Designing and Evaluating Assessment-Based Interventions to Reduce Stereotypy Among Adults With Autism in a Community Job

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ABSTRACT

We designed and evaluated assessment-based interventions to reduce stereotypy among three adults with severe autism in a community job setting. An initial descriptive assessment, conducted during the regular work routine in the employing company, indicated that stereotypy occurred while the supported workers were waiting for work assignments or when they stopped working on an assigned task. An on-the-job functional analysis was then conducted; the results showed that the stereotypy of each worker was not maintained by socially-mediated consequences. Individualized interventions were then designed for increasing work behavior to compete with stereotypy by restructuring the job routine to reduce wait time and/or prompting and praising work behavior more frequently. The interventions increased work behavior and were accompanied by decreased stereotypy for each worker. Guidelines for practitioners and future research directions are offered, focusing on the use of assessment-based interventions for reducing stereotypy within community jobs.

Keywords: adults with autism, assessment-based interventions, stereotypy

A common challenge facing clinicians working with adults with severe autism is frequent stereotypic behavior. Stereotypy is a noted behavioral characteristic of people with autism (Jones, Walsh, & Sturmey, 1995), and particularly among individuals with autism at the severe end of the spectrum (Noll & Barrett, 2004). Stereotypy can interfere with adaptive behavior such as work performance (Lancioni, Singh, O'Reilly, & Sigafoos, 2009) and can lead to more seriously challenging behavior such as self-injury (Jones et al., 1995). An additional concern that is especially relevant in community environments is that stereotypic behavior can result in adults with autism being treated unfavorably (Noll & Barrett, 2004; Pyles, Riordan, & Bailey, 1997).

There has been a considerable amount of research directed at reducing stereotypy among people with autism that corresponds to its prevalence and the number of concerns associated with it (for reviews see Lancioni et al., 2009; Jones et al., 1995; Rapp & Vollmer, 2005). One general conclusion of this research is that stereotypy often appears to be automatically reinforced and maintained independently of social consequences (Rapp & Vollmer, 2005). The automatically reinforcing feature of stereotypy can make treatment problematic because it is difficult to identify and/or manipulate the source of reinforcement for the behavior (Vollmer, 1994).

One approach to reducing stereotypy that seems suitable for community-based applications involves interventions designed to promote desirable behavior that competes with stereotypy (Lerman & Rapp, 2006). For example, if there are certain situations in the community that are accompanied by high rates of stereotypy, then those specific situations could be altered by including other activities, which may occasion behavior that competes with stereotypy. Another option is to interrupt stereotypy through instructions to engage in other behavior appropriate to the setting (Ahearn, Clark, MacDonald, & Chung, 2007).

One specific type of setting in which research on reducing stereotypy seems warranted is supported work placements in community jobs. There has been considerable attention in recent years to involving adults with autism in supported work relative to more traditional participation in nonwork day programs and segregated or sheltered employment (Lattimore, Parsons, & Reid, 2008). However, there has been a relative dearth of research on assessing and reducing stereotypy in supported work situations.

The purpose of this investigation was to determine the efficacy of assessment-based interventions for reducing stereotypy among adults with severe autism in supported work. The intent was to evaluate a systematic process for assessing and then reducing stereotypic behavior that was amenable to practical application in community job sites.

The process involved three steps. First, a descriptive (observational) assessment of work-situation variables associated with stereotypic behavior was conducted at the job site. Second, an on-the-job functional analysis was conducted to more precisely assess potential variables maintaining the stereotypy. Third, interventions to reduce stereotypy were developed based on the assessment results and then individually implemented with each supported worker.

Method

Participants and Setting

The setting was a small publishing company in which the three participants (supported workers) worked part time in a supported work capacity performing clerical tasks (e.g., putting tabs or address labels on advertising fliers, collating manual pages, shredding paper). Each supported worker had been diagnosed with autism based on at least two independent evaluations and each was nonvocal. All of the participants were adult men, ranging in age from 33 to 45 years old. Mr. Mise and Mr. Ream responded to simple vocal instructions and communicated with idiosyncratic gestures. Mr. Geoff had a severe hearing loss and responded to a small number of manual signs. He communicated with a small repertoire of manual signs and idiosyncratic gestures. Mr. Mise and Mr. Geoff worked two mornings per week at a publishing company and Mr. Ream worked one morning per week. These men were selected for the study because they had autism characteristic of the severe end of the spectrum (Powers, 2000), they engaged in stereotypic behavior, and they worked in the same company.

The three participants attended work with one or two other supported workers, who were not involved in the study, and two job coaches. One of the job coaches, who had 14 years of supported work experience, conducted all intervention procedures with the three supported workers while the other coach worked with the remaining supported workers present.

Behavior Definitions and Observation System

The primary target behavior was stereotypy, defined for two participants as repetitive (at least two consecutive), nontask related body movements. For participant Mr. Mise, examples included body rocking (either standing or sitting) by moving his torso back and forth, flapping his fingers back and forth, scratching the floor, and twirling hair with his finger. Examples for Mr. Geoff included waving his hand in front of his face, tapping his finger on his face, and rubbing or tapping his fingers together. The definition for Mr. Ream involved a body posturing form of stereotypy (Rapp & Vollmer, 2005), defined as eyes fixed in one direction at a wall or ceiling for at least 3 s with no task-related activity during that time and no person or activity within the direction of his gaze. The most common example was Mr. Ream looking up at the top portion of the wall of the work room or the ceiling while otherwise remaining motionless. Work was the secondary target behavior, defined as manipulating materials in a manner necessary to complete a work task (e.g., placing paper in a shredder, picking up a manual page from a pile and placing it on another pile for collating, putting a tab or mailing label on an advertising flier). Both target behaviors were scored during each observation session in continuous 10-s intervals by experimenters (the job coach who routinely worked with the participants and carried out all experimental procedures did not collect observational data). Only one participant was observed per session. Stereotypy was scored on a partial-interval basis within each interval. For work behavior to be recorded, it had to occur for the majority of the 10-s interval (i.e., for at least six continuous seconds; otherwise nonoccurrence of work behavior, or *off-task*, was recorded).

Descriptive Assessment

The purpose of the descriptive assessment was to evaluate whether stereotypic behavior was associated with aspects of the usual work routine and in particular, the participants' engagement in work relative to off-task behavior. For each work period, the supported workers (and job coaches) performed according to their typical ongoing routine. The workers were provided with materials and instructed to work on tasks assigned by a company supervisor. Mr. Mise and Mr. Goeff sat at a table for their tasks, which involved putting tabs or address labels on folded advertising fliers or collating stacks of manual pages. Typically only one of the tasks was assigned per work day depending on the needs of the publishing company. Mr. Ream sat in front of a paper shredder with a stack of papers to be shredded on a table within his reach. Each worker was proficient in the skills to perform each task, having worked on these tasks for at least three years prior to the investigation. Following the initial presentation of materials and instruction to work by the job coach, the coach supervised each worker and provided occasional prompts and praise statements (vocal and/or signed) for work performance. Experimenter observations indicated a prompt and/or praise statement occurred approximately every 10 min for Mr. Mise and Mr. Ream. These were provided more frequently for Mr. Geoff; averaging approximately every 1.5 min. Mr. Geoff generally required closer supervision to maintain work behavior, due in part to occasional challenging behavior such as pica that periodically occurred with materials in the area (e.g., paper clips).

Work and stereotypic behavior were observed and recorded throughout 10 min of the work period for each participant. Additionally, when stereotypic behavior was observed, the observer recorded whether the participant was engaging in work or off-task behavior immediately preceding the stereotypy. It should be noted that although stereotypy could occur simultaneously with work for Mr. Mise and Mr. Geoff, this did not occur; stereotypy was never observed to occur simultaneously with work. Interobserver agreement (IOA) checks were conducted by experimenters (again, excluding the job coach) during 63% of all observations for each worker. Interobserver agreement was assessed interval-by-interval for each behavior

category, and was calculated by dividing the number of agreements by number of agreements plus disagreements, multiplied by 100%. For stereotypy, overall agreement averaged 92% (range, 83% to 100%), occurrence agreement averaged 81% (range, 67% to 100%), and nonoccurrence averaged 72% (range, 0% to 100%). The 0% agreement on nonoccurrence involved one session in which there were disagreements on 3 out of the total 60 intervals of observation. For work behavior, overall agreement averaged 96% (range, 91% to 100%), occurrence averaged 77% (range, 42% to 100%), and nonoccurrence averaged 95% (range, 87% to 100%).

Results and discussion. Results indicated that stereotypy was very frequent for Mr. Mise, averaging 85% of observation intervals (range, 64% to 96%), and relatively frequent for Mr. Geoff (average 34%; range, 14% to 53%) and Mr. Ream (average 30%; range, 16% to 53%). Work behavior occurred less frequently (averaging 24%, 23%, and 34% of observation intervals for Mr. Mise, Mr. Geoff, and Mr. Ream, respectively) than off-task for each supported worker.

When stereotypy was observed, it was consistently preceded by off-task behavior for each worker (Figure 1). For all observation intervals in which stereotypy was recorded across observed work periods, the stereotypy was preceded by or co-occurred with off-task behavior for 100% of the occasions for Mr. Mise and Mr. Ream, and for 89% of the occasions for Mr. Geoff (11% preceded by work).

The rather low levels of work behavior appeared due in large part to how the work activities were structured for two workers (Mr. Mise and Mr. Geoff). To illustrate, for the collating task, each worker collated a given set of manual pages and then placed the collated pages on the work table. Another worker then picked up the pages to continue the collating process with additional pages. The former worker had to wait several minutes while the latter worker finished his given task and then another pile of pages was given to the former worker to continue the collating process. During the waiting period, the former worker had no assigned work activity except to wait for the next set of pages to be provided. By definition, while the worker was waiting his behavior was recorded as off-task, even though the off-task behavior was the result of the structure of the work activities (i.e., work was not possible given the absence of relevant materials). A somewhat similar situation existed with tabbing and labeling advertising fliers in that when a worker finished tabbing or labeling a given set of fliers, he had to wait until a job coach provided him with another set of fliers to tab or label (fliers were only available after a different worker folded the fliers that were to be tabbed or labeled). For these two workers, an additional analysis of their stereotypy was conducted while they were waiting for work versus not working when work materials were available. The results indicated that 74% of observation intervals involved waiting for work for Mr. Mise (who completed his assigned tasks more rapidly than Mr. Geoff such that there were relatively longer wait periods for Mr. Mise), and that 94% of all stereotypy occurred during these wait periods. For Mr. Geoff, 39% of observation intervals involved waiting for work, and 38% of stereotypy occurred during these wait periods. The results were different for Mr. Ream who was provided with a sufficient amount of papers to shred each observation such that there was no wait period. His off-task behavior occurred when he periodically stopped shredding even though there was shredding available.

> The automatically reinforcing feature of stereotypy can make treatment problematic because it is difficult to identify and/or manipulate the source of reinforcement for the behavior.

Analysis of the results of the descriptive assessment indicated that stereotypy almost always occurred when the workers were not immediately engaged in work behavior (whether due to waiting for more work or disengaging in work that was assigned). Although the descriptive assessment allowed for the identification of a correlation between stereotypy and off-task behavior, a functional relation between stereotypy and some environmental event was not shown (and is not possible with a descriptive assessment; see Iwata & Dozier, 2008). In other words, the impact of other variables on stereotypy, such as periodic attention provided by job coaches by occasionally responding to stereotypy with an instruction to work, or a worker possibly engaging in stereotypy to avoid work, are unknown following descriptive assessments. An on-the-job functional analysis was conducted to further examine possible variables related to the occurrence of stereotypy because there have been reports of stereotypy among people with autism being maintained by socially mediated consequences (e.g., Kennedy, Meyer, Knowles, & Shukla, 2000).

Functional Analysis

Three conditions were conducted within the functional analysis, representing the three basic test conditions initially described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). These conditions, modified to fit within the regular work setting, included social-positive reinforcement

(contingent attention), social-negative reinforcement (escape from demands), and automatic or nonsocially mediated reinforcement (alone—modified to represent no work available and no attention or demands). An additional condition to more precisely control for the effects of attention and escape was not included in our analysis, partly because the alone condition can serve as an adequate control condition when testing for behavioral sensitivity to attention or escape (see Kahng & Iwata, 1998). Each condition was presented three times for 5 min in a multi-element design, with each of the conditions presented one time per work day. The order of the three conditions was randomized across work days. Observations of stereotypy occurred throughout each condition as described earlier, with IOA checks occurring during 67% of all sessions for each condition and participant. Interobserver agreement for stereotypy was calculated as described previously and averaged 97% (range, 82% to 100%) for overall agreement, 85% (range, 50% to 100%) for occurrence, and 93% (range, 55% to 100%) for nonoccurrence.

The functional analysis conditions for Mr. Mise and Mr. Geoff were conducted similarly as their work assignments were the same. The attention condition involved providing the worker with a pile of fliers to label or tab, sufficient in number to require more than 5 min to complete. Both workers routinely began labeling or tabbing the fliers independently once placed in front of them and given an instruction to work by the job coach. Contingent upon stereotypic behavior, the job coach provided a few seconds of attention (e.g., a light pat on the back, saying or signing a positive statement such as "OK"). For the demand condition, the worker was given one flier at a time to tab or label (tabs or labels were available on the table in front of the worker) with an initial instruction to work. As soon as the worker placed the tab or label on the flier, the coach gave another flier to tab or label (the presentation of the flier was considered the instruction after the first instruction to work, which was typically followed by compliance of the worker). In this manner, the worker was provided with repeated instructions to tab or label by the job coach presenting each individual flier in contrast to the process of providing a pile of fliers and tabs or labels such that the worker could proceed at his own rate. If stereotypy occurred, the job coach withheld presentation of the next flier for 10 s, thus providing a brief break from instructions contingent on stereotypy. In the modified alone condition, the worker sat in his usual position in the work room but was not provided with work materials or any interaction from the job coach.

The functional analysis conditions were conducted in the same manner with Mr. Ream as with the other two supported workers with the following exceptions that were necessary due to the different nature of Mr. Ream's work assignment (shredding paper). Mr. Ream was given a sufficient amount of paper such that he would not run out of paper to shred during the attention condition, and provided with an instruction to work at the beginning of the period. In the demand condition, the job coach handed Mr. Ream one sheet of paper at a time to shred and then immediately gave him another sheet as soon as the previous one was shredded. Otherwise, differential consequences were provided as described above.

Results and discussion. Stereotypic behavior was always more frequent in the alone (no work) condition than the attention and demand conditions for each of the three supported workers (Figure 2). These results suggest that the workers' stereotypy was maintained automatically and not by socially-mediated consequences (attention or escape from demands) in the work setting.

Interventions to Reduce Stereotypy

Results of the descriptive assessments and functional analyses suggested that stereotypy was most likely to occur on the job when supported workers were not engaged in work behavior, and was directly reinforced by the products of the responses. Consequently, it was hypothesized that if the work routine could be revised to decrease nonwork time and/or increase work behavior, stereotypy would decrease. The resulting interventions to increase work behavior varied across workers because the association between work behavior and stereotypy was somewhat different across the three workers (e.g., occurrence of stereotypy while waiting for more work and/or disengaging from available work).

Intervention for Mr. Mise. During the descriptive assessment, all of Mr. Mise's stereotypy was preceded by off-task behavior; specifically, while he was waiting for more work after completing his immediately assigned task. Therefore, to decrease off-task behavior, Mr. Mise was provided with alternative work to complete while he waited for more materials with his initially assigned task. The alternative work was provided by placing a pile of advertising fliers to label or tab on a small table next to Mr. Mise's usual work table (sheets of tabs or labels were placed beside the pile of fliers). Upon completion of the assigned collating task, the job coach instructed Mr. Mise to turn in his chair to the adjacent table and work on the fliers. Mr. Mise was instructed to work on the collating again when a new pile of pages to collate was ready. This process continued throughout the work period. The job coach continued his usual supervisory interactions with Mr. Mise except for providing alternating instructions to work on the collating or the alternative task.

Intervention for Mr. Geoff. The descriptive assessment indicated Mr. Geoff engaged in stereotypy both during the wait period and when he would stop working on an assigned task before it was completed; therefore, his intervention consisted of two components. The first component was the same as with Mr. Mise. The job coach provided alternative work on a small table adjacent to Mr. Geoff's regular work table such that he could turn in his chair and work on the alternative task during the usual wait period. The second component involved increased prompting and praising of work behavior by the job coach in order to decrease the frequency of unscheduled breaks

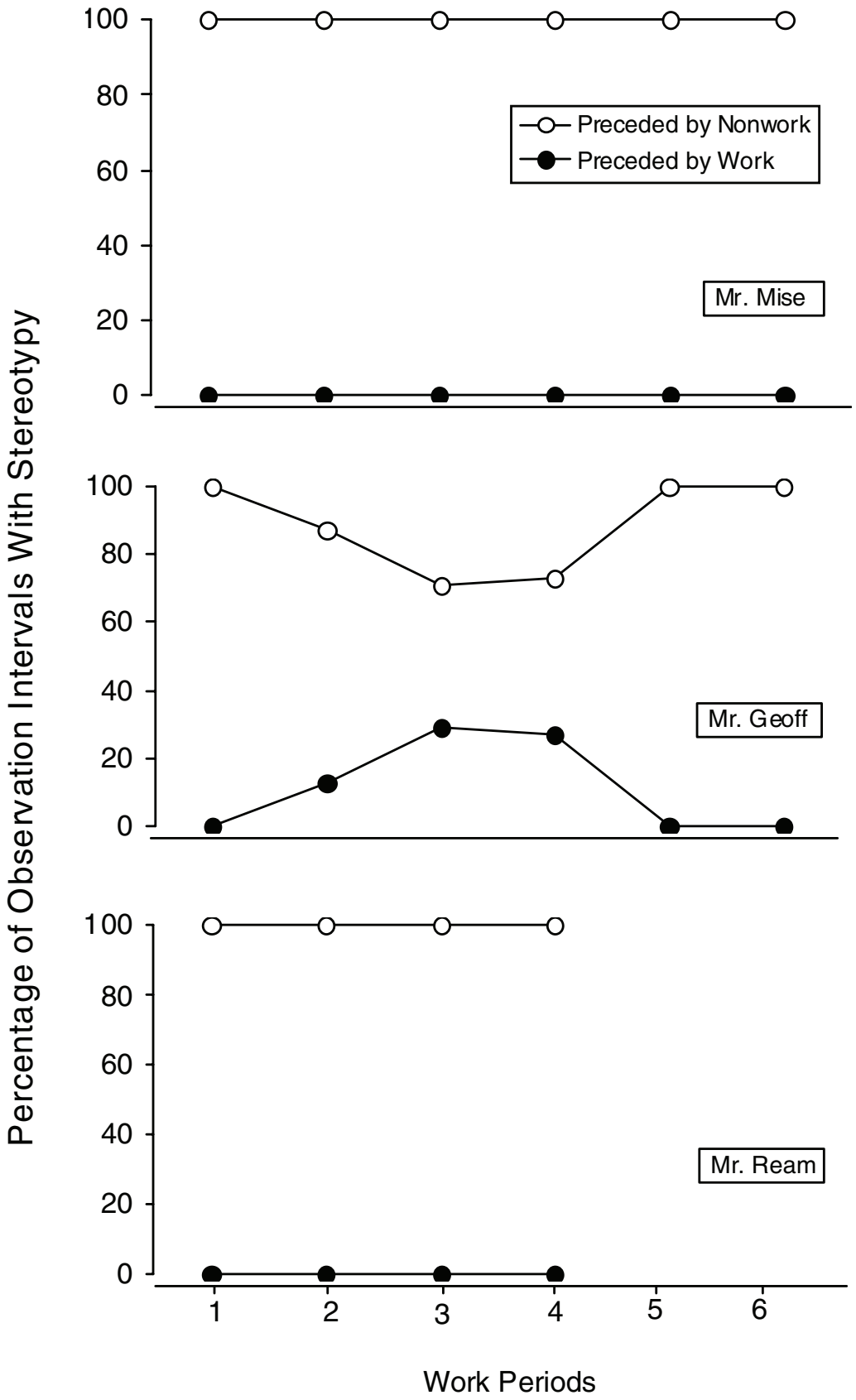

Figure 1. Percentage of observation intervals with stereotypy that was preceded by work and nonwork behavior during each work period for each of the three supported workers.

during which Mr. Geoff engaged in stereotypy. The job coach was asked to look directly at Mr. Geoff every 15 s, or as close to 15-s intervals as he could accomplish without interfering with his supervision of the other workers, and either prompt work behavior through a signed instruction to work if Mr. Geoff was not working or sign a praise statement (e.g., "good") if Mr. Geoff was working. Probe observations showed that the job coach prompted or praised work behavior every 20 s on average.

Intervention for Mr. Ream. The descriptive assessment indicated that all of Mr. Ream's stereotypy occurred when he stopped working on his assigned paper-shredding task (i.e., there was no wait period involved in his usual work routine). Hence, his intervention was designed to reduce the amount of time he spent not working when given his assigned paper-shredding task. The job coach was requested to look at Mr. Ream every 30 s and if he was not working, hand him a few sheets of paper to shred. If, when the job coach looked at Mr. Ream and he was working, the job coach provided praise by patting him on the back and/or signing "good." The 30-s intervals were chosen based on discussions with the job coach. Experimenter probes indicated the job coach provided a prompt or praise statement during 95% of all 30-s intervals.

Experimental conditions, design, and observation system. The baseline condition for each worker was the same as the descriptive assessment: the workers and job coaches worked according to their usual routine. The individualized interventions for each of the supported workers were implemented as described above. All sessions lasted 10 min. Following an initial baseline condition, a multi-element design was used to compare levels of stereotypy during baseline and intervention sessions. Conditions were alternated within each work day and observations were separated by approximately 15 min. Following the multi-element analysis, the intervention condition continued in isolation.

IOA checks occurred during 31% of all sessions across conditions and workers. For stereotypic behavior, overall agreement averaged 95% (range, 78% to 100%), occurrence averaged 85% (range, 31% to 100%), and nonoccurrence, 80% (range, 0% to 100%). Respective averages for work behavior were 96% (range, 85% to 100%), 91% (range, 67% to 100%), and 87% (range, 50% to 100%).

Results and discussion. The interventions resulted in increases in work behavior relative to baseline. The most noticeable increases occurred for Mr. Mise and Mr. Geoff. During the baseline conditions, work behavior averaged 19% (range, 5% to 38%) for Mr. Mise and 17% (range, 8% to 24%) for Mr. Geoff but improved to averages of 99% (range, 98% to 100%) and 77% (range, 64% to 96%) during the intervention conditions. Mr. Ream's work behavior increased from an overall baseline average of 67% (range, 46% to 90%) to 90% (range, 78% to 100%) during intervention.

The interventions to increase work behavior were accompanied by reduced stereotypy for each worker relative to the levels observed in baseline, with large, medium, and small effects across Mr. Mise, Mr. Geoff, and Mr. Ream, respectively (Figure 3). These low levels of stereotypy (relative to baseline) persisted for each worker.

Discussion and Guidelines for Practitioners

Results indicated that the assessment-based interventions reduced stereotypy and increased work performance among the supported workers with severe autism. The assessment and interventions for reducing stereotypy were conducted within the ongoing work situation and the interventions were carried out by the regular job coach during his typical duties. The initial observations (descriptive assessment) were conducted without any changes to the ongoing work routine, and the functional analysis was designed such that it could be conducted while the supported workers were performing their regularly assigned work duties or were taking a break from work (i.e., the alone condition). The assessment process was also relatively brief, requiring 10 min of observation for each descriptive assessment and 45 min of observation for each functional analysis. These features would appear to make the approach user-friendly relative to approaches that require extra personnel beyond observers to measure target behaviors or may involve disruptions to typical work routines.

Although the interventions were implemented by the job coach, the systematic observations were conducted by a separate observer. The behavior analyst working with job coaches might be an observer during the assessment because the observation periods were relatively brief. Perhaps if a more efficient observation process was employed, such as a momentary time sampling procedure (Bailey & Burch, 2002), then the supported work personnel might be able to conduct the observations themselves following brief training and intermittent supervision from a behavior analyst.

Regarding the practicality of the interventions, it should be noted that the schedule for prompting and/or praising work performance was relatively dense for two workers: averaging every 20 s for Mr. Geoff and every 30 s for Mr. Ream (no additional prompting or praising was required with Mr. Mise). However, the prompting and praising was very brief, involving only a few seconds to sign "work" or "good" for Mr. Geoff and to hand Mr. Ream some papers to shred or pat him on the back. The job coach was able to accomplish this by remaining in his usual position in the work room within a few feet of each worker's assigned work space and while conducting his usual supervision of the workers. Informal observations indicated that prompting and praising became less frequent following the investigation as the workers were spending the vast majority of their work time working on their tasks, though no formal plan was evaluated for fading the job coach's interactions. Future research seems warranted to formally evaluate a method of fading job coach prompting and praising to enhance the practicality of these types of interventions.

It should also be noted that stereotypy was not totally

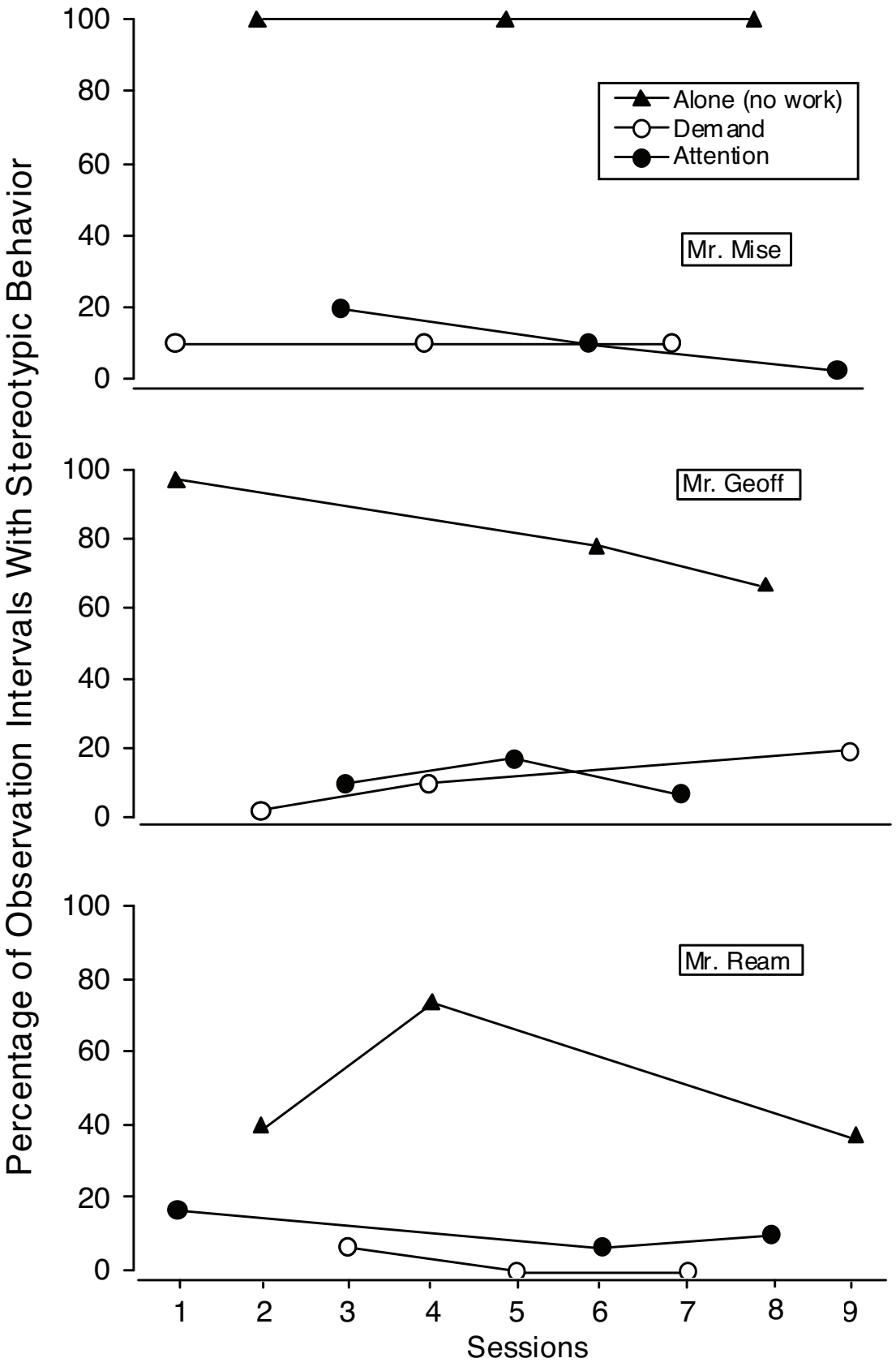

Figure 2. Percentage of observation intervals with stereotypy during each functional analysis condition (session) for each of the three supported workers.

eliminated for any of the three workers, though it was at near-zero levels for Mr. Mise. Reductions in stereotypic behavior that are apparently maintained independently of social consequences among individuals with autism without totally eliminating the stereotypy is common within investigations designed to reduce stereotypy (e.g., Ahearn et al., 2007; Lerman, Kelley, Vorndran, & Van Camp, 2003; Sidener, Carr, & Firth, 2005). In the current investigation, the reductions that did occur would appear to be socially significant from two perspectives. First, the degree of socially stigmatizing features of stereotypy (Pyles et al., 1997) would seem to decrease as the frequency of stereotypy decreases. Second, the reductions were accompanied by substantial increases in work behavior for each of the three supported workers.

When considering the reductions in stereotypy that were observed, it should be noted that the exact mechanism for the decreases was not precisely identified. One explanation is that the interventions impacted stereotypic behavior indirectly by promoting behavior (e.g., work) that reduced the time available to engage in the stereotypic behavior (Lerman & Rapp, 2006).

As indicated previously, each supported worker was able to perform the assigned work tasks and routinely began working on the tasks once instructed by the job coach and provided with the work materials. These preexisting skills likely allowed for the intervention to be effective. Additional research is warranted to evaluate if the same assessment-based intervention approach would be effective when a worker is not skilled in performing all the necessary steps to complete a job task and/or does not immediately respond to work instructions and material availability. At this point, this assessment and intervention process should not be assumed to be effective in those situations, and direct measurement of the effects of this process is therefore warranted.

In light of the results and qualifications just noted, the following guidelines are offered for consideration when providing support to skilled workers with autism who also engage in frequent stereotypy while at work. First, during the ongoing work routine, systematically observe the behaviors and environmental events that occur before, during, and after stereotypic and work behavior. Those events that reliably occur prior to behavior may occasion those behaviors. Those events that follow may be serving as reinforcers (Bijou, Peterson, & Ault, 1968). Second, conduct a functional analysis to identify the different sources of antecedent control of, or reinforcement for, the stereotypic behavior. Third, design interventions involving changes in the structure of the work assignments and/or interactions of the job coach based on the results of both assessments. An important focus of such interventions, because of the community context, should be on promoting behavior that competes with stereotypy and produces high levels of work behavior.

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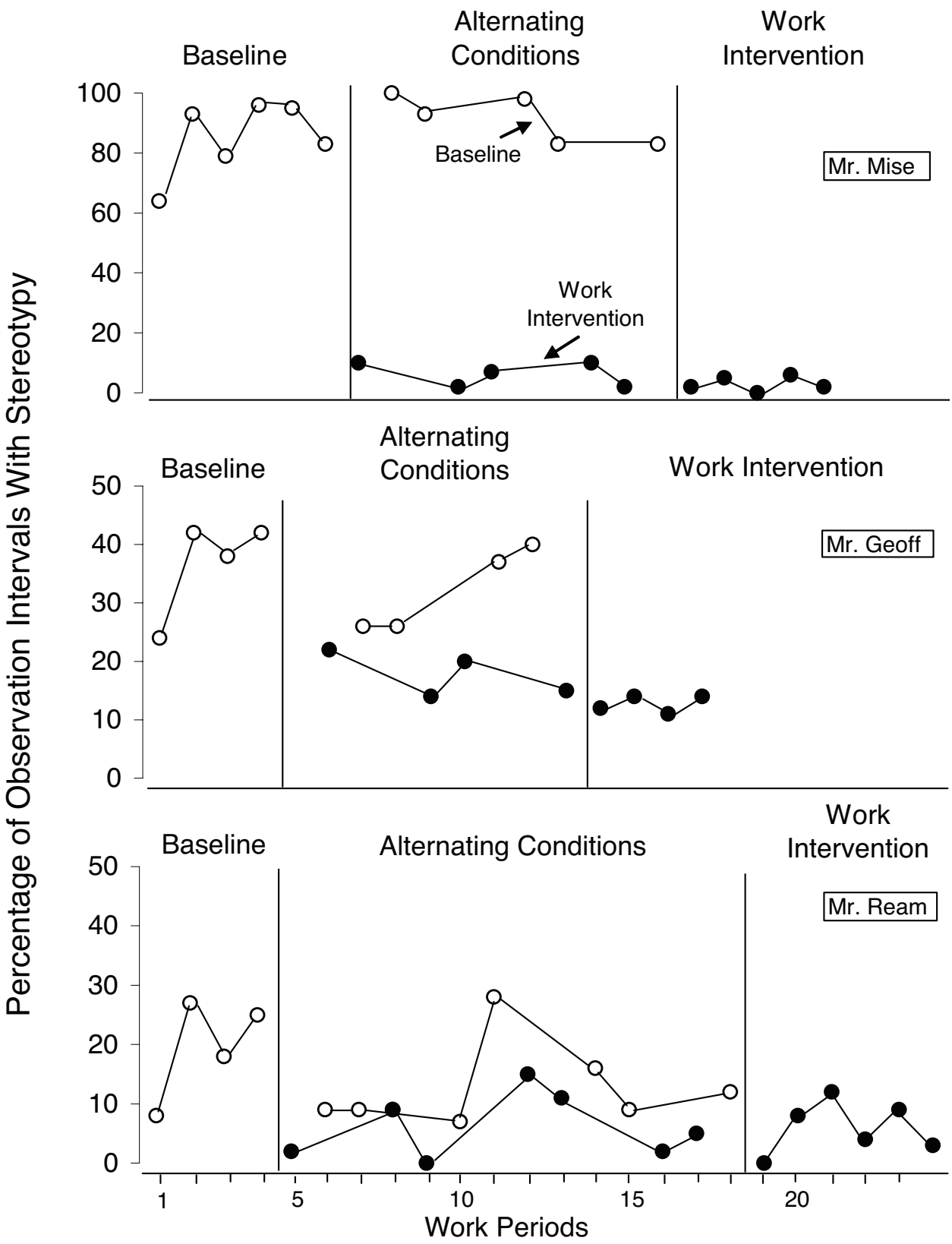

Figure 3. Percentage of observation intervals with stereotypy during each baseline and experimental condition for each of the three supported workers. Note the different vertical axis on the top panel relative to the bottom two panels.

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