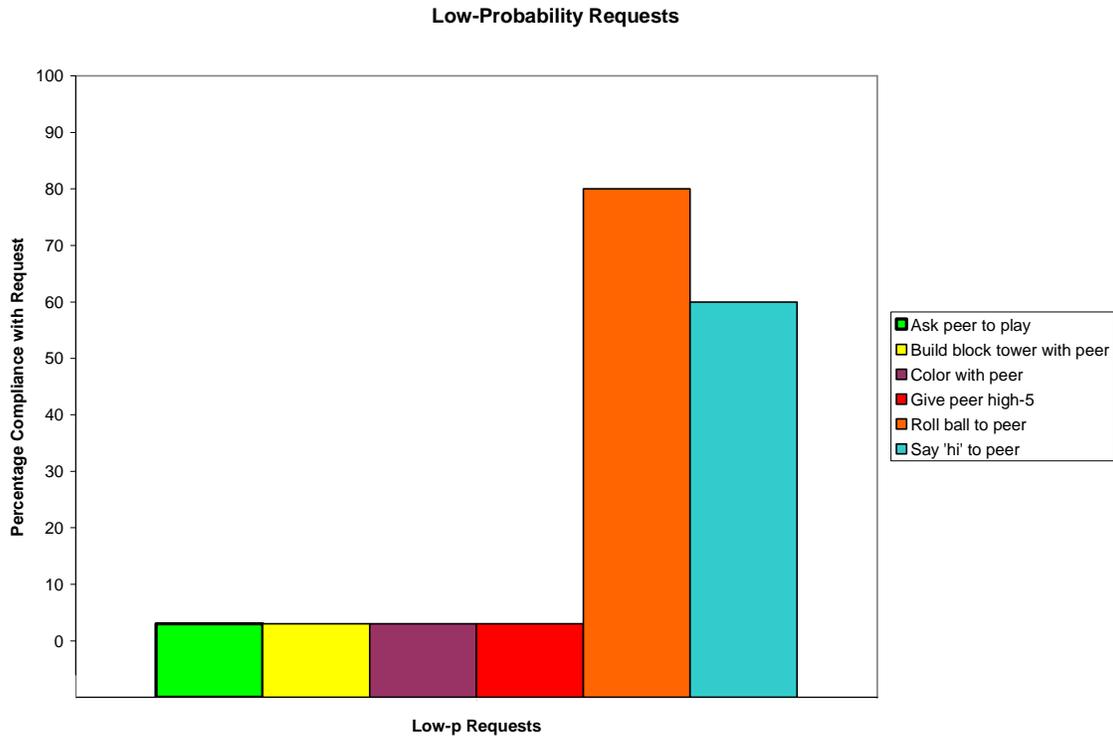**Low-Probability Requests**
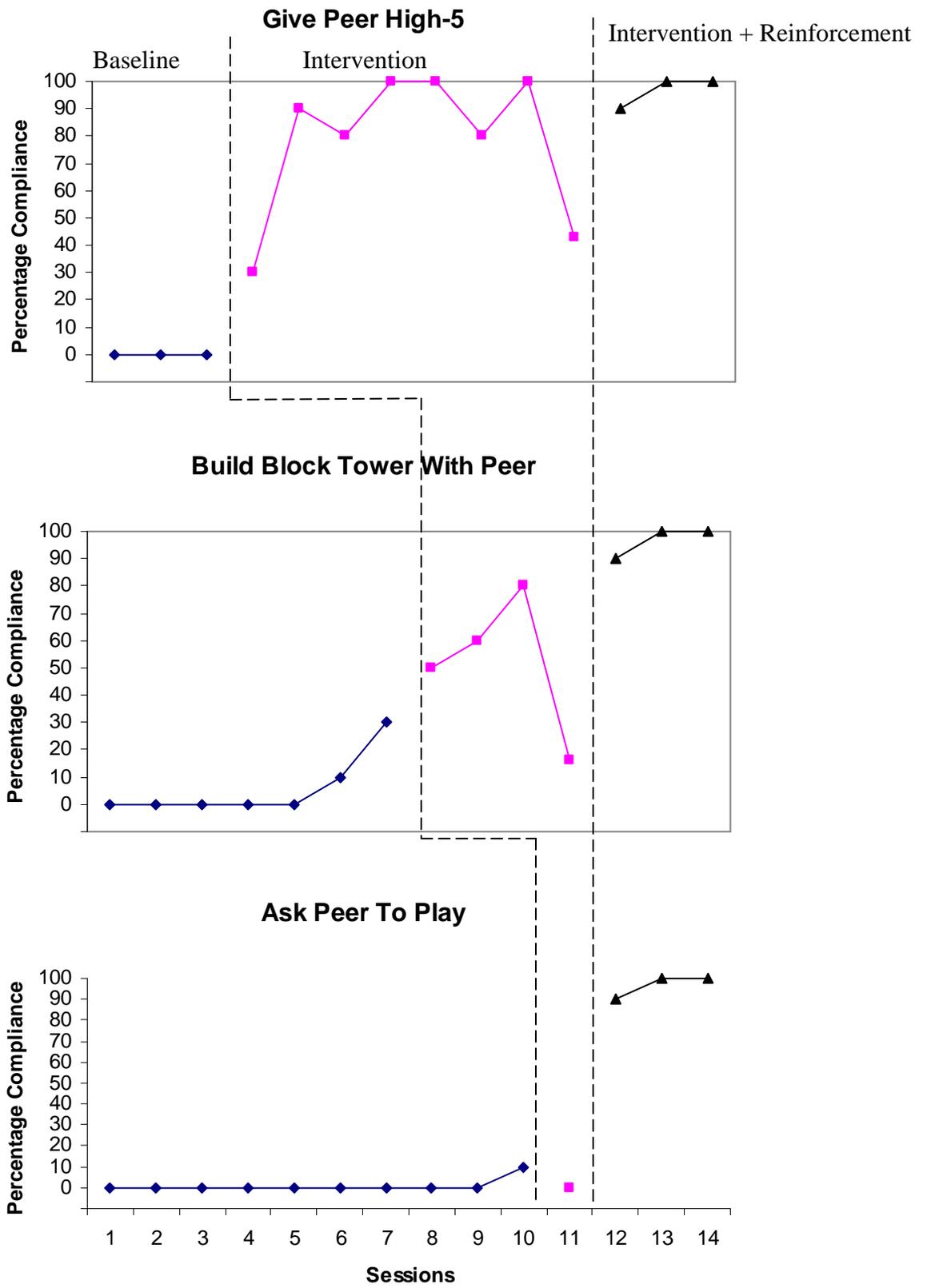

Figure 2.

Figure 3.

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