

THE EFFECTS OF A RECESS OR BREAK
AND STIMULANT MEDICATION
ON THE CLASSROOM BEHAVIOR
OF CHILDREN WITH ADHD

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Psychology

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B.S., Louisiana State University, 1999
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August 2004

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Abstract

Only two empirical studies of recess have been extended to children with a diagnosis of attention deficit hyperactivity disorder (ADHD) and only one has included a single-case analysis. In addition, no studies have been found that specifically evaluated the effects of a quiet, indoor break on the classroom behavior of children in general, and children with ADHD in particular. The primary purpose of this study was to evaluate the effects of a recess, break, and continuous classroom schedule on the subsequent classroom behavior of children with a diagnosis of ADHD both when participants did and did not receive stimulant medication. Results were most apparent for 1 participant's disruptive behavior when he did not receive medication. Specifically, when this participant did not receive medication his disruptive behavior was lowest on days when he had a recess and highest on days when he had a continuous classroom schedule. Results of classroom schedule effects for all other participants were more equivocal. Regardless, stimulant medication was the only intervention that resulted in acceptable levels of off-task and disruptive behavior for the participants in this study.

Introduction

Recess has been defined in a variety of ways. For example, recess has been defined simply as a break in whatever one is doing (Jarrett et al., 1998). It has also been defined as “a period away from the task at hand: an interlude, a change of pace” (Jambor, 1994, p.17). When referring to recess in the elementary schools, it is most often considered as a break from academic work during which children go outdoors and are free to choose the activity in which they participate, as well as the students with whom they interact (Pellegrini & Bjorklund, 1997). Regardless of how recess is defined, preschool through elementary school children generally have had recess as a scheduled part of their day for as long as there have been schools and throughout the entire world (Pellegrini, 1995; Pellegrini & Bjorklund, 1997). According to Pellegrini & Bjorklund (1997), recess has been part of the school day since formal educational systems were established. By the 1950s, scheduling of three recesses a day was the normal case in the United States (Mulrine, 2000).

In 1989, the National Association of Elementary School Principals (NAESP) sent a survey to the state superintendents of schools in all 50 states, as well as Washington, DC. Forty-seven out of 51 responded. From these surveys, it was found that 90% of the school districts had recess. Recess occurred once or twice a day in 96% of the school districts that had recess. In 75% of the school districts that had recess, recess lasted 15 to 20 minutes. Fifty percent of the schools with recess employed teachers as the supervisors of the recess periods, and 36% appointed teacher aides as supervisors. Of the teacher aides who were supervisors, 86% had no formal training for supervising recess. In 87% of the schools, the recess policy decisions were made within the specific school. The recess policy was about equally divided between structured versus unstructured periods (Pellegrini, 1995). In 1991, the NAESP surveyed 383 principals

about recess. It was found that recess was felt by the principals surveyed to be healthy and productive for children. Most of the principals believed that children who have recess are more attentive and relaxed later in the day (Caterino & Polak, 1999).

Although most schools include recess in the typical school day, the number of recesses per day, the length of the recesses, the type of recess (i.e., structured versus unstructured), and the policy for supervision of recesses varies dramatically from one school to another (Pellegrini, 1995). Some schools allow a short recess (i.e., 5 or 10 minutes) every forty to forty-five minutes (Stevenson & Lee, 1990), while others only include one recess period in the afternoon of each day (Blatchford, 1989). Some primary schools in Britain schedule 3 recesses a day: one 15 minute recess in the morning, an 80 to 90 minute lunch break during which children are allowed to choose the activity in which they participate after they are finished eating, and a 15 minute recess in the afternoon (Pellegrini, 1995). Schools in Japan have 10 to 20 minute breaks between each 45 minute lesson or five minute breaks between 45 minute lessons with a long play break after lunch (Lewis, 1995). According to Pellegrini (1995), schools in Taiwan have many recesses scheduled into the school day, as well as 5 to 6 minutes of transition time after each recess. Recess is obviously an important part of the school day in many countries. There is a recognized need throughout the world for children to be physically active, talk with peers, and to play freely (Jarrett et al., 1998). However, many variations that are seen in the timing and duration of recess may have an impact on children's behavior both in the classroom and on the playground (Pellegrini, Huberty, & Jones, 1995).

Until recently, recess had been taken for granted by virtually everyone involved in the school systems, with very little written about recess from a policy or research perspective (Blatchford, 1989). However, recess became a source of some controversy in the late 1980's

when people began to question its role in the school curriculum (Hart, 1993a, 1993b; Lindsay, 1994; Pellegrini, 1995; Sutton-Smith, 1990). According to Kieff (2001) and Mulrine (2000), more than 40% of school districts in the United States have eliminated recess or are considering doing so. The trend of eliminating recess is also affecting schools in the United Kingdom and Australia (Blatchford, 1996). Because schools have begun to limit or eliminate recess (Jambor & Guddemi, 1993), young elementary school children currently may often have no more recess breaks than older children (Hart, 1993c; Lindsay, 1994; Pellegrini & Smith, 1993; “Recess: an Issue,” 1991; Sutton-Smith, 1990).

Educators, parents, and legislators have supported the elimination of recess for many reasons. Parents and legislators have pressured schools to raise test scores, and therefore, some schools have taken recess time away in order to allow for more instructional time (Jambor & Guddemi, 1993; Jarrett et al., 1998; & Pellegrini & Bjorklund, 1997). Schools have also cited violence on the playground as a reason for eliminating recess periods (Lindsay, 1994). It has been suggested by some that recess actually encourages aggression and antisocial behavior (Blatchford, 1989; Jambor & Guddemi, 1993; Jarrett et al., 1998; Pellegrini, 1995). However, empirical studies suggest that these problem behaviors are very uncommon, accounting for less than 2 to 3% of children’s playground behavior (Pellegrini, 1995). Also, most problems with aggression and antisocial behavior actually occur during the transition periods, not at recess (Blatchford, 1989). Another common concern is that recess disrupts children’s work and causes increased levels of inattention and excitement following the break (Blatchford, 1989; Jarrett et al., 1998). However, there is again little empirical support for this concern (Pellegrini & Bjorklund, 1997).

Elimination of recess from the schools also has been viewed as a necessary cost saving measure. The elimination of recess may be viewed by administrators as cost saving due to safety and first aid issues as a response to potential threats of litigation arising from accidents or inappropriate behavior, and as a response to teacher union concerns regarding recess supervision issues (Johnson, 1996). Finally, Johnson (1996) attributes an adult lack of understanding and indifference towards child play behaviors as underlying the elimination of recess in the nation's schools.

Just as there are supporters of eliminating recess from the nation's schools, there are those who strongly argue for the maintenance of the recess break during the scheduled day. The arguments in favor of recess are nearly mirror images of those against it. In support of recess, Jambor and Guddemi (1993) argue that children develop important skills, such as problem-solving, risk-taking, social skills, cooperation, language, flexibility, coordination, and adaptability during recess. The authors state that all of these skills are also important for intellectual growth. Perhaps the most common argument in favor of recess is the belief that children need a break from academic work (Jambor & Guddemi, 1993). Educators often describe recess as a necessary time for children to "blow off steam" and thus increase subsequent concentration in the classroom.

Many educators have argued that children are allowed sufficient time to play in the classroom, and consequently, recess is viewed as unnecessary. However, these play periods typically involve activities such as puzzles, games, and toys, that are designed to teach academic skills (Flaxman, 2000). Therefore, children are not allowed to freely choose the activities in which they participate. Flaxman (2000) argues that free choice of play activities, which recess allows, promotes growth and learning.

Theories of Recess

Surplus Energy Theory

There are many theories and ideas about why recess and play are important for children. One of the earliest theories about the importance of play was proposed by Herbert Spencer in 1898 and was described as the surplus energy theory (Jarrett et al., 1998; Spencer, 1898). According to the surplus energy theory, extra energy that was left over following the completion of life-supporting activities built up overtime when one participated only in sedentary activities (Hartle & Johnson, 1993). Physical activity or play was the opportunity that allowed for the use of this surplus energy. This theory also makes the assumption that using the “surplus” energy was necessary for renewal of attention (Jarrett et al., 1998; Spencer, 1898). Therefore, play was considered an essential activity during childhood (Hartle & Johnson, 1993), and recess in the schools was justified as a chance for children to “blow off steam” after classroom activities and thus increase attention in the classroom (Blatchford, 1989; Pellegrini & Davis, 1993; & Spencer, 1898). Because of the influence of this theory, early playgrounds were places lacking imaginative quality; they were merely places where children could run about and use their surplus energy (Hartle & Johnson, 1993). The surplus energy theory does appear to be indirectly supported by findings such as those that show a positive relationship between the length of confinement before recess and the activity level during recess (e.g., Pellegrini & Davis, 1993). However, the theory lacks scientific credibility. The current understanding of physiology does not support the building up and discharging of energy as described in the surplus energy theory (Jarrett et al., 1998; Smith & Hagan, 1980). There is also a lack of criteria for what defines a “surplus of energy” (Smith & Hagan, 1980). In addition to these criticisms, the surplus energy

theory does not explain why children who are tired still play in the presence of interesting stimuli (Burghardt, 1984).

Massed Versus Distributed Practice Effects on Learning

Some have suggested that recess may increase attention because it serves to distribute learning opportunities or practice (Jarrett et al., 1998; Pellegrini & Bjorklund, 1997). This distribution of learning has relevance to the principle of massed versus distributed practice. The principle of massed versus distributed practice suggests that memory recall is better when learning is distributed over time instead of massed into an extended period. Research on different spacing intervals of word and picture presentations has shown that both children and adults remember more when presentations are distributed over time rather than massed together or presented with very short intervals separating the presentations (Dempster, 1988; Hunter, 1929; Toppino, Kasserian, & Mracek, 1991). Children seem to benefit from distributed practice by the way in which they learn many skills that are school-related. However, classroom studies of massed versus distributed practice have been less impressive than those conducted in the laboratory.

It has recently been suggested that recess could function as a space between learning activities, and therefore, distribute practice of academic skills (Jarrett et al., 1998; Pellegrini & Bjorklund, 1997). Based on the massed versus distributed practice evidence, it might be said that any break is a good break, and recess provides a break that is beneficial to overall learning (Pellegrini & Bjorklund, 1997).

Cognitive Immaturity Hypothesis

The principle of massed versus distributed practice implies that any change of activity should be sufficient to lead to the distribution of practice effects. However, younger children

may require a greater change in the type of activity before experiencing the effects of distribution of practice. According to the cognitive immaturity hypothesis, young children's immature nervous systems may be more susceptible to interference (Bjorklund & Brown, 1998). Research has shown that children become better at resisting interference from task-irrelevant stimuli and inhibiting task-irrelevant thoughts with increasing age (e.g., Bjorklund & Harnishfger, 1990; Brainerd & Reyna, 1993; Dempster, 1992, 1993). The degree of difference between consecutively presented tasks can effect performance on these tasks (Pellegrini & Bjorklund, 1997). That is, a change in subject matter may be sufficient to prevent interference for older children, but younger children may require a larger change, such as from a structured to an unstructured activity as in a typical recess (Pellegrini & Bjorklund, 1997).

Deprivation Theory

More recently, deprivation theory has been proposed as an alternative to the surplus energy theory. According to Fagen's (1981) deprivation theory of play, social skills and cardiopulmonary functions are developed and exercised during childhood and young children participate in physically and socially vigorous activities in order to develop these functions (Fagen, 1981; Smith & Hagan, 1980). Play deprivation theory includes a rebound hypothesis which suggests that if children are deprived of opportunities during which they can engage in socially and physically vigorous activities, they will later rebound or compensate with higher levels of social interaction and physical activity (Pellegrini et al., 1995). According to this theory, recess is a time during which children can engage in necessary social and physical activities. It would be predicted that during the deprivation period (i.e., the classroom time before recess) the inattention of children should increase as a function of time (Bjorklund & Harnishfeger, 1990; Burghardt, 1988; Stevenson & Lee, 1990). A long deprivation period before

recess should then cause a rebound of socially and physically vigorous activities during recess. The longer the deprivation period, the more vigorous the subsequent activity should be (Pellegrini et al., 1995). Small samples of British and American elementary school children have shown post-deprivation activity rebound effects (Pellegrini & Davis, 1993; Smith & Hagan, 1980).

Novelty Theory

Novelty theory proposes that people function better, in general, when they have changes in activities. The theory suggests that people become habituated when they are involved in one particular activity for an extended period, and therefore become bored and seek novelty. Behavior is said to be initially determined by the degree of novelty in the particular activity. According to the novelty theory, children may habituate to classroom activities as a function of time, and therefore, seek novelty in a different activity. Thus, over time this leads to inattention for the particular classroom activity to which they are assigned (Berlyne, 1966; Ellis, 1984). However, recess provides novelty, for its characteristics are greatly different from those of the classroom's and can thus prevent habituation. The recess activities are typically defined by the child and involve more physically vigorous activities as well as spontaneous social interaction.

Recess is also one of the few times during the school day in which children have control over their own activities (Pellegrini et al., 1995). In contrast, the classroom activities are directed by the teacher and are typically sedentary (Pellegrini, 1995). Elementary school boys have been shown to be more physically active than elementary school girls (Eaton & Enns, 1986). Therefore, boys may seek novelty on the playground through more physically vigorous activities than girls. In contrast, girls engage in more social sedentary activities than boys and

may seek novelty through these types of activities. Physical activity may therefore be just one of the ways in which children find novelty, and thus prevent habituation to classroom activities.

According to the novelty theory, children should also seek more novelty during recess as a function of how long they were confined prior to having a recess break. Children should then habituate to recess activities as a function of time and seek novelty in a different activity, such as classroom work. Therefore, this theory predicts an increase in attention to classroom activities, but only if the children are allowed enough time at recess to habituate to its activities (Pellegrini, 1995; Pellegrini & Davis, 1993).

Recess as Exercise

The positive effects of recess have been attributed by some to the physical activity and exercise that children engage in during these break periods. In general, exercise has been hypothesized to have a positive effect on cognitive processes (Jarrett et al., 1998). It also has been reported that exercise may promote emotional health in children with disruptive behavior (Karper, 1981). Carlson (1982) wrote of the multiple benefits of exercise in improving children's emotional, cognitive, social, imaginative, and behavioral processes. Scherman (1989) noted that stress interferes with school performance, but physical activity reduces stress, and therefore, may help to improve academic performance.

Some studies have shown that physical activity has led to immediate increases in attention for adults, but overall a review of the literature has suggested more equivocal results for school-age children (Pellegrini, 1995; Tomporowski & Ellis, 1986). There is currently a lack of data that consistently demonstrates that exercise improves children's classroom performance or attention (Pellegrini & Bjorklund, 1997). For example, Pellegrini & Davis (1993) found that vigorous activity of children at recess can actually lead to subsequent inattention in the

classroom. However, other studies have shown that physical activity does not interfere with subsequent attention in school age children. Raviv and Low (1990) administered the d2 concentration test (Brickenkamp, 1962), which was designed to measure attention under stress, to junior high school students. This test was given to 4 groups of students at the beginning and end of each lesson. Two groups participated in a physical education lesson, while the other 2 groups participated in a science lesson. One group of physical education and science students were given the lesson at 8:00 a.m., while the remaining groups had their lesson at 2:00 p.m. Concentration scores increased at the end of the lesson for all groups. The nature of the lesson apparently did not influence concentration. However, concentration was higher for the groups whose lesson was given at the beginning of the day regardless of the activity. Although physical activity did not lead to increased attention, it was not detrimental to subsequent attention as was found in the Pellegrini & Davis (1993) study. This could be due to the fact that older children were studied in the Raviv & Low (1990) study, or that the test of concentration was significantly different from typical classroom activities.

Caterino & Polak (1994) conducted a study on the effects of physical activity on the concentration of second-, third-, and fourth-grade students. The children were divided into 3 groups; one group participated in free-play recess, the second group participated in a passive activity, while the third group participated in a physical activity. No significant differences were found between the 3 groups in concentration after the activity. However, a significant difference was found between girls and boys, with girls scoring higher than boys on the test of concentration after the activity.

Caterino & Polak (1999) examined the effects of a physical activity versus a classroom activity on performance on a test of concentration. Children in second, third, and fourth grade

were divided into either the classroom activity group or the physical activity group. Those in the classroom activity group were administered the Woodcock-Johnson test of concentration (1989) after a typical classroom activity. Those in the physical activity group participated in 15 minutes of stretching and aerobic walking before the test of concentration was administered. There were no significant differences between the classroom activity and physical activity groups for second and third grade. However, for the fourth graders, the physical activity group performed significantly better.

Recess as a Positive Reinforcer

An increase in responding as a function of a particular consequence is referred to as the process of positive reinforcement (Catania, 1984). The positive reinforcer is a stimulus or event presented contingent on the occurrence of a behavior, which increases the probability that the behavior will occur in the future (Heron, 1987). It is possible that recess may function as a positive reinforcer. That is, if recess is provided contingent of a particular behavior, the probability of that behavior occurring in the future may in fact increase.

Premack (1959) hypothesized that behaviors themselves could be used as reinforcers. His hypothesis, called the Premack principle, states that a behavior that has a high probability of occurring may be used as an effective reinforcer for a behavior that occurs less frequently. In other words, access to the high frequency behavior is made contingent upon the occurrence of the low frequency behavior (Heron, 1987). Based on observing the frequency with which children engage in play on the playground, Geiger (1996) suggested that free play at recess is a high probability behavior and can thus be used to reinforce a lower probability behavior, such as on task behavior to classroom activities.

Geiger (1996) found that recess on the playground acted as a reinforcer that motivated the students to “focus on the material to be learned and to practice self-discipline” (p. 4). Seventh and eighth grade students were given a contingency contract, whereby these students could go outdoors for recess for the last 5 or 10 minutes of a 45 minute class period if all work was completed neatly within the given time period. Sixth grade students, however, were not allowed to go outdoors for recess after their assignments were completed; they were allowed to participate in a quiet activity in the classroom contingent on the completion of class work. Geiger (1996) found that the seventh and eighth grade students completed their class work 5 to 10 minutes before the end of the class period for the majority of the class periods, while the sixth graders completed their work 5 to 10 minutes before the end of the class period only 6% of the time. Geiger (1996) also reported little discipline problems for seventh and eighth graders, while the sixth grade students had many problems.

Recess as a Negative Reinforcer

Negative reinforcement has been defined as a reduction or termination of an ongoing aversive stimulus, contingent upon a response that results in the increased probability of a behavior occurring again under similar stimulus conditions (Skinner, 1953). The stimulus that is removed or reduced is called the negative reinforcer (Heron, 1987). According to Skinner (1974), “a negative reinforcer strengthens any behavior that reduces or terminates it” (p. 46). Negative reinforcement has often been referred to as “escape,” as a particular response functions to allow “escape” from an existing aversive stimulus (Heron, 1987).

Recess may function as a negative reinforcer if it functions to provide an escape from work by removing or terminating aversive classroom activities. Therefore, if children are engaged in appropriate behavior immediately before recess, their appropriate behavior may be

negatively reinforced by the removal of classroom demands that recess provides. However, conversely if a student engages in inappropriate behavior immediately before recess, the escape from classroom activities that recess provides may function to negatively reinforce the student's inappropriate behavior.

In phase 1 of Golonka et al. (2000), 2 participants were provided with choice making opportunities during which they were allowed to choose between continuing to work and taking a break. During this phase, participants were also placed in two conditions: a break alone or a break enriched with social interactions and preferred activities. During phase 2, the participants were able to choose between continuing to work, taking a break alone, or taking an enriched break.

Golonka et al. (2000) found that a 12 year-old participant engaged in escape-maintained aberrant behavior during 32% and 36% of the intervals during 2 sessions in which she was given an opportunity to make a choice between continuing to work or taking a break alone. However, aberrant behavior occurred during 11% and 10% of the intervals during 2 sessions when she was given a choice between continuing to work and taking an enriched break. The lowest percentage of aggression occurred when provided with the choice of continuing to work, taking a break alone, or taking an enriched break. When the participant was given a choice to work or take a break alone, she earned the break during 18% and 26% of the intervals across the 2 sessions. However, when she was given the choice of continuing to work or taking an enriched break with access to preferred social activities, she earned a break during 47% and 57% of the intervals. During the three choice option phase the participant continued to request the enriched break. The results for a second 30-year-old participant in the Golonka et al. (2000) study showed similar effects. This participant earned enriched breaks more often than breaks alone and

continued to demonstrate aberrant behavior when breaks alone rather than enriched breaks were provided. The participant engaged in aberrant behavior during enriched breaks on an average of just 12% of the intervals as compared to an average of 45% of the intervals when breaks alone were provided.

Golonka et al. (2000) suggest that access to preferred activities and the type of break provided to the participants affected choice making and increased appropriate behavior. This study may have implications for recess. If a child's behavior is escape-maintained, simply providing a break from work may not be sufficient in increasing appropriate behavior. However, since children choose the activities in which they participate during recess, recess may provide an enriched break with access to preferred social activities. Therefore, an unstructured recess may be more effective at increasing appropriate behavior than a break alone.

Empirical Studies of Recess

Empirical studies of recess have focused on academic achievement, classroom confinement, duration and intensity of playground behavior, classroom attention, and recess timing. Pellegrini (1992) examined the extent to which kindergarten children's social behavior during recess predicted their first grade academic achievement. It was found that peer interaction during recess was a positive predictor of first grade achievement, while interaction with adults was a negative predictor of first grade achievement. Peer and adult interaction during kindergarten recess accounted for a significant amount of the variance in first grade achievement even after kindergarten achievement was controlled.

Smith and Hagan (1980) examined the effects of confinement on 3 to 4-year-old nursery school students' active play on the playground during recess. The children stayed in the classroom for either a shorter (45 minutes) or longer (90 minutes) period of time before going

outdoors to play. During the periods of confinement, children participated in indoor classroom work, during which active play was almost entirely prevented. It was found that children were more active for a longer period of time during recess after the longer period of confinement, as compared to the shorter period of confinement. Furthermore, activity levels decreased as a function of time on the playground. Finally, no gender differences were observed.

Pellegrini and Davis (1993) examined the effects of classroom confinement on 9-year-old students' classroom and playground behavior in an American elementary school. Children were confined for shorter (2 ½ hours) and longer (3 hours) periods and the duration and intensity of the students' playground behavior were observed. It was found that children, but especially boys, were more restless while doing seat work as a function of time. Concentration on seat work also decreased as a function of time. It was also found that longer periods of classroom confinement (3 hours) elicited more vigorous social and nonsocial activity during recess. A general decline in exercise subsequently occurred across the recess period with marked decreases in physical activity after six or seven minutes. Boys were again found to be more physically active than girls on the playground, especially after the longer period of confinement. Finally, it was found that the children who engaged in physically active play were more likely to be less attentive after recess, while children who engaged in less active social behavior were more likely to be attentive and less fidgety following recess. Pellegrini and Davis (1993) suggested children may need changes from seat work, however these changes may need to be settling rather than exciting. Physical activity at recess may not be the most important variable relating to improved attention following recess.

Pellegrini et al. (1995) conducted three experiments in which they examined the effects of recess timing on kindergarten, second-grade, and fourth-grade children's classroom and recess

behaviors. In the first experiment, Pellegrini et al. (1995) found that children were less attentive in the classroom during a long confinement period (recess at 10:30 a.m.) than they were during the short confinement period (recess at 10:00 a.m.). However, no significant effect for confinement was found for second graders. Even so, second graders were less attentive than fourth graders. It was also demonstrated that a male-preferred task (i.e., having a male-preferred story read) before recess elicited higher levels of inattention for girls than boys. Fourth graders were found to be significantly more socially active during recess than second graders after a long confinement period. Fourth graders were also found to be more socially interactive during recess after a long confinement period when compared to a shorter confinement period. However, physical activity levels during recess were not significantly different following the two confinement periods. Second and fourth grade students had higher levels of inattention before recess than after recess. Fourth graders were also found to be more active during recess than other children, and boys were more active than girls. Overall, results suggest that giving students a break from classroom work may help to maximize their attention (Pellegrini et al., 1995).

Experiment 2 of the Pellegrini et al. (1995) study was designed to replicate experiment 1. In experiment 2, it was found that fourth grade boys' inattention in the classroom was higher in the long confinement period when compared to the short confinement period. Experiment 2 also demonstrated that female-preferred tasks (i.e., having a female-preferred story read) elicited more inattention for second graders during the long confinement period. Fourth graders were also found to be more physically active than second graders. After a long confinement period, all children were more physically active during a subsequent recess than after a short confinement period. Social interaction during recess also increased after the long confinement period, with levels of social interaction increasing as grade level increased. The relationship

between physical activity during recess and subsequent classroom inattention was not significant. However, the relationship between social interaction during recess and subsequent classroom inattention was positive and significant. Second grade students' attention to seat work was found to be higher following recess when compared to before recess. Results from this experiment suggest that children's inattention to classroom activities is affected by duration of confinement, and duration of confinement interacts with the task as well as the age and gender of the children. Duration of confinement also affected the amount of social interaction shown by children at recess. Children, but especially boys, were also more physically and socially active at recess as a function of age. In both experiment 1 and 2, it was found that the type of recess activities generally did not relate to post recess attention. However, in both experiments, children had higher levels of inattention prior to recess than after recess.

In experiment 3, Pellegrini et al. (1995) examined the effects of classroom confinement on indoor recess behavior, and the effects of the behaviors displayed at recess on the post recess inattention of the children. Again, it was found that boys were more active than girls, and children were more active after a longer period of confinement. It was also found that more locations in the classroom were visited during indoor recess after a longer period of confinement and that more locations were visited by boys. It was found that type of recess activity did not relate to post recess inattention, but that overall pre-recess inattention was higher than post recess inattention.

In general, the three above experiments by Pellegrini et al. (1995) demonstrated that children's, but especially boys', inattention increased as length of classroom confinement increased. Results from the experiments also suggested the gender-preference of the task to be a variable related to children's inattention. Results from these experiments also suggest that in

order for classroom attention to be maximized, children's classroom task efforts should be distributed (Pellegrini et al., 1995). Higher levels of physical activity or social interaction following longer periods of confinement indicate a rebound effect after deprivation of such activities. During the indoor recess, rebound was expressed by seeking more locations in the classroom. It was found that children's recess activities did not relate to post recess attention. This finding is contrary to the Pellegrini and Davis (1993) study, in which higher levels of physical activity led to post recess inattention. Because recess activities did not relate to post recess attention, and post recess attention was higher than pre-recess attention, it has been suggested that recess functions to simply provide a break, and the break is what is most important (Pellegrini & Bjorklund, 1997).

Recess and ADHD

Introduction

Attention deficit hyperactivity disorder (ADHD) is one of the most common psychiatric disorders affecting children and adolescents in the United States (Panksepp, 1998; Dulcan et al., 1997). ADHD is estimated to affect approximately 3 to 5% of school-aged children (American Psychiatric Association, 1994). Approximately 50% of all referrals of school-aged children to mental health clinics in this country are for ADHD (Barkley, 1990). Furthermore, ADHD is believed to be one of the most common reasons for mental health referrals to pediatricians, family physicians, pediatric neurologists, and child psychiatrists (Biederman, Newcorn, & Sprich, 1991; Cantwell, 1996).

According to the *Diagnostic and Statistical Manual of Mental Disorders (4th ed.) (DSM-IV)*, attention deficit hyperactivity disorder consists of two major groups of symptoms which are inattention and hyperactivity-impulsivity (APA, 1994). Attention deficit hyperactivity disorder

is divided into 3 types based on the presence or absence of at least 6 symptoms in each symptom group (i.e., inattention and hyperactivity-impulsivity). The three types of ADHD are predominantly inattentive, predominantly hyperactive-impulsive, and combined. In order to diagnose any type of ADHD, some symptoms must have been present in the child before the age of 7 and symptoms must have been present for at least 6 months (APA, 1994). The core deficits of ADHD include impulsive responding to external stimuli or internal wishes or needs and lack of rule-governed behavior in a variety of settings (Barkley, 1994).

Empirical Studies of Recess and ADHD

Jarrett et al. (1998) examined the effects of a recess break on the on task behavior, fidgeting, and listlessness of fourth grade students. Children at this school did not typically have recess, although they did have physical education three times a week in the morning. Jarrett et al. (1998) therefore scheduled a recess after 2 ½ hours of classroom confinement on one of the nonphysical education days. One day a week, the fourth grade children did not have physical education or recess. It was found that children's classroom behavior did not differ during the "pre-recess" observations on recess and no-recess days. "Post-recess" observations were recorded for both recess and no-recess days. Results of the study showed that children worked more and were less fidgety when they had recess as compared to when they did not have recess. However, children's listless behavior did not differ on recess and no-recess days. It was also found that off task behavior and fidgety behavior decreased to below pre-recess observation levels following recess. Because group effects were significant, Jarrett et al. (1998) examined individual differences. Those children who benefited the most from the recess break were compared to those who did not in order to determine the characteristics on which the children differed. Sixty percent of the children benefited the most from recess, either by becoming

significantly more on task and/or less fidgety. All five children who had a diagnosis of attention deficit disorder (ADD) benefited from recess; 1 child with ADD was more on task, 2 children with ADD were less fidgety, and 2 children with ADD were both more on task and less fidgety following recess. The researchers anecdotally observed that much of the time at recess was spent socializing rather than in physical activity. This supports the idea that a change of pace or break which recess provides may be what is important for attention in the classroom.

Ridgway, Northup, Pellegrin, LaRue, and Hightshoe (2003) evaluated the effects of recess on the classroom behavior of children with a diagnosis of attention deficit hyperactivity disorder (ADHD). In addition to examining the effects of recess on classroom behavior, the time of recess was matched to the behavior of the individual children and results were evaluated using single-case designs. This study also replicated and extended the methods of Pellegrini and Davis (1993) and Pellegrini et al. (1995) to evaluate the effects of time of classroom confinement on classroom behavior for participants with ADHD on an individual basis. Finally, the study included typical peers, allowing for further evaluation of the effects of recess for children who did not have a diagnosis of ADHD as well as providing an indirect comparison of the effects of recess for children with a diagnosis of ADHD as compared to typical peers.

The primary participants observed by Ridgway et al. (2003) were 3 boys 8 years of age. All were in the second grade at a private school and had a prior diagnosis of ADHD. All three students who had a prior diagnosis of ADHD were receiving stimulant medication. In addition, 3 boys in the same classroom as each of the 3 participants with a diagnosis of ADHD were nominated by their teachers as “typical” students. Thus, there were 3 different peer groups (of 3 peers) matched to each student with a diagnosis of ADHD. The school chosen for the study did not have a regularly scheduled morning recess break.

All participants in the Ridgway et al. (2003) study were initially observed in the classroom at periodic intervals from the beginning of the school day until their naturally scheduled lunch break. These observations occurred at 8:30 a.m., 9:00 a.m., 9:30 a.m., 10:00 a.m., 10:30 a.m., and 10:50 a.m. and were conducted for 3 days before a morning recess break was introduced. Recess was introduced on alternating days for the entire class at 9:45 a.m. since this time was determined to be the most appropriate time for each participant with a diagnosis of ADHD based on visual analysis of the results of the observations of inappropriate behavior. Recess consisted of the children going outdoors onto a playground for 10 min with an additional 10 min allowed for transitions. On days when the children did not have recess, typical classroom activities continued uninterrupted. All participants were observed at the same times on both recess and no recess days. Thus, prerecess observations were collected at 8:30 a.m., 9:00 a.m., and 9:35 a.m., and postrecess observations were collected at 10:10 a.m., 10:30 a.m., and 10:50 a.m.

Ridgway et al. (2003) found that overall levels of inappropriate behavior were substantially higher on days when the 3 participants with a diagnosis of ADHD did not have recess as compared to days when they did have recess. It was also found that the level of inappropriate behaviors generally increased over time for all participants, including the typical peer groups that were matched to each student with a diagnosis of ADHD, on days when there was no recess. However, this general progressive increase of inappropriate behavior over time did not occur on days when the participants did have recess. Therefore, Ridgway et al. (2003) noted that the primary effect of recess may be to prevent an increase in off-task and other inappropriate behaviors rather than result in any immediate improvement in classroom behavior. The results of Ridgway et al. (2003) indicated that recess was beneficial for both typical peers as

well as those children with a diagnosis of ADHD. However, the results also suggested that recess may have a greater effect on levels of inappropriate behavior for children with a diagnosis of ADHD, but this effect may be associated with higher levels of baseline inappropriate behaviors as compared to typical peers.

Pharmacological Treatment for ADHD

Stimulant Medication. Stimulant medications have been the most commonly recommended treatment for children with a diagnosis of ADHD (Pelham, 1993). It has been estimated that approximately 90% of children with a diagnosis of ADHD will be treated with stimulant medication (Pelham, 1993). Research has suggested that stimulant medication has been effective for the short-term management of ADHD-related behaviors (Dulcan, 1997). Seventy to 80% of children taking stimulant medications for the treatment of ADHD show significant behavioral, academic, and social improvements (DuPaul & Barkley, 1993).

Stimulant medications currently prescribed for the treatment of ADHD include methylphenidate (MPH, Ritalin, Concerta, Metadate ER), dextroamphetamine (Dexedrine, Dextrostat), amphetamine (Adderall, Adderall XR), dexmethylphenidate (Focalin), and pemoline (Cylert). All stimulant medications are approved by the FDA for children age 6 and older, with the exceptions of Adderall, Dexedrine, and Dextrostat which are approved for children age 3 and over. However, many stimulant medications are prescribed off-label for younger children with a diagnosis of ADHD (National Institute of Mental Health, 2002).

Stimulant medications have a relatively short half-life. The behavioral effects of methylphenidate and dextroamphetamine peak between 1 to 3 hours following ingestion. The behavioral effects of these medications then gradually decrease until no behavioral effects can be observed 2 (MPH) to 4 (dextroamphetamine) hours after the peak of the effects. Behavioral

effects of pemoline are evident within 2 hours following ingestion with peak effects occurring between 4 to 6 hours following administration. The behavioral effects of pemoline last for a total of 8 to 10 hours (Dulcan, 1997). However, unlike most stimulant medications whose effects can typically be observed during the first day of administration, the maximum effects of pemoline cannot be observed until the medication has been administered for 2 consecutive days (Pelham et al., 1990). There are also long acting and extended release stimulant medications available. Concerta is a newer form of methylphenidate which is long acting (up to 12 hours). Metadate ER is a newer extended release form of methylphenidate which can be sprinkled into food for those children who have difficulty swallowing pills. Amphetamine is also available in an extended release form (Adderall XR).

Behavioral Effects. Numerous studies have demonstrated the effectiveness of stimulant medication in increasing on task behaviors (Pelham et al., 1993; Pelham, Vodde-Hamilton, Murphy, Greenstein, & Vallano, 1991; Johnson, Handen, Lubetsky, & Sacco, 1994; Rapport, DuPaul, Stoner, & Jones, 1986), increasing academic accuracy and completion (Pelham et al., 1993; Pelham et al., 1991; Rapport et al., 1986), and increasing adherence to rules (Pelham et al., 1993; Pelham et al., 1991). Studies have shown methylphenidate to be effective in decreasing disruptive behaviors (Northup, Gulley, Edwards, & Fountain, 2001; Pelham et al., 1993; Rapport, Denney, DuPaul, & Gardner, 1994), increasing compliance (Barkley, McMurray, Edelbrock, & Robbins, 1989; Pelham, Schnedler, Bologna, & Contreras, 1980), decreasing fidgeting (Johnson et al., 1994), and improving performance on laboratory measures of attention and impulsivity (e.g., continuous performance tasks) (Rapport et al., 1986). However, few studies have examined the long term efficacy of stimulant medication (Barkley, 1990). It has been concluded that no long term benefits are associated with stimulant medication and the

benefits of stimulant medication cease when the administration of medication is terminated (Pelham et al., 1991).

Side Effects. The most commonly reported side effects of stimulant medications include reduced appetite, insomnia, stomachaches, headaches, and jitteriness (Barkley, 1990). Other possible side effects include nausea, irritability, dizziness, tachycardia, drowsiness, skin rashes, and motor and vocal tics (Barkley, 1990; Pelham, 1993). Due to the risk of serious side effects on the liver, pemoline is not ordinarily prescribed as the first-line of medication therapy (NIMH, 2002). Blood tests are necessary to monitor liver functioning when pemoline is administered (Greenhill et al., 1996). In addition, numerous studies have demonstrated that stimulant medications may be related to a decrease in social interactions (Barkley & Cunningham, 1979; Cunningham & Barkley, 1978; Northup et al., 2001; Smith et al., 1998; Schliefer et al., 1975).

Dose Response. Research has demonstrated the relationship between dose of stimulant medication and behavioral response to the medication to be highly idiosyncratic for children with a diagnosis of ADHD (DuPaul & Barkley, 1993; Northup et al., 2001). Idiosyncratic response to stimulant medication exists not only across children, but also across behaviors within children (Northup et al., 2001; Sprague & Sleator, 1977). In other words, separate classes of behavior (e.g., disruptive behavior, academic behavior, social behavior) can be affected differently at the same dose of medication within the same child. Furthermore, very few children demonstrate improvements in all areas of functioning with stimulant medication treatment (Greenhill, Halperin, & Abikoff, 1999).

Other Medications. Other medications are sometimes used in the treatment of children with a diagnosis of ADHD. These medications are used when stimulants prove to be ineffective or are associated with adverse side effects. These medications include bupropion, tricyclic

antidepressants, and other antidepressants (i.e., SSRI's, MAOI's). Bupropion has been shown to decrease aggression and hyperactivity as well as improve cognitive performance. However, bupropion is also associated with a decreased threshold for seizures and an increase in tics (Dulcan, 1997).

Tricyclic antidepressants have also been found to be somewhat effective in treating ADHD-related symptoms. However, tricyclic antidepressants have the potential for serious cardiac side effects, sedation, and declining effectiveness over time (Dulcan, 1997). SSRI's are the treatment of choice when antidepressants must be used when treating ADHD due to their fewer side effects.

Clonidine, an alpha-adrenergic agonist, may be used to manage many behaviors associated with ADHD. These ADHD-related behaviors include mood swings, activity level, frustration, sleep, and cooperation. The effect of clonidine is best when used in combination with stimulant medication. However, the effects may not be observable for a month after treatment initiation. Possible side effects of clonidine include dry mouth, sedation, nausea, dizziness, and hypertension (Dulcan, 1997).

Conclusion

Because recess improved the classroom behavior of children with ADD/ADHD in the Jarrett et al. (1998) and Ridgway et al. (2003) studies, recess may be viewed as an intervention for some of the behavior problems associated with ADD/ADHD. Although recess improved the classroom behavior of all children with ADD/ADHD, the effects varied for individuals. Furthermore, the effects of stimulant medication vary for individual children (Northup et al., 2001; Sprague & Sleator, 1977). These findings are supported by DuPaul, Eckert, and McGoey (1997) who state that when treating ADHD, "one size does not fit all" (p. 369). A common myth

concerning the treatment of ADHD is that some interventions are effective for all children diagnosed with ADHD, however individual differences exist among children in their response to interventions (DuPaul et al., 1997). DuPaul et al. (1997) suggest that individualized assessment and treatment plans may be required in order to assist children with ADHD in succeeding in school. Recess may not be an exception; children with ADHD may respond differently to recess and optimal effects of recess may be demonstrated for different individuals at different times during the school day. In addition, children with ADHD may respond differently to a combination of stimulant medication and recess. Because of this possibility, it seems to be beneficial to study the effects of recess or a break and stimulant medication on the classroom behavior of students with ADHD using a single-case design rather than a within subjects group designs.

Implications of Recess for Children with ADHD

As described above, Jarrett et al. (1998) found that recess benefited all 5 participants with ADD and Ridgway et al. (2003) found that recess benefited all 3 participants with ADHD. This may not be surprising due to the fact that having difficulty focusing on classroom tasks for an extended period of time is a defining characteristic of ADD/ADHD (Jarrett et al., 1998). These studies appear to be the only two studies to specifically evaluate the effects of recess on children with ADD/ADHD. Nevertheless, recommendations abound in the literature for frequent breaks and need for active play for children with a diagnosis of ADHD.

Panksepp (1998) has suggested that children's playful impulses will be increasingly visible in normal classroom activities if children are not allowed enough time to play. It may be the case that children who are very active, such as those children diagnosed with ADHD, have a greater need for recess than less active children (Pellegrini, 1995). In fact, Ridgway et al. (2003)

found that recess may have a greater effect on levels of inappropriate behavior for children with a diagnosis of ADHD, but this effect may be associated with higher levels of baseline inappropriate behaviors as compared to typical peers. For example, 2 of the 3 participants with ADHD displayed substantially higher levels of inappropriate behaviors than their peer groups on days when they did not have recess, but the reduction in inappropriate behavior associated with recess also appeared as greater for these 2 participants than for their peer groups.

It has even been suggested that an increase in the diagnosis of ADHD may be due to the fact that children no longer have enough opportunities to play. Therefore, educational expectations and intolerance of play in children may be leading to an increase in the diagnosis of ADHD (Panksepp, 1998). Providing breaks in the school day for children with ADHD has been recommended by many. Pellegrini (1995) has suggested that making a provision for recess after a specific amount of time in the classroom may work to increase the attention of active children. Panksepp (1998) suggests that allowing more time for play in the schools may decrease ADHD symptoms in the classroom. Even in a current educational psychology textbook, when explaining ways to adapt instruction for children with ADHD, the author notes that “we must certainly make sure that our students have regular opportunities to release pent-up energy, such as during recess and physical education” (Ormrod, 2000, p.184).

Panksepp (1998) suggests that medication has been too heavily relied on for the treatment of ADHD-related behaviors in the schools and “some of the simplest and most straightforward strategies, such as modifying aspects of our educational systems” to allow play have been ignored (p. 179). However, it remains unknown whether a traditional recess is the only activity that may help to improve the classroom behavior of children with ADHD. Previous studies have shown that the type of recess activities did not relate to post recess inattention (Pellegrini et al.,

1995). However, Pellegrini and Davis (1993) found that children who engaged in physically active play were more likely to be less attentive after recess. It is possible that a quiet break from classroom activities (e.g., watching a video) may have the same effect as recess in preventing an increase in inappropriate behaviors. In practice, many teachers use educational videos to entertain students in lieu of recess or ongoing classroom instruction.

Research has supported the belief that allowing children to play may help reduce ADHD-related behaviors. However, all participants with ADHD/ADD in the Jarrett et al. (1998) and Ridgway et al. (2003) studies were taking stimulant medication. The progressive increasing trend in inappropriate behavior across the morning is not only characteristic of time of confinement effects, but also of the time-course effects for methylphenidate (Northup et al., 2001). That is, the effects of a single dose of methylphenidate typically progressively dissipate over the course of a morning. Nevertheless, the results from the Ridgway et al. (2003) study might be viewed as encouraging in that recess appeared to prevent this increasing trend, apparently regardless of whether medication effects were dissipating.

Environmental variables may influence an individual's response to pharmacological treatment of ADHD (Denney, 2001). Recess or a break may therefore be environmental factors that might interact with the behavioral effects of stimulant medication.

Summary

Many theories have been proposed to explain the effects of recess on the classroom behavior of children. The theories have descriptive value with a commonsense approach. However, with the exception of recess as generally a positive or negative reinforcer, most of these theories lack empirical support. Most of the theories also lack scientific credibility (e.g., surplus energy theory) or explanatory power.

The empirical studies of recess have however revealed a number of consistent findings. First, it has been consistently demonstrated that children become less attentive as a function of time of classroom confinement (Pellegrini & Davis, 1993; Pellegrini et al., 1995, Ridgway et al., 2003). It has also been shown that children are more active both physically and socially for a longer period of time during recess after a longer period of confinement, as compared to a shorter period of confinement (Pellegrini & Davis, 1993; Pellegrini et al., 1995; Smith & Hagan, 1980). Second, it has been demonstrated that activity levels on the playground decrease as a function of time (Pellegrini & Davis, 1993; Smith & Hagan, 1980). Third, boys have been found to be more physically active both on the playground and in the classroom than girls (Pellegrini & Davis, 1993; Pellegrini et al., 1995). Fourth, Pellegrini et al. (1995) also found that children are more socially and physically active during recess as a function of age. Fifth, Pellegrini et al. (1995) also found that the type of recess activity did not relate to post recess attention. Finally, it has been consistently found that children were more on task and less fidgety when they had recess as compared to when they did not have recess, and it has been consistently demonstrated that children are more on task following recess as compared to immediately before recess (Jarrett et al., 1998; Pellegrini et al., 1995, Ridgway et al., 2003).

The primary purpose of this study was to evaluate the effects of recess, a break, a continuous classroom schedule, and stimulant medication on the subsequent classroom behavior of children with a diagnosis of ADHD. With the exception of Jarrett et al. (1998) and Ridgway et al. (2003), no studies had been found that have specifically evaluated the effects of recess on the classroom behavior of children with ADHD, despite numerous recommendations that recess and/or frequent breaks may be particularly beneficial for these children. In addition, no studies had been found that specifically evaluated the effects of a quiet, indoor break on the classroom

behavior of children in general, and children with ADHD in particular. Furthermore, medication status (i.e., stimulant medication or no stimulant medication) was alternated daily. Thus, the effects of a recess, break, and continuous classroom schedule on the subsequent classroom behavior of each participant were evaluated both when participants did and did not receive stimulant medication. No studies had been found that evaluated the differential and combined effects of recess or breaks and stimulant medication. In addition, all results were evaluated using single-case alternating treatments designs. It was expected that levels of inappropriate behavior would be lower on days when the children had a recess than on continuous days. This study also evaluated whether or not a break resulted in lower levels of inappropriate behavior. It was expected that stimulant medication would be related to lower levels of inappropriate behavior.

This study also replicated the methods of Ridgway et al. (2003) and extended the methods of Pellegrini & Davis (1993) and Pellegrini et al. (1995) to evaluate the effects of time of classroom confinement on the classroom behavior of participants. In other words, this study examined the time of confinement effects on children with a diagnosis of ADHD on an individual basis.

Method

Participants and Setting

The participants were 5 children between 4 and 6 years of age. All participants were enrolled in a summer research program for children with a diagnosis of ADHD and therefore had a prior diagnosis of ADHD based on the criteria of the *Diagnostic and Statistical Manual of Mental Disorders IV* (DSM-IV, APA, 1994). In addition, a consulting child psychiatrist corroborated each participant's diagnoses. Participants had been previously prescribed stimulant medication. Sam was receiving 40 mg of Metadate and .5 mg of Tenex in the morning. Bob was receiving 36 mg of Concerta in the morning. Jill was receiving 5 mg of Dexedrine in the morning, and Stacy was receiving 10 mg of Adderall in the morning. At the beginning of the study, Carl was receiving 40 mg of Adderall XR in the morning. The children's parents and physicians agreed that a medication evaluation could be beneficial for each participant. Medication was held constant throughout the study with the exception of Carl's medication which was frequently changed due to his parents' and the consulting psychiatrist's concerns about effectiveness. Therefore, Carl's medication was changed to 40 mg of Metadate, then to 36 mg of Concerta, then to 54 mg of Concerta, and finally to 54 mg of Concerta plus .5 mg of Tenex. All participants were within at least an average range of intellectual functioning.

The children participated in the summer program each weekday morning between 8:30 and 11:30 for six weeks. All assessment procedures were conducted in a classroom setting and on the playground. The daily schedule was designed to be representative of a typical elementary education classroom and included whole group and individual instruction, as well as center activities. Behavioral observations were conducted as unobtrusively as possible in the classroom and on the playground.

Response Definitions and Data Collection

Classroom Behaviors

Participants were observed during 5 min classroom observations while engaged in their regular classroom activities. Observers recorded each of the following target behaviors: (a) off-task, (b) inappropriate vocalizations, (c) out-of-seat, (d) fidgeting, (e) playing-with-objects. Off-task was defined as the child looking away from instructional materials for greater than 3 s.

Inappropriate vocalizations was defined as any vocal noise or verbalization that was not preceded by the child's raised hand and/or acknowledgment from an adult. Out-of-seat was defined as the child's full body weight not being supported by a chair, and/or the child's buttocks removed from the chair for at least 3 s. Fidgeting was defined as repetitive unnecessary movements of any part of the child's body. Playing-with-objects was defined as touching any object that was not associated with an assigned task. Out-of-seat behavior, inappropriate vocalizations, and playing with objects were combined and labeled as disruptive behavior.

Recess Behaviors

During recess observers recorded each of the following target behaviors: (a) high activity level behavior, (b) low activity level behavior, (c) social behavior, (d) nonsocial behavior, and (e) inappropriate behavior. High activity level behavior was defined as the child engaging in vigorous movement, including walking, running, and/or jumping. Low activity level behavior was defined as the child remaining stationary (i.e., standing or sitting in place). Social behavior was defined as engaging in cooperative playful activities with other children and/or producing vocalizations directed at other children or adults. Nonsocial behavior was defined as the child not interacting or playing with peers or adults. Inappropriate behavior included aggression,

property destruction, inappropriate vocalizations (e.g., name calling, complaining, threatening, etc.), and inappropriate nonverbal behavior (e.g., sticking out one's tongue, face making, etc.).

Break Behaviors

During break observers recorded high activity level behavior, low activity level behavior, social behavior, nonsocial behavior, and inappropriate behavior (as defined above) for each participant.

Data Collection

Classroom observations were conducted using a 10 s partial-interval recording procedure. Recess and break observations were conducted using a 10 s partial-interval recording procedure for high activity level behavior, social behavior, and inappropriate behavior and a 10 s whole-interval recording procedure for low activity level behavior and nonsocial behavior. Classroom observations lasted 5 min and recess and break observations lasted 10 min.

All participants were observed at the same times on recess, break, and continuous classroom schedule days. Thus, precondition observations were collected at 8:40 a.m., 9:10 a.m., and 9:40 a.m., and postcondition observations were collected at 10:10 a.m., 10:30 a.m., and 10:50 a.m. The 9:40 a.m. and 10:10 a.m. observations occurred immediately prior to and following the recess time on all recess, break, and continuous days. The classroom schedule was held consistent from day to day with the same subject matter being scheduled at the same time on all recess, break, and continuous classroom schedule days. Scheduled classroom activities included handwriting, reading skills, language, math, phonics, and vocabulary. All participants were also observed during recess and break using the response definitions described above in order to verify that a break limited social behavior and high activity behavior while recess did not limit these same behaviors.

A total of 10 observers simultaneously collected behavioral observation data. All observers were graduate and undergraduate students in psychology. All observers were blind to the purpose of the study. Observers were required to meet an 85% agreement criterion during training prior to the beginning of the study. A second observer simultaneously, but independently collected data for a minimum of 25% of the observations for each child in each condition. Interobserver agreement was calculated on an exact interval-by-interval basis for occurrence and nonoccurrence for each participant and for each response definition. Interobserver agreement was scored by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100%.

Interobserver agreement for classroom observations was 96.7% (range, 87% to 100%) for Sam, 89.8% (range, 87% to 100%) for Bob, 96.7% (range, 87% to 100%) for Jill, 91.7% (range, 87% to 100%) for Carl, and 96.3% (range 87% to 100%) for Stacy.

Interobserver agreement for recess observations was 98.6% (range, 95% to 100%) for Sam, 97.5% (range, 90% to 100%) for Bob, 96.7% (range, 90% to 100%) for Jill, 99.4% (range, 97% to 100%) for Carl, and 95% (range, 88% to 98%) for Stacy.

Interobserver agreement for break observations was 98.6% (range, 95% to 100%) for Sam, 98.7% (range, 93% to 100%) for Bob, 95% (range, 87% to 100%) for Jill, 99.7% (range, 98% to 100%) for Carl, and 100% for Stacy.

Procedures

Days that children had recess, a break, or a continuous classroom schedule were counterbalanced to control for order effects. Children had recess on at least 6 days, a break on at least 6 days, and a continuous classroom schedule on at least 6 days. Recess and the break were introduced for the entire class at 9:45 a.m. On days when the children did not have recess or a

break, typical classroom activities continued uninterrupted; children participated in centers, which included a math center, reading center, listening center, and computer center. Children were assigned to one center activity per continuous classroom schedule day.

Recess

Recess consisted of the children going outdoors onto a playground or play area for 10 min. An additional 10 min were allowed for transition to and from the playground. A variety of common toys and activities were available such as jump ropes, balls, and hula-hoops. All participants were allowed to choose the activities in which they participated, and staff intervened only in the event of dangerous or inappropriate behavior.

Break

The break consisted of children watching a short, educational- entertainment video (i.e., School House Rock video) in a room adjacent to the classroom for 10 min. An additional 10 min were allowed for transition to and from the room. Each participant was assigned a seat on the floor to view the video. Typical classroom rules (e.g., raising a hand before speaking, staying in the assigned area, etc.) were enforced during the break. The purpose of this condition was to provide a break from the classroom and instruction that did not involve a free choice of activities and limited social and active play.

Medication Status

A consulting psychiatrist prescribed an alternating course of the child's regularly prescribed stimulant medication and no stimulant medication. The medication status for each day of the following week was given to parents each Friday. Parents were provided written instructions each afternoon regarding medication administration for the following day. Parents were also contacted by telephone each evening by the first author regarding medication

administration for the following day. Parents were asked to complete a drug administration checklist each morning and the program director confirmed that the child did (or did not) receive medication as prescribed. Experimenters and staff were kept blind to the participants' medication status.

Treatment Acceptability

The parents and teacher of the participants were given the Treatment Evaluation Inventory-Short Form (TEI-SF; Kelley, Heffer, Gresham, & Elliot, 1989) to complete on the last day of the summer treatment program in order to evaluate the treatment acceptability of the recess and break. A brief vignette describing the problem behavior of a 5 year old with ADHD and the procedures used in the break and recess interventions were provided. Recess and break were rated using separate vignettes and rating scales. The TEI-SF required the parents and teacher to rate 9 statements on a 5-point Likert scale, with a score of 5 indicating that they strongly agreed with the statement and a score of 1 indicating that they strongly disagreed with the statement. Therefore, the minimum acceptability score was a 9 and the maximum acceptability score was a 45 for each intervention. The TEI-SF is considered to assess parental opinions of treatment acceptability with validity and reliability (Kelley et al., 1989). The internal consistency coefficient alpha of the TEI-SF is approximately .89 (Kelley et al., 1989).

All eleven children enrolled in the summer research program were also asked whether they preferred days when they went outdoors and had a recess, days when they had a break and therefore stayed indoors and watch an entertaining educational video, or days when they had a continuous classroom schedule. In addition, the children were allowed to choose whether they had a recess, a break, or a continuous classroom schedule on the last day of the summer research program.

Design

The effects of recess, a break, and a continuous classroom schedule on the subsequent classroom behavior of each participant were compared using single-case alternating treatments designs. The results were evaluated via visual inspection (Kazdin, 1982). Recess, break, and continuous classroom schedules were changed daily in a counterbalanced order with each condition occurring a minimum of six times. However, data collection continued beyond the eighteen-day minimum as time allowed. In addition, medication status (i.e., stimulant medication or no stimulant medication) was alternated daily. Thus, the effects of a recess, a break, and continuous classroom schedule on the subsequent classroom behavior of each participant were evaluated both when participants did and did not receive stimulant medication.

Results

Results were first evaluated separately for each target behavior. Inappropriate vocalizations, out-of-seat behavior, and playing with objects were subsequently combined into one category of behavior referred to as disruptive behavior. However, the results for off-task behavior are presented separately because some differences from disruptive behaviors were evident. Results are presented for each condition for both off-task and disruptive behaviors.

Figures 1 and 2 show the results of off-task and disruptive behavior for each condition for all participants both when the participants did not receive medication (left columns) and when the participants received medication (right columns). These results represent the mean of the classroom observations conducted at 10:10 a.m., 10:30 a.m., and 10:50 a.m.

Figures 3, 4, 5, 6, and 7 show a time-analysis for off-task behavior and are included in Appendix A. Each figure shows the average of all observations of off-task behavior at every time interval for each condition both when the participant did not receive medication (left column) and when the participant received medication (right column). Figures 8, 9, 10, 11, and 12 show a time-analysis for disruptive behavior and are included in Appendix B. Each figure shows the average of all observations of disruptive behavior at every time interval for each condition both when the participant did not receive medication (left column) and when the participant received medication (right column).

Off-Task Behavior

Results for No Medication Days

Figure 1 shows the results of off-task behavior for each condition for all participants when the participants did not receive medication (left column). When participants did not receive medication, 1 of the 5 participants' off-task behavior may have been lowest on days

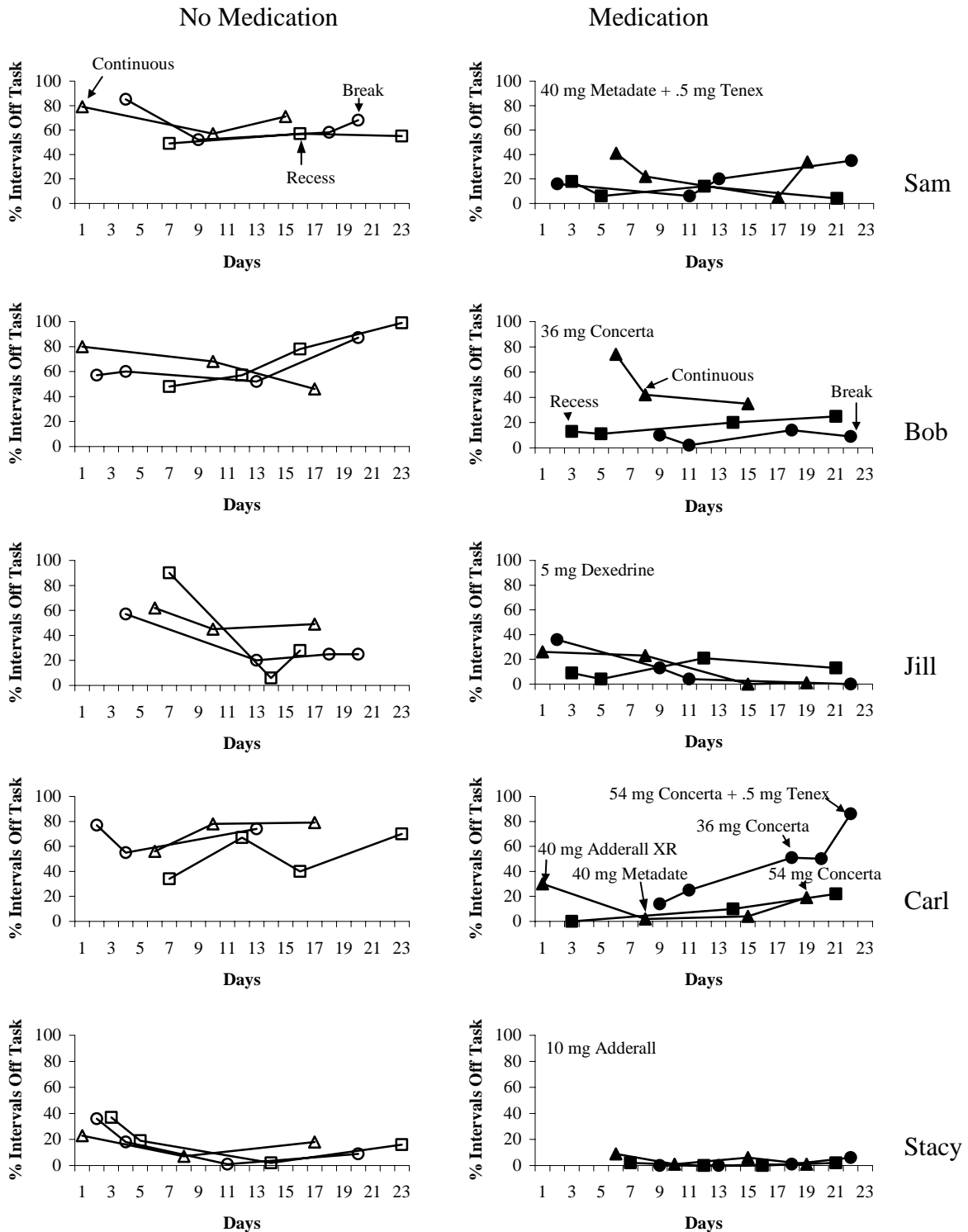


Figure 1. The results of postcondition observations on off-task behavior for each condition. Left column no medication. Right column stimulant medication.

when he had a recess and highest on days when he had a continuous classroom schedule. No effects were observed for 4 of the 5 participants. When Sam did not receive medication his off-task behavior may have been lowest on days when he had recess and highest on days when he had a continuous classroom schedule. Off-task behavior was variable on days when Sam had a break. When Bob did not receive medication off-task behavior was variable across all conditions and no effects were observed. When Jill did not receive medication off-task behavior was variable across all conditions and no effects were observed. Likewise, when Carl did not receive medication off-task behavior was variable across all conditions and no effects were observed. When Stacy did not receive medication her off-task behavior was low across days regardless of the condition and no effects were observed.

Results for Medication Days

Figure 1 shows the results of off-task behavior for each condition for all participants when the participants received medication (right column). When participants received medication, 1 of the 5 participant's off-task behavior may have been lowest on days when he had a break and highest on days when he had a continuous classroom schedule. Additionally, 1 of the 5 participant's off-task behavior may have been lowest on days when he had a recess and highest on days when he had a break. No effects were observed for 3 of the 5 participants. When Sam received medication off-task behavior was variable across all conditions and no effects were observed. When Bob received medication, his off-task behavior may have been lowest on days when he had a break and highest on days when he had a continuous classroom schedule. In addition, when Bob received medication, his off-task behavior may have been lower on days when he had a recess than on days when he had a continuous classroom schedule, but higher than on days when he had a break. When Jill received medication, off-task behavior

was variable across all conditions and no effects were observed. When Carl received medication off-task behavior may have been lowest on days when he had a recess and highest on days when he had a break. In fact, Carl's off-task behavior increased across days on which he had a break. Off-task behavior was variable on days when Carl had a continuous classroom schedule. When Stacy received medication, her off-task behavior was consistently low across days regardless of the condition and no effects were observed.

Disruptive Behavior

Results for No Medication Days

Figure 2 shows the results of disruptive behavior for each condition for all participants when the participants did not receive medication (left column). When participants did not receive medication, 1 of the 5 participants' disruptive behavior was lowest on days when he had a recess and highest on days when he had a continuous classroom schedule. No effects were observed for 4 of the 5 participants. When Sam did not receive medication disruptive behavior was lowest on days when he had recess and highest on days when he had a continuous classroom schedule. Disruptive behavior was variable on days when Sam had a break. When Bob did not receive medication disruptive behavior was variable across all conditions and no effects were observed. When Jill did not receive medication disruptive behavior was variable across all conditions and no effects were observed. Likewise, when Carl did not receive medication disruptive behavior was variable across all conditions and no effects were observed. When Stacy did not receive medication, her disruptive behavior progressively decreased across days regardless of condition and no effects were observed.

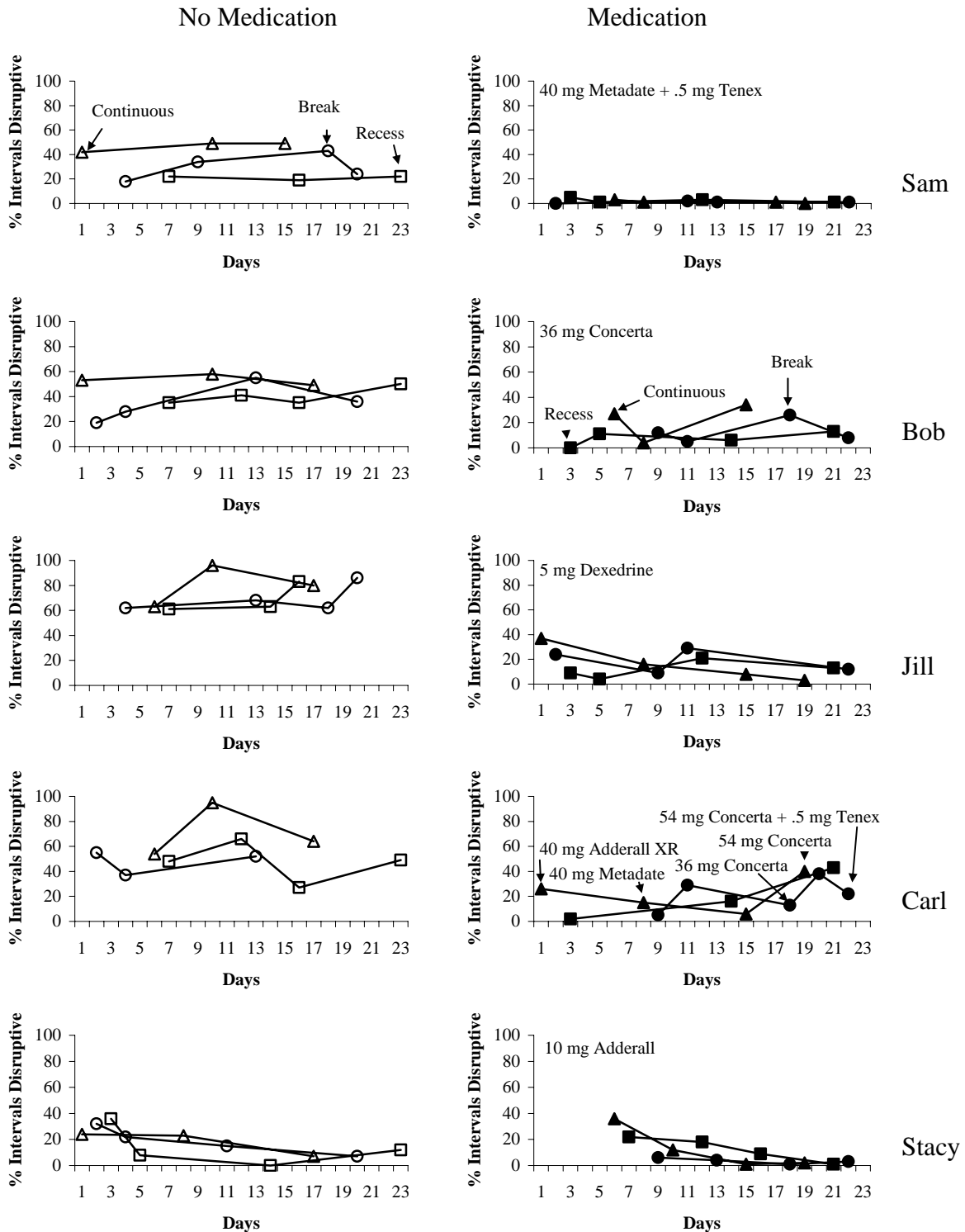


Figure 2. The results of postcondition observations on disruptive behavior for each condition. Left column no medication. Right column stimulant medication.

Results for Medication Days

Figure 2 shows the results of disruptive behavior for each condition for all participants when the participants took medication (right column). A recess or a break appeared to have no effect on participants' disruptive behavior on days when they received medication. When Sam received medication disruptive behavior was consistently low regardless of the condition. When Bob received medication disruptive behavior was variable on days when he had a break or a continuous classroom schedule. Disruptive behavior was relatively low and stable on days when Bob received medication and had a recess. Jill's disruptive behavior was variable across all conditions when she received medication. Likewise, Carl's disruptive behavior was variable across all conditions when he received medication. Stacy's disruptive behavior progressively decreased across days when she received medication regardless of the condition.

Medication Effects

Off-task behavior was lower on days when participants received medication as compared to days when they did not receive medication, regardless of the condition (Figure 1). However, when Bob received medication and had a continuous classroom schedule, his level of off-task behavior approached levels of off-task behavior that were observed on days when he did not receive medication. Likewise, when Carl received medication and had a break, his level of off-task behavior approached levels of off-task behavior that were observed on days when he did not receive medication.

For 4 of the 5 participants, disruptive behavior was consistently lower on days when participants received medication as compared to days when they did not receive medication, regardless of the condition (Figure 2). However, Stacy's disruptive behavior progressively decreased across days, regardless of medication status.

Recess and Break Observations

Social Behavior

Table 1 shows the mean percentage of intervals of social behavior for all participants during break and recess on days when they did and did not receive medication. All participants' social behavior during the break was consistently lower than social behavior during recess, regardless of medication status. These results verify that the break did, in fact, limit social behavior, while recess did not. Although social behavior was higher during recess for all participants, Sam's social behavior during recess was substantially lower on days when he received medication as compared to days when he did not receive medication.

Table 1

Mean Percentage of Intervals of Social Behavior During Break and Recess When Participants Did and Did Not Receive Medication

	No Medication		Medication	
	Break	Recess	Break	Recess
Sam	23.8% (range, 7% to 48%)	74.3% (range, 65% to 93%)	1.4% (range, 0% to 3%)	28% (range, 15% to 43%)
Bob	19.8% (range, 3% to 45%)	87% (range, 60% to 100%)	7% (range, 0% to 20%)	72.3% (range, 40% to 100%)
Jill	32.8% (range, 17% to 52%)	97.7% (range, 95% to 100%)	7.8% (range, 0% to 17%)	86% (range, 63% to 98%)
Carl	20.7% (range, 5% to 50%)	86.7% (range, 72% to 95%)	2.7% (range, 0% to 7%)	75% (range, 40% to 97%)
Stacy	1.8% (range, 0% to 7%)	82% (range, 68% to 100%)	3.3% (range, 0% to 5%)	74.8% (range, 38% to 93%)

High Activity Level Behavior

Table 2 shows the mean percentage of intervals of high activity level behavior for all participants during break and recess on days when they did and did not receive medication. All participants' high activity level behavior was consistently lower during the break than during recess, regardless of medication status. These results verify that the break did, in fact, limit high

activity level behavior, while recess did not limit this behavior. Although high activity level behavior was higher during recess for all participants, Carl’s high activity level behavior during recess was slightly lower on days when he received medication as compared to days when he did not receive medication.

Table 2

Mean Percentage of Intervals of High Activity Level Behavior During Break and Recess When Participants Did and Did Not Receive Medication

	No Medication		Medication	
	Break	Recess	Break	Recess
Sam	4.8% (range, 0% to 12%)	91.7% (range, 82% to 100%)	0%	94.3% (range, 87% to 100%)
Bob	0.5% (range, 0% to 2%)	93.3% (range, 73% to 100%)	0%	97.3% (range, 92% to 100%)
Jill	56.8% (range, 42% to 75%)	85.7% (range, 72% to 95%)	12.6% (range, 0% to 28%)	69.5% (range, 65% to 73%)
Carl	9.3% (range, 0% to 20%)	99.3% (range, 98% to 100%)	1% (range, 0% to 3%)	76.7% (range, 68% to 82%)
Stacy	4.8% (range, 0% to 20%)	81.8% (range, 77% to 87%)	0.8% (range, 0% to 3%)	59.8% (range, 23% to 93%)

Treatment Acceptability

The average acceptability score for recess was 33.2 (range, 25 to 43). The average acceptability score for the break was 31.6 (range, 16 to 43). Therefore, the parents and teacher found recess and a break to be approximately equal in acceptability for the treatment of ADHD.

All eleven children enrolled in the summer research program reported that they preferred days when they had a recess as compared to days when they had a break or a continuous classroom schedule. On the last day of the summer research program, all children chose to go outdoors for a recess rather than stay indoors and watch a video during a break, or have a continuous classroom schedule.

Summary

Effects of classroom schedule on off-task and/or disruptive behavior may have been observed for 3 of the 5 participants. However, clear effects of classroom schedule were observed for only 1 participant's disruptive behavior when he did not receive medication.

When participants did not receive medication, 1 of the 5 participants' off-task behavior may have been lowest on days when he had a recess and highest on days when he had a continuous classroom schedule. When participants received medication, 1 of the 5 participants' off-task behavior may have been lowest on days when he had a recess or break and highest on days when he had a continuous classroom schedule. Specifically, when this participant received medication his off-task behavior may have been lowest on days when he had a break and highest on days when he had a continuous classroom schedule. In addition, his off-task behavior may have been lower on days when he had a recess than on days when he had a continuous classroom schedule, but higher than his off-task behavior on days when he had a break. When participants received medication, Carl was the only participant whose off-task behavior may have been highest on days when he had a break and lowest on days when he had a recess.

When participants did not receive medication, 1 of the 5 participants' disruptive behavior was lowest on days when he had a recess and highest on days when he had a continuous classroom schedule. However, recess or a break appeared to have no effect on participants' disruptive behavior on days when they received medication.

Discussion

The effects of a recess, a break, and continuous classroom schedule on the subsequent off-task and disruptive behavior of 5 children with a diagnosis of ADHD were evaluated both when participants did and did not receive stimulant medication. Results were most apparent for Sam's disruptive behavior when he did not receive medication. Specifically, when Sam did not receive medication his disruptive behavior was lowest on days when he had a recess and highest on days when he had a continuous classroom schedule. Results of classroom schedule effects for all other participants were more equivocal. Regardless, stimulant medication was the only intervention that resulted in acceptable levels of off-task and disruptive behavior for the participants in this study.

This study contributes to the relatively small amount of literature that has evaluated the effects of recess on the classroom behavior of children. In particular, this study extends the literature by evaluating the effects of recess and a break on the classroom behavior of children with a diagnosis of ADHD. With the exception of Jarrett et al. (1998) and Ridgway et al. (2003), no studies have been found that specifically evaluated the effects of recess on the classroom behavior of children with ADHD. In addition, no studies have been found that evaluated the effects of a quiet, indoor break as compared to a traditional recess on the classroom behavior of children, in general, or children with a diagnosis of ADHD, in particular. In this study, 1 of the 5 participants may have benefited in some way by having a break. A quiet indoor break could potentially be easier and less time consuming for teachers to implement than a recess, since an indoor break does not require a transition to and from the playground. Therefore, problems with aggression and antisocial behavior during transition periods could be avoided. In addition, less

instructional time would be sacrificed since additional time for transitions would not be necessary.

Incidental results from this study also contribute to the literature on the effects of stimulant medication on social behavior and activity level of children with a diagnosis of ADHD during recess and a break. Results of this study indicate that 1 of the 5 participants displayed substantially less social behavior during recess on days when he received medication as compared to days when he did not receive medication. Additionally, 1 of the 5 participants displayed slightly less high activity level behavior during recess on days when he received medication as compared to days when he did not receive medication. These findings may be of concern since recess not only provides a diversion from classroom activities, but is also intended to promote social behavior and high activity level. This finding is somewhat consistent with the results from Northup, Gulley, Edwards, and Fountain (2001) which found an increasing dosage of MPH to be associated with social withdrawal for 2 of the 3 participants. In addition, LaRue et al. (2003) found stimulant medication to result in a number of detrimental social effects for some participants. These findings support the importance of evaluating the effects of stimulant medication on social behavior of children with a diagnosis of ADHD.

Finally, this study contributes to the literature by assessing the social validity of the procedures utilized during recess and break. The average acceptability score for recess was 33.2 (range, 25 to 43) on the TEI-SF. The average acceptability score for the break was 31.6 (range, 16 to 43) on the TEI-SF. Therefore, the parents and teacher found recess and a break to be approximately equal in acceptability for the treatment of ADHD. This finding is of particular interest due to teachers' conflicting opinions regarding the utility of recess. However, parents were the primary source of information for this data; only one teacher completed the TEI-SF.

Teachers may have rated the acceptability of recess and break differently, since parents do not have to transition children to and from the classroom. In addition, the break also required a transition to and from the classroom, although a transition of shorter distance. In a typical classroom setting, a transition out of the classroom for a break may not be necessary. However, it is a limitation that this study failed to assess the social validity of the procedures utilized during a continuous classroom schedule.

The results for 3 of the 5 participants are consistent with previous findings that children become generally less attentive as a function of time of classroom confinement when they do not have an interruption from their regular classroom activities (Pellegrini & Davis, 1993; Pellegrini et al., 1995; Ridgway et al., 2003). However, this study is inconsistent with previous findings in several ways. Previous research has found that, in general, children are more on task when they had recess as compared to when they had a continuous classroom schedule (Jarrett et al., 1998; Pellegrini et al., 1995; Ridgway et al., 2003). However, no clear effects of classroom schedule on off-task behavior were observed in this study. Additionally, this study varies from the Ridgway et al. (2003) study in that a recess was clearly beneficial for only 1 participant when he did not receive medication. All 3 participants with a diagnosis of ADHD in the Ridgway et al. (2003) study were receiving medication, but recess resulted in lower levels of inappropriate behavior for all 3 participants.

There are a number of limitations to the current study. First, participants had a relatively small number of days for each condition. In addition, this study utilized relatively short observation periods. The number of days for each condition and the length of the observation periods were limited by the duration of the summer research program. Future research might provide more days for each condition over a longer period of time and longer classroom

observations of the participants. In addition, the effects of varying lengths of recess or break, type of recess (i.e., structured versus unstructured), and type of break (e.g., entertaining educational video versus a video game) might be evaluated.

Future research might also evaluate variations in the number of recesses and breaks provided throughout the school day. In this study, when participants did not receive medication and had a recess, 2 of the participants' off-task behavior immediately following the recess (i.e., 10:10 a.m.) was significantly lower than on days when they had a continuous classroom schedule or a break. However, this decrease in off-task behavior did not extend to the 10:30 a.m. and 10:50 a.m. observations as in the Ridgway et al. (2003) study. In addition, when 1 of the 5 participants in this study did not receive medication and had a break, off-task behavior immediately following the break was slightly lower than on days when he had a continuous classroom schedule. Participants in the Ridgway et al. (2003) study were 8 years of age, whereas participants in this study ranged from 4 to 6 years of age. Additionally, the participants in this study may have had more severe cases of ADHD than the participants in the Ridgway et al. (2003) study. It could be possible that younger children and/or children with more severe cases of ADHD need more frequent recesses and/or breaks in order to prevent increasing levels of off-task and other inappropriate behaviors.

Another limitation to this study was 1 participant's frequent medication changes. Carl was prescribed 5 different types, dosages, or combinations of medication during this study due to his parents' and the consulting psychiatrist's concerns about effectiveness. Future researchers might conduct medication evaluations prior to evaluating the differential and combined effects of a recess or break and stimulant medication on participants' classroom behavior.

An additional limitation to this study is the fact that the study was conducted during a summer research program. Although the summer research program was designed to be representative of a typical elementary education classroom, it remains unknown whether or not results would generalize to the participants' regular classrooms. It is possible that results could have been influenced by several variables including a small class size consisting of only children with ADHD, the experience of the teacher and staff, the small student to staff ratio, and the lack of a long history of reinforcement. Results from this study may be inconsistent with Ridgway et al. (2003) findings due to differences in these variables. For example, participants in the Ridgway et al. (2003) study were observed in their regular education classroom, which contained 28 children, the majority of whom did not have a diagnosis of ADHD. In addition, the Ridgway et al. (2003) study was conducted during the spring semester; observations began after a 5 month history of reinforcement. Observations for this study began on the third day of the summer research program.

A further limitation is the fact that the summer research program teacher was not completely blind to the conditions of the study. Although the teacher was blind to each participant's medication status, she did have prior knowledge of the daily classroom schedule for each day in order to plan lessons accordingly. It is possible that the teacher's behavior was influenced by this knowledge. In addition, a change in the teacher's behavior due to the prior knowledge of the classroom schedule may have, in turn, led to a systematic change in the participants' behavior.

Perhaps the most important limitation of the current study was the absence of a functional assessment of off-task and disruptive behavior for each individual child. A recess or a break as provided in this study may serve a wide variety of functions for children. For example, a recess

or a break may function as a negative reinforcer if it functions to provide an escape from work by removing or terminating aversive classroom activities. For example, classroom confinement may have served as an establishing operation for the reinforcing value of escape for a particular individual. Recess or a break may have served as noncontingent escape that decreased the value of escape following recess or break and in turn led to a reduction in off-task and/or disruptive behavior. However, if recess and break served as noncontingent escape, both recess and break should have been associated with lower off-task or disruptive behavior when compared to days when the participant had a continuous classroom schedule. This is just one possible function of recess and/or break, and the function(s) of recess and/or break may vary across individuals. For example, a recess may also function as a positive reinforcer if it functions to provide physical exercise, the opportunity for social interaction, or access to play materials. As a result, individual differences in the effects of recess and a break might be anticipated. Due to the lack of functional behavioral assessments, the function of each participant's off-task and disruptive behavior, as well as the mechanism by which recess and/or break affected each participant's behavior remains unknown. Recess and/or a break may not have been effective interventions for these behaviors. Future research might examine the behavioral processes responsible for the effects of recess and a break on the behavior of individual children. This knowledge could contribute to the development of more effective interventions that may provide an alternative to medication.

In conclusion, the results of this study show that recess and/or a break were clearly associated with lower off-task and/or disruptive behavior for just 1 participant. Specifically, Sam's disruptive behavior was lowest on days when he had a recess and did not receive stimulant medication. However, the results of this study show that off-task and disruptive

behavior were never higher on recess days than on continuous classroom schedule days for any of the participants. Nevertheless, stimulant medication was the only intervention that resulted in acceptable levels of off-task and disruptive behavior for the participants in this study. The development of alternative interventions may be needed in order to provide an effective alternative to stimulant medication for some children.

Overall, the results and limitations of this study suggest that future research on the effects of a recess, break, and continuous classroom schedule on the classroom behavior of children, in general, and children with a diagnosis of ADHD, in particular, might be conducted in a regular education setting rather than a summer research program. It may be possible that critical characteristics of a regular education classroom can simply not be replicated in a summer research program.

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Appendix A: Off-Task Behavior Graphs

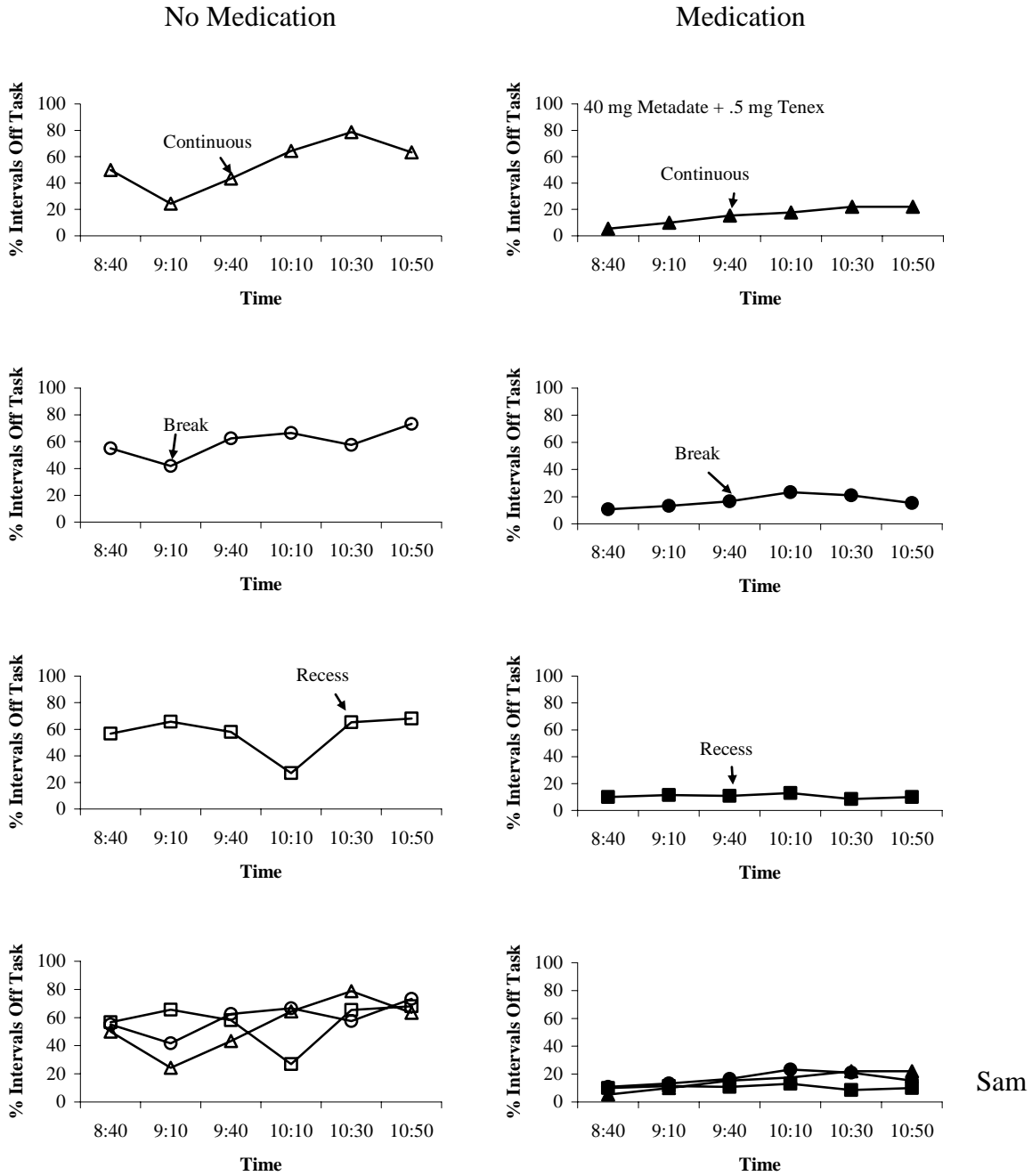


Figure 3. The average of all observations of off-task behavior for Sam at each time interval for each condition. Left column no medication. Right column stimulant medication.

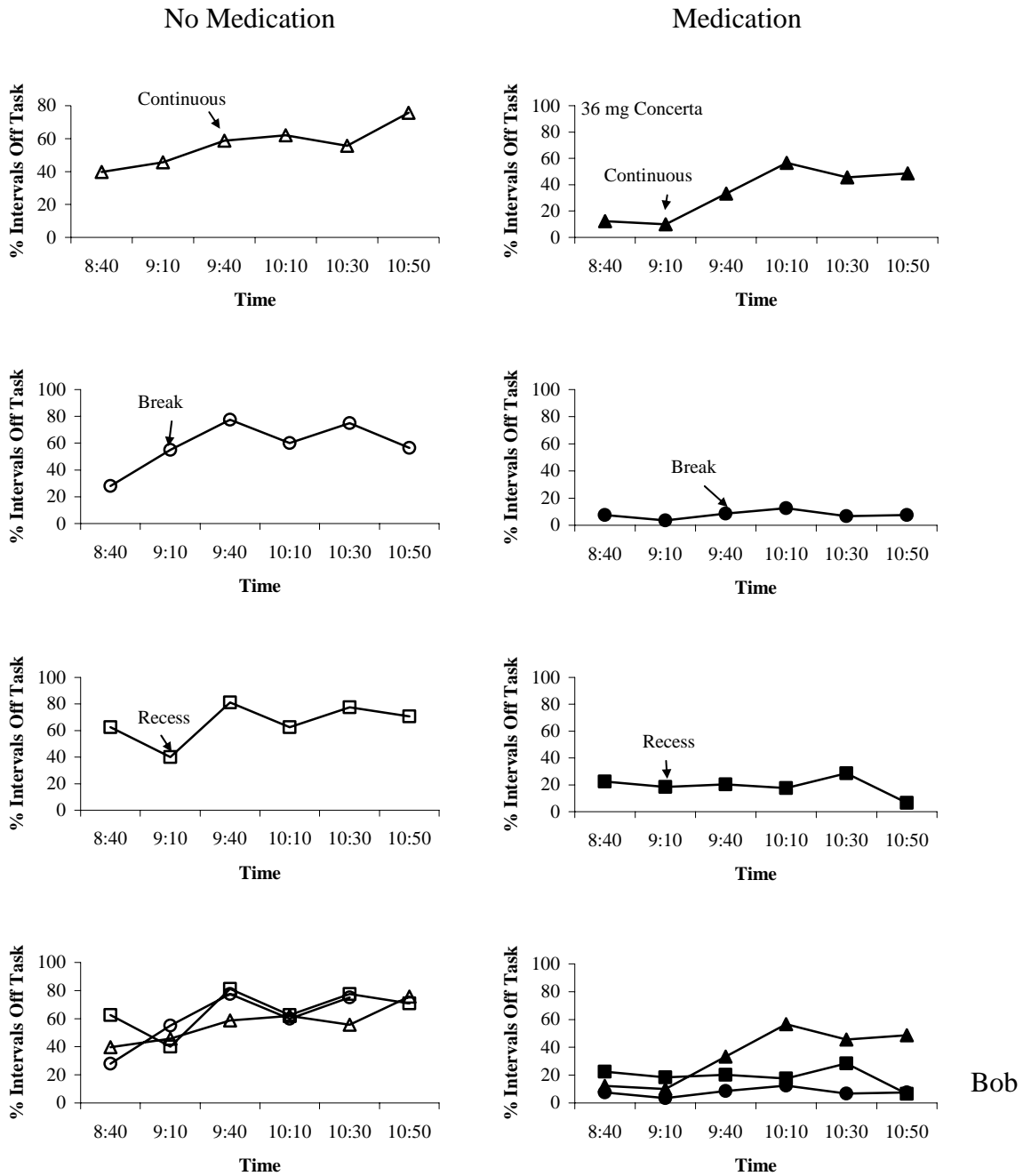


Figure 4. The average of all observations of off-task behavior for Bob at each time interval for each condition. Left column no medication. Right column stimulant medication.

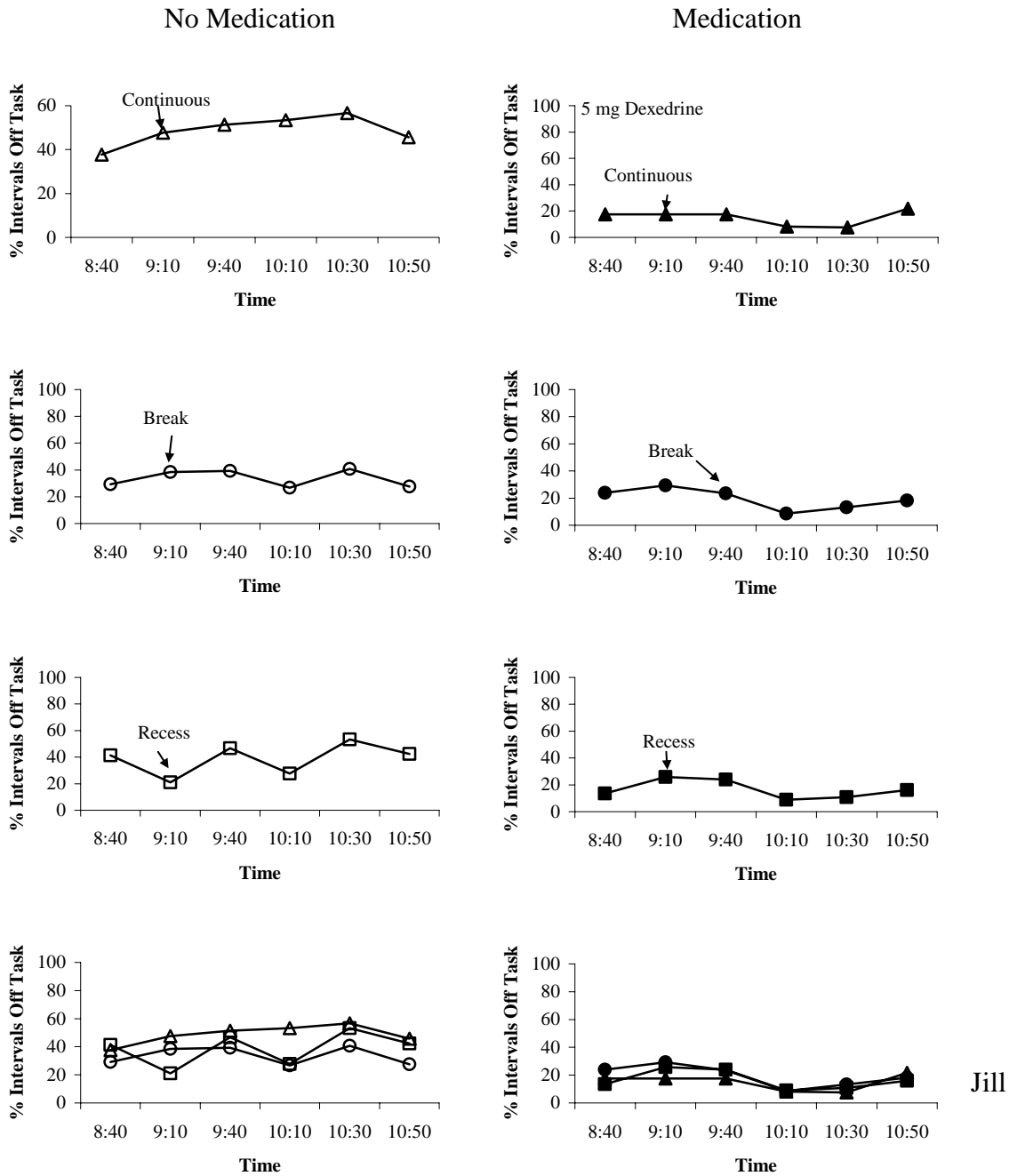


Figure 5. The average of all observations of off-task behavior for Jill at each time interval for each condition. Left column no medication. Right column stimulant medication.

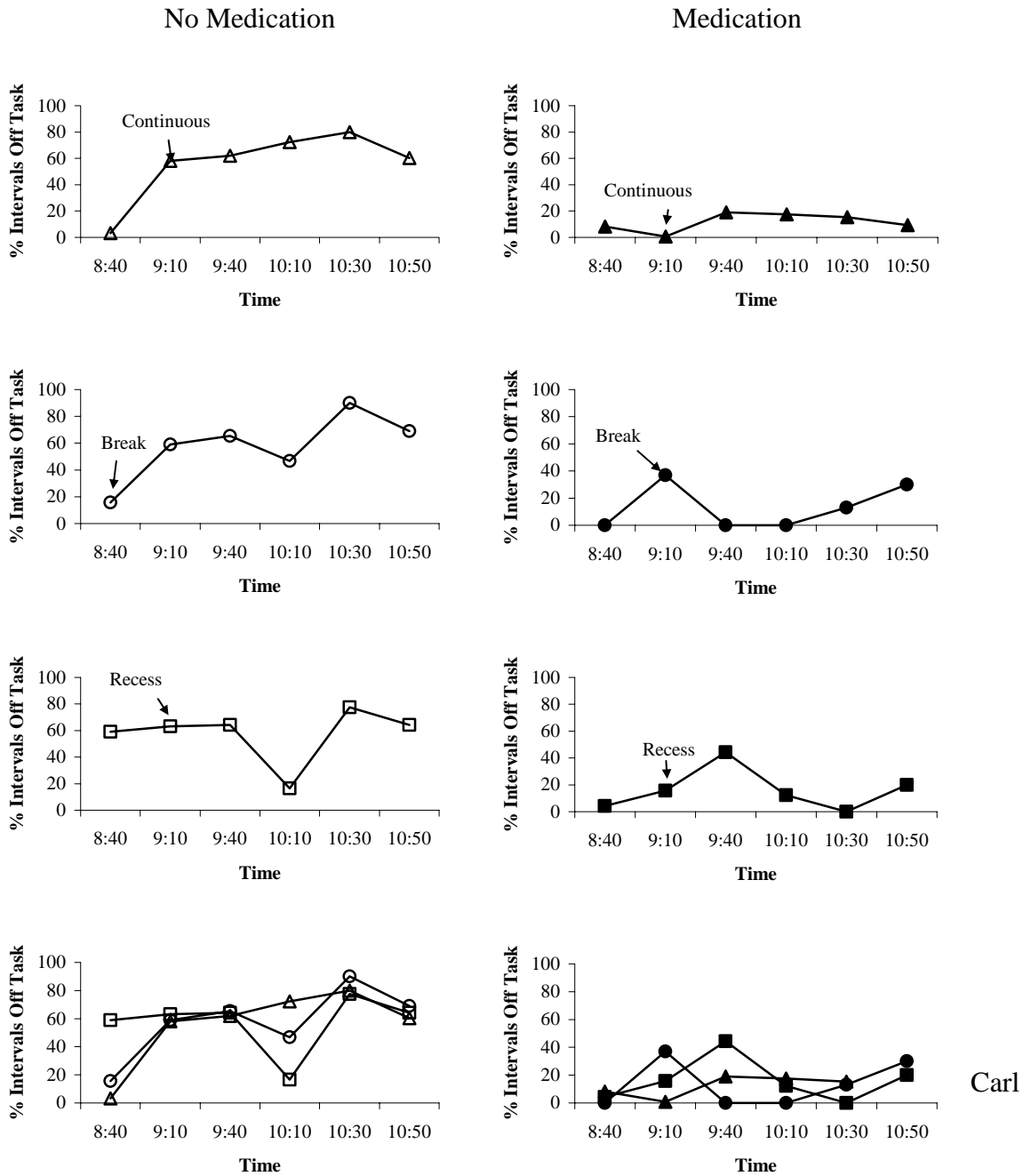


Figure 6. The average of all observations of off-task behavior for Carl at each time interval for each condition. Left column no medication. Right column stimulant medication.

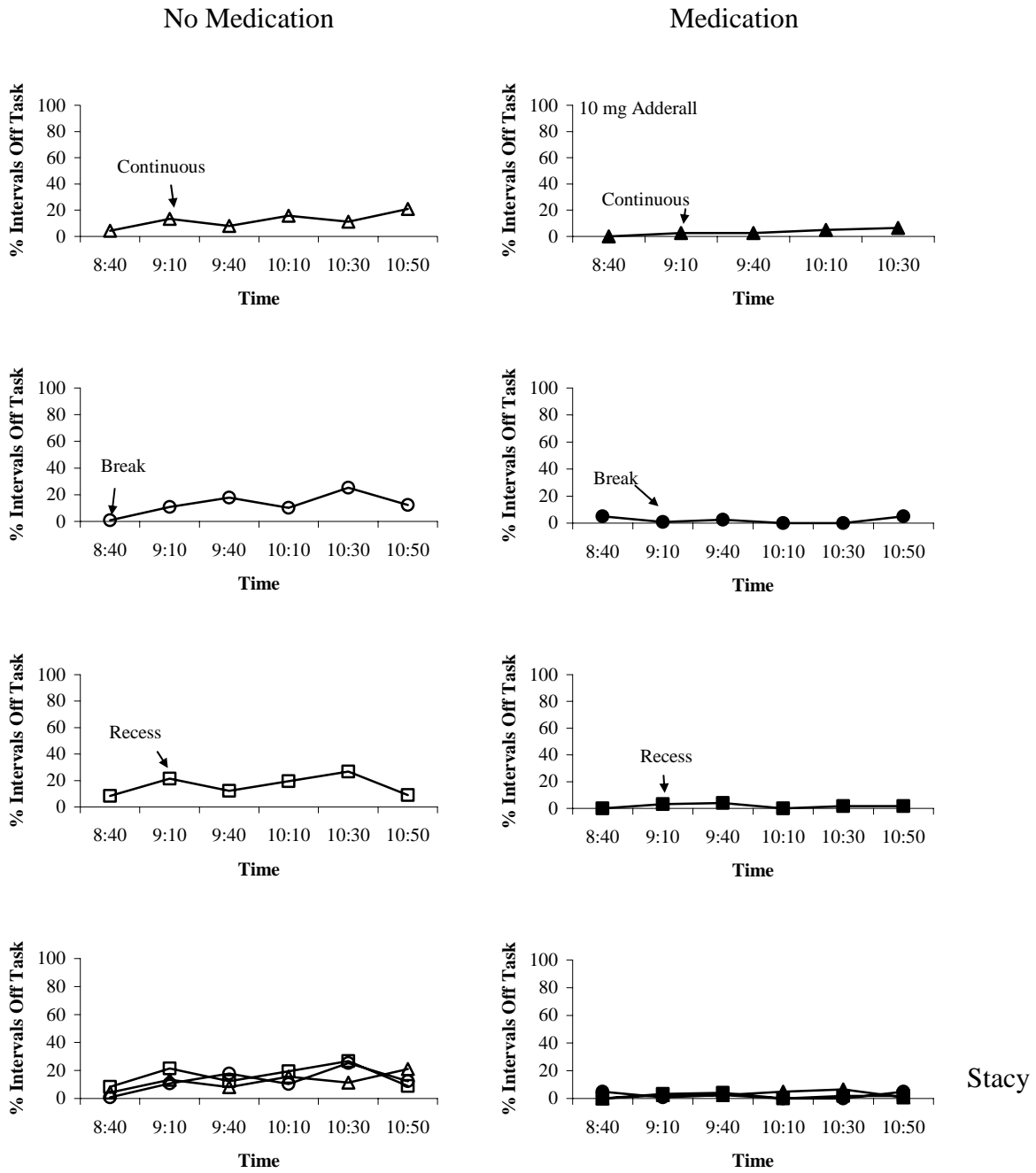


Figure 7. The average of all observations of off-task behavior for Stacy at each time interval for each condition. Left column no medication. Right column stimulant medication.

Appendix B: Disruptive Behavior Graphs

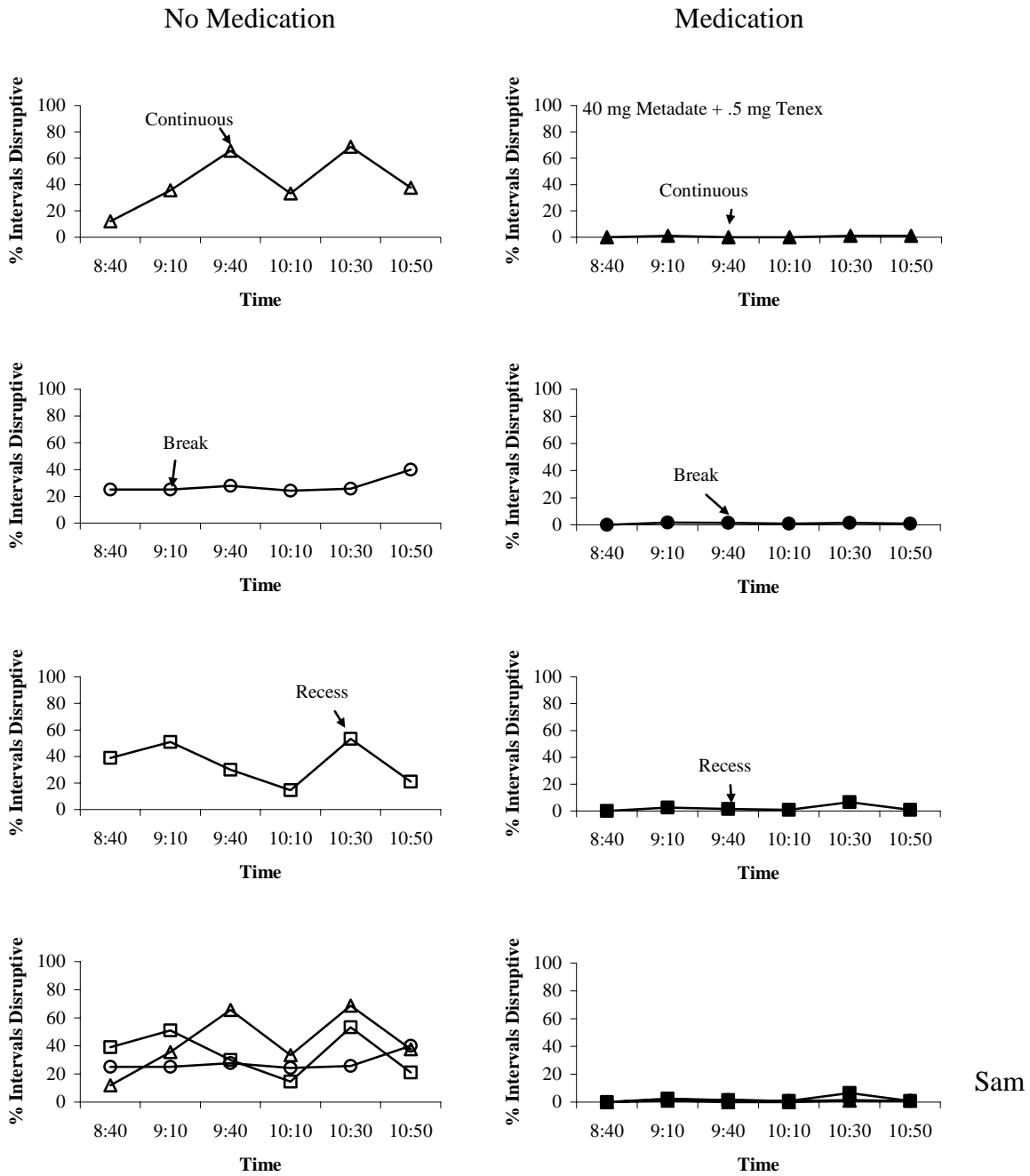


Figure 8. The average of all observations of disruptive behavior for Sam at each time interval for each condition. Left column no medication. Right column stimulant medication.

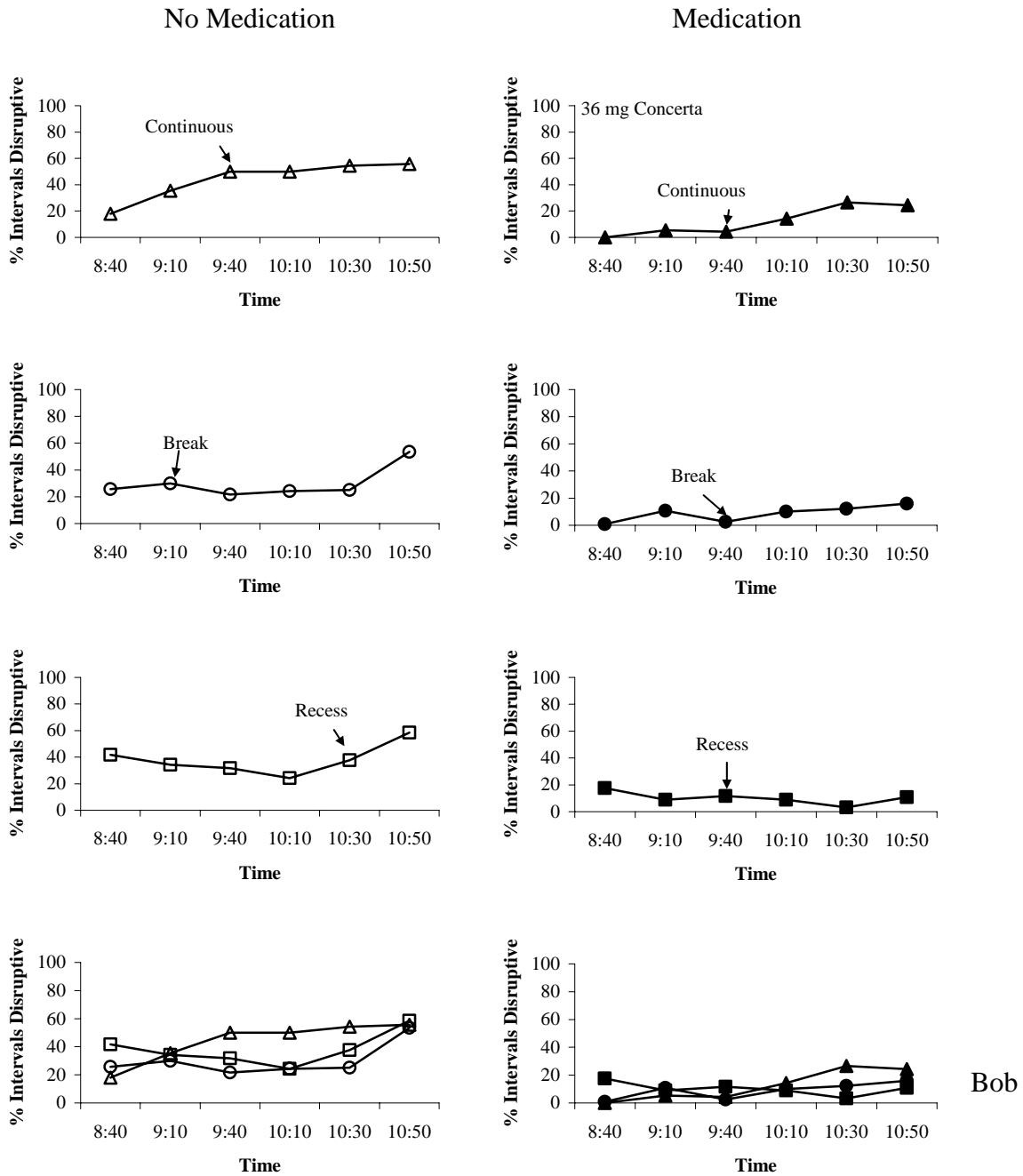


Figure 9. The average of all observations of disruptive behavior for Bob at each time interval for each condition. Left column no medication. Right column stimulant medication.

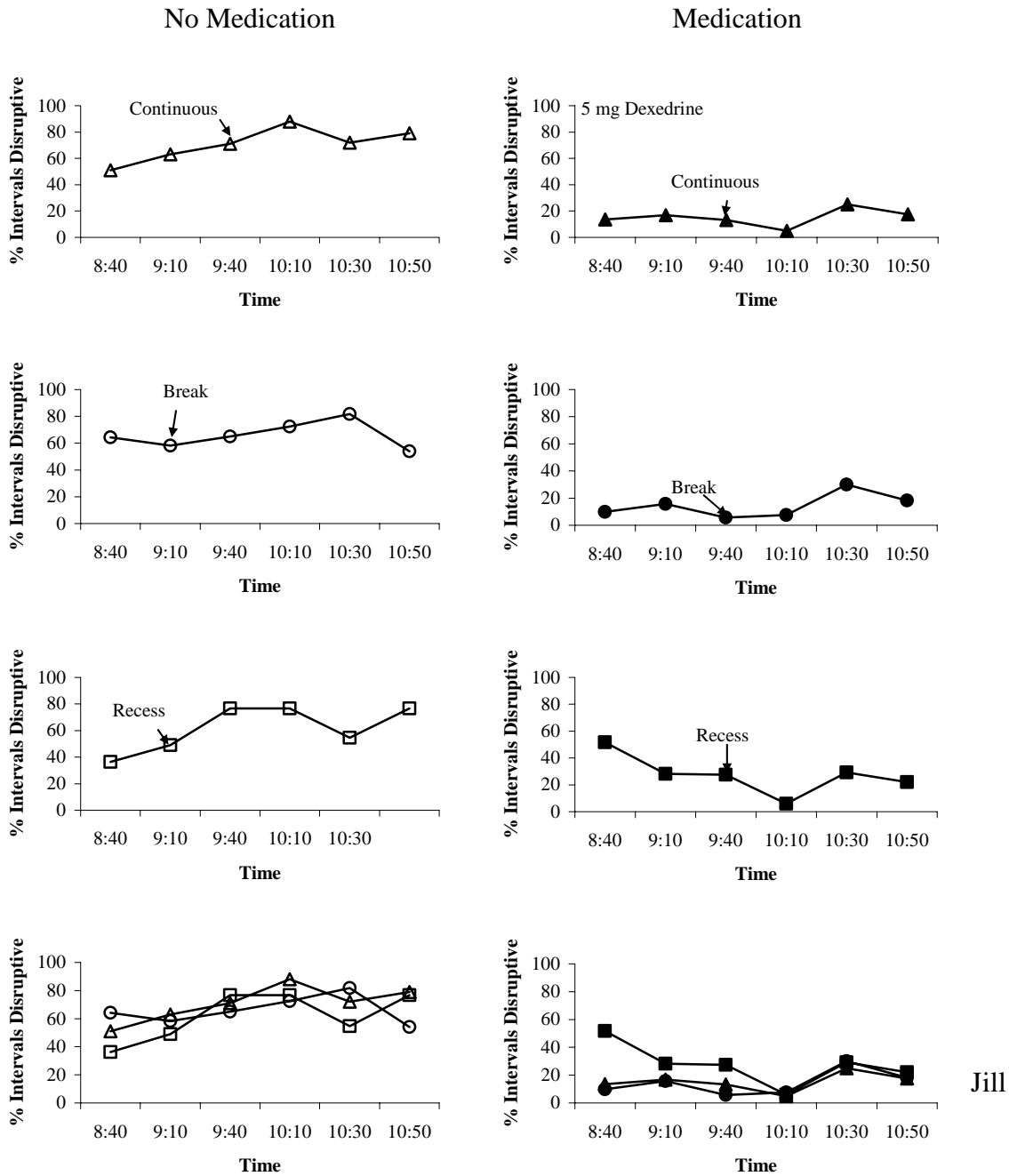


Figure 10. The average of all observations of disruptive behavior for Jill at each time interval for each condition. Left column no medication. Right column stimulant medication.

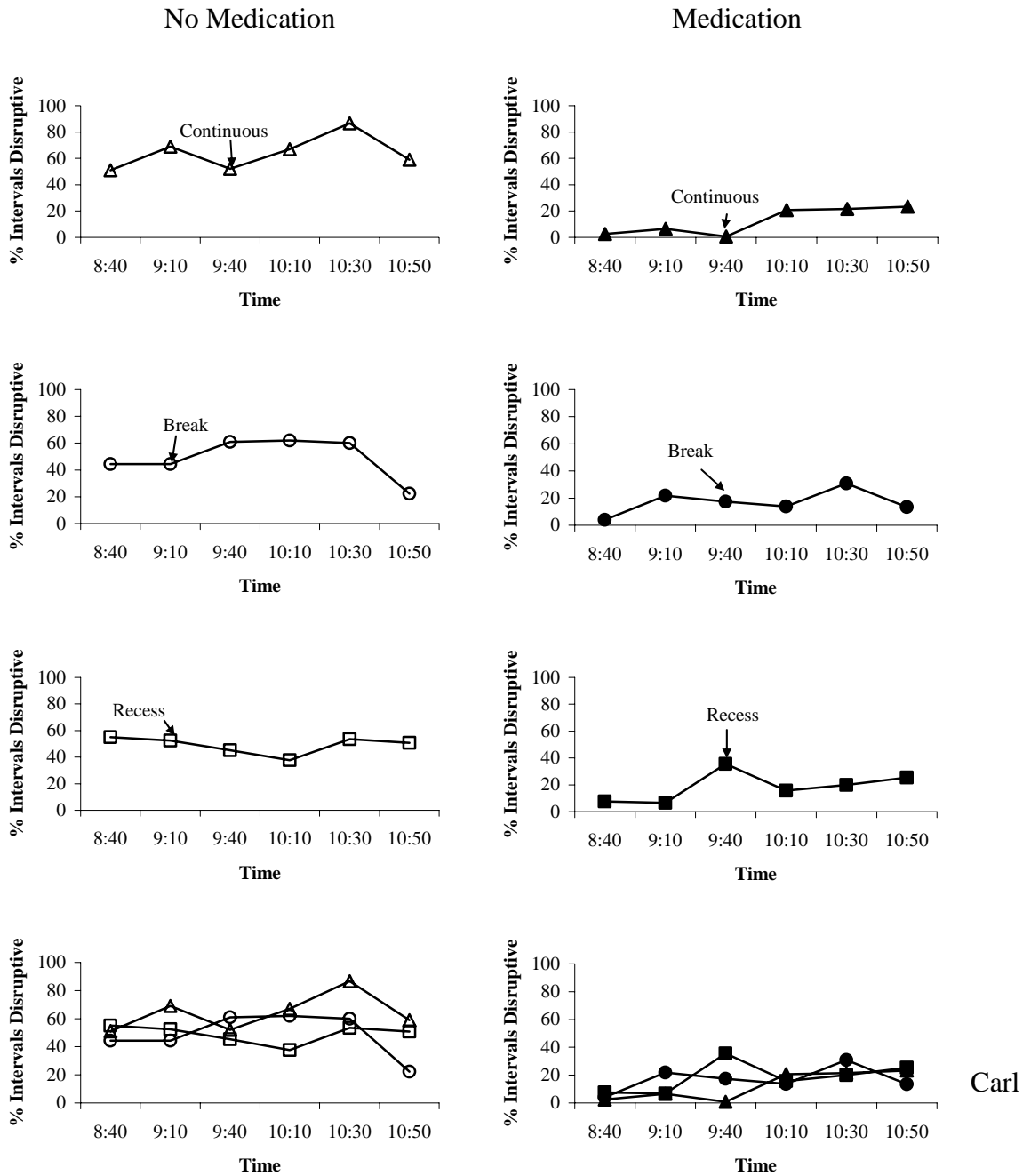


Figure 11. The average of all observations of disruptive behavior for Carl at each time interval for each condition. Left column no medication. Right column stimulant medication.

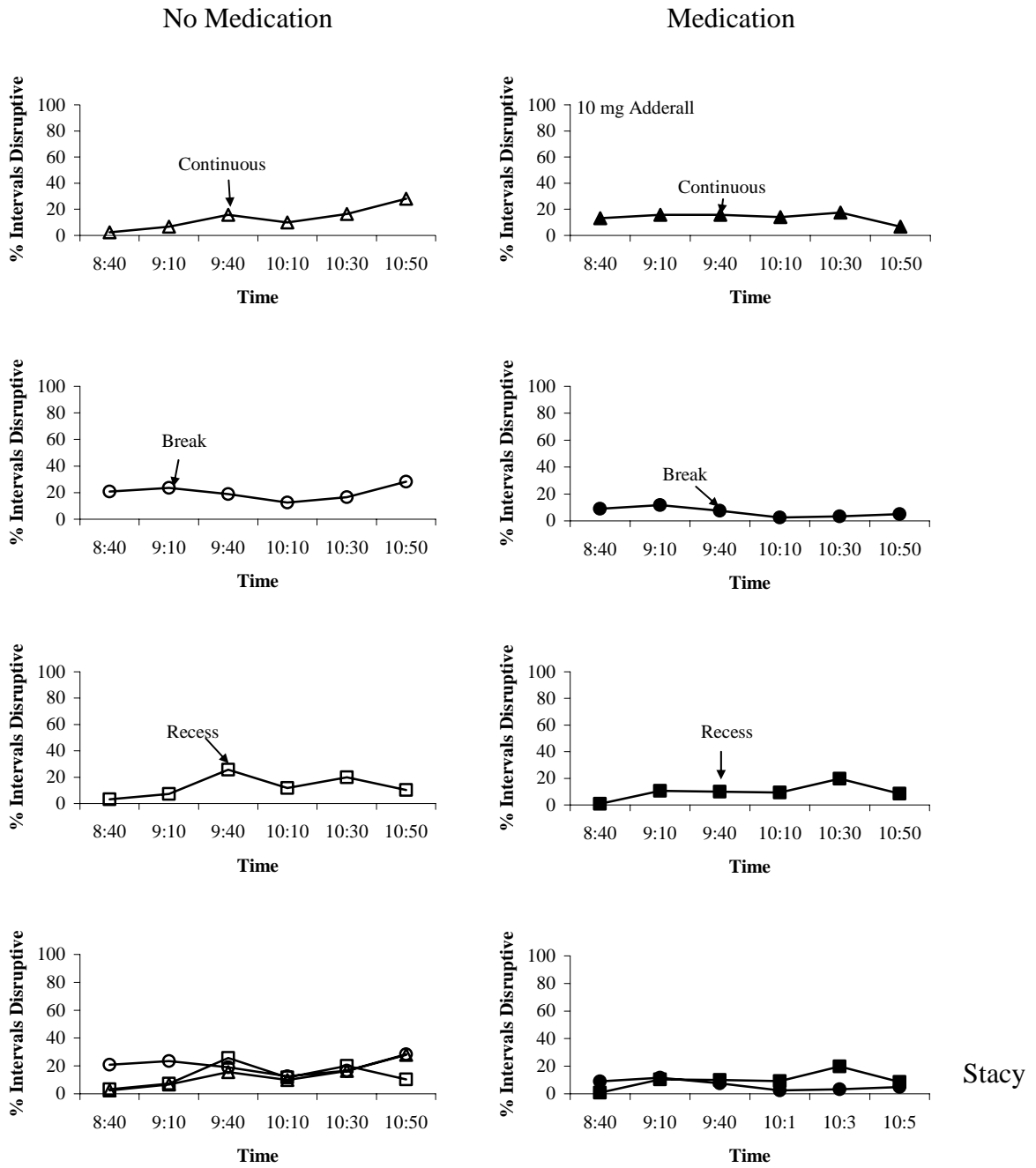


Figure 12. The average of all observations of disruptive behavior for Stacy at each time interval for each condition. Left column no medication. Right column stimulant medication.

Vita

Andrea Ridgway was born in Vincennes, Indiana, to J. Lee Ridgway and Glenda W. Ridgway on May 17, 1977. She received her Bachelor of Science in the College of Arts and Sciences from Louisiana State University in 1999 and graduated *Summa Cum Laude*. Andrea received her Master of Arts in psychology from Louisiana State University in 2001. She is currently pursuing her doctorate of philosophy in school psychology at Louisiana State University.