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RESEARCH ARTICLE

Using Fidget Spinners to Improve On-Task Classroom Behavior for Students With ADHD

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Abstract

Using fidget toys is one way to allow students with attention-deficit/hyperactivity disorder (ADHD) to move while completing academic assignments in the classroom. This study investigated the effect of fidget spinners on the on-task behavior of three second-grade students with ADHD. Before beginning treatment, the rules of use were briefly explained and demonstrated to students by the researchers; students were then provided with fidget spinners during treatment sessions in language arts class. A multiple-baseline design across students was used to determine whether each student had higher levels of on-task behavior when using the fidget spinner. Momentary time sampling was used to record on-task behavior; visual analysis of time-series graphs showed large immediate and sustained increases in on-task behavior during fidget spinner use. Implications for implementing a fidget spinner intervention and suggestions for future research are discussed.

Keywords Intervention · ADHD · Fidget spinner · Single-case design · On task

Students with attention-deficit/hyperactivity disorder (ADHD) have difficulty maintaining attentiveness and focus during class. ADHD, a childhood-onset neurodevelopmental disorder that affects 5%–6% of the population, is characterized by the presence of developmentally inappropriate and impairing levels of inattention, hyperactivity, and impulsivity (Mastropieri & Scruggs, 2018). Many students with ADHD not only present abnormally high levels of motor activity (Mastropieri & Scruggs, 2018) but also have significant difficulties in maintaining and controlling their attention (Stalvey & Brasell, 2006), planning (Patros et al., 2019), and resisting impulses (Somma et al., 2019). In a classroom, students with ADHD may fail to pay attention to details, make careless mistakes during classroom activities, not listen when being spoken to, lose classroom or personal items, and avoid mentally straining tasks (Kercood et al., 2007; Stalvey & Brasell, 2006). These behaviors, when left untreated, result in long-term decrements in academic achievement (Arnold et al., 2020), financial status and monthly income at age 30 (Pelham III et al., 2020), and mental health functioning (Klein et al., 2012). Although pharmacological approaches may improve some outcomes, a multimodal process involving classroom-based interventions is considered the gold standard of treatment.

The various behavioral and academic needs that students with ADHD exhibit in the classroom present challenges for educators and school professionals. Finding methods to improve on-task behavior and attention and to decrease disruptions by students in this population has been a focus of research (Gaastra et al., 2016; Hartanto et al., 2016; Ng et al., 2017; Stalvey & Brasell, 2006). Most school-based interventions focus on behavioral therapies such as using token economy systems, training parents, and teaching organizational skills to students (Fabiano & Pyle, 2019). Although effective, these interventions may be work and time intensive and disruptive to teaching and may be seen by teachers as unfair to other students in the classroom. If a teacher perceives that an intervention will require too much time or will disrupt classroom culture, the intervention is likely to be less acceptable (Martens et al., 1985) and less likely to be implemented with integrity (Sanetti & Kratochwill, 2009). Thus, many parents and teachers prefer

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interventions that are quick and require little effort. Fidget toys may fall into this category despite the fact some of them have very little evidence supporting their use (Schecter et al., 2017).

The evidence that is available is based on contentions that body movements during learning activities can improve a student's ability to concentrate (Rapport et al., 2009). In groups of boys aged 8–12 years, both students with ADHD and without ADHD moved more when completing tasks that purported to measure working memory (Rapport et al., 2009) and behavioral inhibition (Alderson et al., 2012). However, the movement that was measured by an actigraph, which tracked the acceleration of a student's body, was significantly more frequent for those with ADHD. For children with ADHD, increased movement was associated with increased correct responding on academic tasks (Hartanto et al., 2016). These studies suggest that inhibiting body movements may cause performance deficits.

However, large-muscle or abrupt body movements may be disruptive in a classroom. Students doing jumping jacks during independent work time or teacher-led instruction would likely serve as a competing environmental stimulus for other students in the classroom. Finding quiet and nondisruptive outlets for movement may provide space for fidgets. Fidgets are small, tactile objects that allow a person to move their body while staying in their seat. Fidgets could include exercise balls, stress balls, rubber bands that are stretched across the legs of a chair, putty or clay, or fidget cubes and spinners.

Fidget devices, sometimes labeled as sensory tools, are often employed in the classroom to engage students with ADHD. Teachers have used stress balls in the past to engage students in activities that help them change their behavior (Cheng & Boggett-Carsjens, 2005; Kercood et al., 2007; Stalvey & Brasell, 2006). Several articles supporting the use of fidget devices use a cognitive or sensory lens to interpret their findings (e.g., Kercood et al., 2007; Soares & Storm, 2020; Soria-Claros et al., 2016). From a behavioral perspective, fidgets may function as an abolishing operation that decreases the reinforcing power of more overt, disruptive movements (Murphy et al., 2003). A student who finds movement reinforcing may find the use of a fidget spinner to be an appropriate replacement for walking around the classroom or moving in the chair. Ledford et al. (2020) found that the noncontingent application of a fidget device reduced movements that in the context of a classroom or social skills group were considered disruptive. In their study involving children with autism in a group setting, the application of fidget spinners resulted in a reduction of movements that were disrupting the rest of the group.

There are those who claim that fidgeting may improve academic performance. For example, in a map-reading activity, when students in Grades 3 through 5 were instructed to move and view a map from multiple perspectives instead of just looking at it from a single viewpoint, they were better able to remember markers on a map (Carson et al., 2001). In 2006, Stalvey and Brasell published their findings about the effects of stress ball use on students' ability to benefit from a written expression task. When using the stress balls, students were distracted fewer times and had higher scores on the written expression assignment, with higher gains for the students with ADHD. One study with college students found that those students who used fidget aids were better able to ignore distractions (Slater & French, 2010). All of these studies looked at cognitive performance during learning activities. Kercood et al. (2007) found that when students used a quiet fidget toy attached to their desk, they were off task less frequently than times when the toy was not available. However, although the students appeared to be on task more frequently, their work productivity did not improve. These findings indicate that fidgets may not help a student's ability to perform difficult tasks in the classroom. For example, students completing a simplified Stroop task showed lower performance while using a fidget aid than those without the fidget aid (Grodner, 2015).

Despite the mixed evidence supporting the academic and behavioral benefits of fidgets, there are still multiple claims made by advertisers that fidgets help students regulate their emotions, thoughts, and behaviors (Pappas, 2017). Perhaps the most famous fidget is a device called the fidget spinner. Fidget spinners are 2.5-in.-wide (6.35 cm), three-pronged devices that spin around a ball bearing. These spinners include pads that can be held between two fingers to be spun with the other hand, can be spun on desks or other body parts (e.g., noses, elbows, and fingertips), or held with one hand and spun. Although these devices appear to be small toys that function similar to tops, companies have produced and sold the fidget spinner as a device that will improve focus and that is useful for students with ADHD.

Unfortunately, there has been little research supporting the claims made by these advertisers (Schecter et al., 2017). One published study investigated the effect of fidget spinners on students with ADHD who were participating in a classroom-based summer treatment program that provided evidence-based behavioral interventions (Graziano et al., 2020). While using fidget spinners, students with ADHD were noted to display less gross motor movement, were on task more frequently, and were in their assigned areas more frequently. However, behavioral improvements for out-of-area violations only occurred during the first time that students were given fidget

spinners, and not the second time. Importantly, Graziano et al. (2020) concluded that the use of fidget spinners may have decreased some of the more disruptive behaviors, but they did not improve student attention. An additional study involving college students found that the use of a fidget spinner impaired memory performance using both between-subject and within-subject designs (Soares & Storm, 2020). In a study investigating fidget spinners in a third-grade general education classroom, students demonstrated significantly lower levels of academic performance on a math curriculum-based measure (Hulac et al., 2020). Although these findings suggest that fidget spinners may be distractors for most general education students, some individual children may benefit from their use if these children display attentional deficits (Graziano et al., 2020).

The present study was different from the extant literature in two ways. Unlike Graziano et al. (2020) and Ledford et al. (2020), the current study worked with elementary-aged participants in general education settings and not clinical settings. Second, unlike Hulac et al. (2020), who examined fidget spinner use across all students in a general education classroom, the current study only targeted those students with ADHD who were displaying disruptive behaviors. We were unable to find any controlled studies that looked at the effect of a fidget spinner on the classroom behavior of students with ADHD who were included within a general education elementary classroom. The current hypotheses suggest that these students may be more likely to display on-task behaviors when using fidget spinners than when not using fidget spinners. The following research questions were asked:

1. During academic tasks, are students with ADHD on task at higher rates while using a fidget spinner than while not using a fidget spinner?
2. Do teachers and students like the fidget spinner intervention and think it helps increase on-task behavior?

Method

Participants, Setting, and Materials

Three second-grade students enrolled in an urban charter school in the midwestern United States participated in this study. All three students were instructed within the same general education classroom. Each student had a diagnosis from the *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition (American Psychiatric Association, 2013), of ADHD from an outside mental health provider. Allison (pseudonym) was an 8-year-old Black female with a diagnosis of ADHD–inattentive type. She was going through an initial special education evaluation due to ADHD and learning problems. Ben was a 7-year-old White male with a diagnosis of ADHD–combined type. Carl was an 8-year-old Black male with a diagnosis of ADHD–combined type. Both Ben and Carl had an individualized education plan under the category of "other health impaired" and received numerous accommodations and modifications during the school day. All three students qualified for free lunch due to their socioeconomic status.

These three students were selected because the teacher indicated that they were often not paying attention during class. The teacher's main concern involved disruption and not focusing on work. An informal observation during language arts class revealed off-task behaviors such as talking to friends (particularly Allison and Ben), tossing objects across the room, looking around the room or out the window, and sleeping (the major concern for Carl). The researchers agreed that these students were more off task than other peers in the classroom and not attending to the current classroom tasks. Although the three students had previously used fidget spinners as toys, they had not used fidget spinners within the classroom setting or as a tool to influence behavior. Permission was obtained from the principal, teacher, university institutional review board, the students' parents, and the participants prior to beginning the study. Materials for the study included one white and two black 3-in. (7.26 cm) plastic fidget spinners with metal weights and a paper listing the fidget spinner rules. Data were collected using the app Insight: Observation Timer (Version 1.3.2), a free behavioral observation recording timer, on the iPad (sixth generation, iOS 12.1.4).

Design and Dependent Variable

A concurrent multiple-baseline across-students design was used to evaluate the effects of the fidget spinner on on-task behavior. Data were collected over the course of 5 weeks in December and January. No data were collected if any one of the three students was absent on a particular day. On-task behavior was defined as the student's eyes oriented toward the work material or the person speaking or the student following specific teacher directions (e.g., "Go sharpen your pencil."). This definition has been previously used in applied research investigating on-task behavior within the classroom for students with a variety of disabilities (Carmouche et al., 2018; Davis et al., 2014; Slattery et al., 2016). Another reason this definition of on-task behavior was chosen is that the teacher provided redirection several times per class session for students to keep their eyes on their own work, not talk to their neighbors, and sit quietly. Teacher prompts were given to individual students and to the entire classroom. By using this definition, no differentiation was made between active on-task behavior and passive on-task behavior. Examples of on-task

behavior included looking at the teacher when she was talking, a book when reading, and a peer when talking to them during teacher-allowed peer discussion. Nonexamples of on-task behavior included looking at a peer outside of teacher-allowed peer discussion periods, looking at the fidget spinner, and looking out the window.

All data were collected between 8:45 a.m. and 9:15 a.m. during language arts centers. The teacher reported that students were often off task during these times even with the small-group instruction. Each participant was included in a different language arts activity center of six to eight students during the observation time. Although during the 75-min center time each student visited all centers, during the observation time Allison was in a group working with the teacher on guided worksheets, Ben was included in a group doing guided reading with the paraprofessional, and Carl was supposed to be working independently, usually on an iPad instructional game, writing assignment, or silent reading. The researchers positioned themselves in the same corner of the classroom for each data collection session where they could see the entire classroom. Momentary time-sampling data collection procedures were used. Data collection sessions lasted 20 min and were separated into 20-s intervals. The researchers looked up to observe student behavior when the iPad signaled the end of each interval, and recorded whether the student was on task based on the definition used in the study. Students were always observed in the same order (Allison, then Carl, and then Ben) for each interval, and all three students were observed in every interval.

Procedural Integrity and Interobserver Agreement

The primary researcher completed a procedural checklist during each data collection session to guide experimental integrity and to make notes of any inconsistencies (see the Appendix). Procedural integrity checks examined whether the student was using the fidget spinner appropriately and whether the teacher was following the fidget spinner procedures correctly. Procedural integrity based on the number of treatment items correctly administered was 100%. Four instances (one by Allison and three by Ben) of disruptive fidget spinner misuse (e.g., tossing the spinner across the room) were recorded, and all four times the researcher reminded the student of the fidget spinner rules at the end of the observation session. A graduate student trained on observational data collection procedures simultaneously and independently recorded procedural and observational integrity across 21% of the sessions (December 14, January 14, and January 28). These days included at least one baseline and intervention day for each student. Agreement was calculated by adding the number of intervals both researchers agreed the student exhibited on-task behavior and dividing by the number of total intervals, then multiplying by 100. Treatment integrity interobserver agreement was 100%. Interobserver agreement of on-task behavior ranged from 93% to 100% (M = 98.5%) and was high for all students (Allison: M = 99%; Ben: M = 98%; Carl: M = 99%) during both baseline (M = 97.75%) and intervention (M = 99.2%) phases.

Procedures

Baseline data were collected on each individual participating student using the multiple-baseline design. During baseline, when the students were not using fidget spinners, the researchers observed the students in the classroom and collected data on on-task behavior. The teacher was instructed to treat this as "business as usual" and to not treat these students differently than other students in the classroom. During baseline instruction, the teacher often used both group and individual prompts to redirect students to keep their eyes on their own work, not talk to their neighbors, and work quietly.

During the intervention phase, the researcher first introduced the student to the fidget spinner, demonstrated the proper way to use the fidget spinner, and provided a list of rules for using the fidget spinner in class. The rules were (a) "I need two fingers on the fidget spinner at all times," (b) "I only use my fidget spinner when I am doing work or listening to the teacher," (c) "I need to keep my eyes on the teacher or my work when I am using my fidget spinner," (d) "I need to use my fidget spinner quietly without distracting others," and (e) "I am the only person who can use my fidget spinner during class time." The researcher read the list of rules to the student and then asked the student to repeat the rules back to them. The student was considered to know the rules when they could tell the researcher the rules without prompting and show the researcher the proper way to use the fidget spinner. Training students on the rules took between 3 and 5 min per student. The rule list was only provided to the student during the initial training session at the beginning of the phase change from baseline to intervention for each student. The researcher then gave the student the fidget spinner to use during the entire center time, which was from 8:30 a.m. to 9:45 a.m. The fidget spinners were collected at the end of center time at 9:45 a.m. and kept until the following day to ensure none were lost or broken. If the student misused the fidget spinner during an observation, at the end of that particular observation, the researcher reminded the student of the rules and how to use the fidget spinner appropriately. The student participants did not receive reminders for not following the fidget spinner rules, but only for disruptive use (i.e., interrupting a peer with the spinner or tossing the spinner across the room). The inclusion of the fidget spinner rules and the postobservation feedback

was due to teacher concerns regarding students severely or dangerously misusing the fidget spinners and disrupting the class.

Analysis

Data were interpreted using visual analysis of time-series graphs by examining across-student changes and within-student, across-phase differences. The level, trend, immediacy of effect, and variability of data were examined visually and through obtaining phase means. Nonoverlap of all pairs (NAP) effect size measures were calculated across baseline and intervention phases for each student (Parker & Vannest, 2009). The formula is $NAP = \frac{Pos+(0.5\times\#of\ Ties)}{Total\#of\ pairs}$, where *pairs* is the number of baseline to intervention pairs of points, *Pos* is the number of times an intervention point is improved from a baseline point, and *Ties* is the number of times an intervention point is the same as a baseline point. Therefore, the percentage of pairwise comparisons across the two phases that show a higher value (*Pos*) than each baseline data point is calculated (Parker & Vannest, 2009). This nonparametric effect size is often used in single-case research as it compares all points across baseline and intervention to each other, has good power efficiency, is appropriate for nearly all data types and distributions, and adequately reflects visual examination of data (Parker & Vannest, 2009, 2014). According to Parker and Vannest (2009), NAP values of .93–1.0 indicate large effects, values of .66–.92 indicate medium effects, and values of 0–.65 indicate weak effects.

Results

Figure 1 displays a repeated-measures graph of the percentage of time during each session that each student was on task. Effect sizes, means, and standard deviations for baseline and intervention data are provided in Table 1. All three students saw a large, immediate increase in on-task behavior when the fidget spinner intervention was applied. Allison's observed intervals displaying on-task behavior during baseline ranged from 12% to 52% (M = 27%). Her baseline data decreased on Days 2 and 3, with a slight increase on Day 4. During the fidget spinner intervention, her percentage of intervals with on-task behavior increased, ranging from 67% to 88% (M = 79%). There was an immediacy of effect with a 45% increase in on-task behavior from the last baseline point to the first intervention point. Additionally, during the entire intervention phase, her percentage of time on task remained high with a rather flat trend. A NAP effect size was calculated for her data, which indicated an effect size of 1, meaning there were no overlapping data from baseline to intervention. Allison had higher percentages of time on task when the fidget spinner intervention was applied than when it was not.

Baseline data for Ben indicated that his percentage of on-task intervals ranged from 0% to 48% (M = 25%) with a decreasing trend. On the day Ben was not on task during any of the intervals, his group was completing a silent reading assignment, and Ben was playing with a toy or looking out the window the entire time with his book still closed. There was an immediate effect when the intervention was applied, with Ben's time on task increasing from 0% to 67%. Ben's percentage of on-task intervals during intervention ranged from 27% to 95% (M = 67%). The day that Ben was on task only 27% of the time was an outlier, and during that session, he had been sent back to his desk and was playing with the fidget spinner the majority of the time. After this point was removed, there was a slightly increasing trend in Ben's intervention data. However, the visual analysis of all intervention data shows some variability in his percentage of time on task. Ben's NAP value comparing baseline to intervention data was .85, indicating a moderate effect (Parker & Vannest, 2009). The removal of the outlying point would raise this value to 1, indicating no overlap from baseline to intervention.

Carl's baseline percentage of intervals on task ranged from 0% to 57% (M = 34%) with a variable trend. His intervals of on-task behavior increased during intervention, ranging from 0% to 80% (M = 55%). The NAP value for Carl's on-task behavior was .90, indicating a moderate effect. On the days in baseline and intervention when Carl displayed 0% on-task behavior, he was sleeping the entire time during the observation. The teacher indicated that Carl often slept during the morning, particularly on days following a weekend, snow day, or extended break. This behavior was attributed to a poor home life situation and avoidance of schoolwork, but the exact reason for this behavior is unknown. Because this was typical behavior for Carl, we continued to collect data on the days when he was sleeping, and the behavior was considered off task. However, if Carl's days with 0% on-task behavior are removed from the data, his baseline data would range from 16% to 57% (M = 43%), and his intervention data would range from 65% to 80% (M = 73%) with no overlapping data points. Additionally, the separate trend of baseline points and intervention points when removing the sleeping days is rather level, indicating that when awake, Carl's behavior was typically consistent across days.

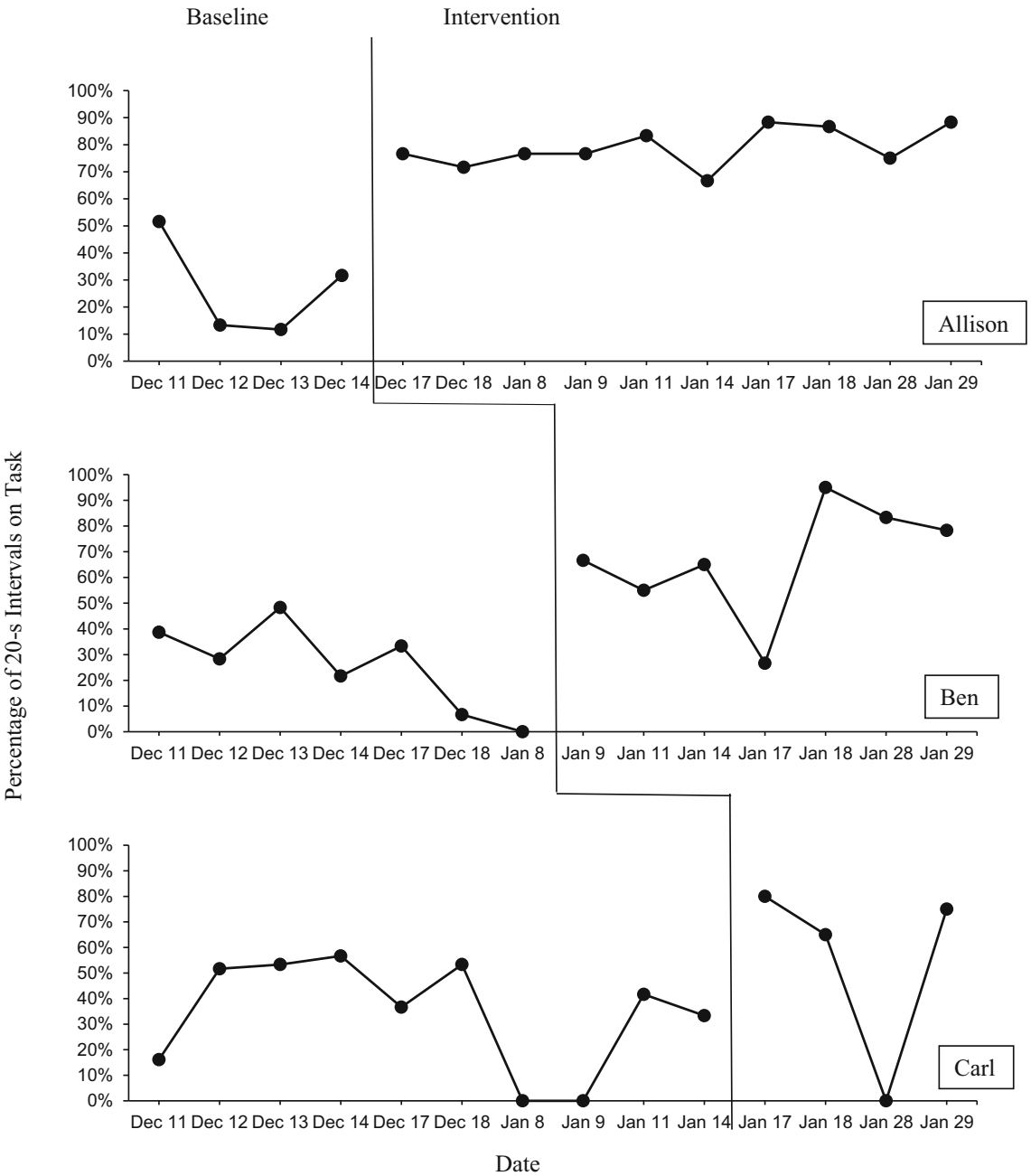

Fig. 1 Percentage of time on task for each student during baseline and intervention phases

Table 1 Means, standard deviations, and effect size measures of percentage of 20-s intervals on task for each student

Student	Baseline *M* (*SD*)	Intervention *M* (*SD*)	NAP
Allison	27% (19%)	79% (7%)	1.0
Ben	25% (17%)	67% (22%)	.85
Carl	34% (21%)	55% (37%)	.90

NAP nonoverlap of all pairs effect size

At the conclusion of the study, the students and teacher completed acceptability measures. The student measure included three items: (a) "I liked using the fidget spinner," (b) "The fidget spinner helped me stay on task," and (c) "The fidget spinner helped me do more work." The students either agreed or disagreed with each statement by circling a smiley or frowny face. Allison and Ben indicated that they agreed with all three statements, whereas Carl disagreed with all three statements.

The teacher measure included five items: (a) "The fidget spinner was a good intervention," (b) "I noticed students' work completion increase when the fidget spinner was used," (c) "I noticed students' on-task behavior improve when the fidget spinner was used," (d) "I will use fidget spinners with other students," and (e) "I would recommend fidget spinners to other teachers." Using a 5-point Likert scale with 1 being *strongly disagree* and 5 being *strongly agree*, the teacher rated all five items at 1, indicating a strong disagreement. When asked why she did not like the intervention, she stated that even though the students may have looked toward their work and were quieter when using the fidget spinners, they did not actually complete the work. She indicated that although she was glad the students were not as rowdy and loud, her main goal was for them to complete the assignments.

Discussion

The purpose of the current study was to examine whether using fidget spinners during language arts centers would increase on-task behavior for three students with ADHD in a general education classroom. Across all three students, immediate and large increases in on-task behavior were observed when the fidget spinner intervention was implemented. Increased on-task behavior was sustained across most intervention sessions, with the exception of 1 day for Ben and 1 day for Carl (when he was sleeping). Because students' on-task behavior increased both across phases and across students, visual analysis suggests that the fidget spinner intervention increased the amount of on-task behavior. Moderate to strong NAP values from baseline to intervention also validate the effectiveness of the fidget spinner.

Previous research suggests that providing opportunities for movement facilitates on-task behavior for children with ADHD (Hartanto et al., 2016; Kercood et al., 2007; Rapport et al., 2009). However, the research on sensory-based interventions for students with disabilities is less than conclusive (Barton et al., 2015). A fidget spinner may serve as a motivating operation that provides a student with opportunities to make small movements, reducing the reinforcing effects of more disruptive movements. In our study, when the students were provided with the fidget spinner, they were more likely to keep their eyes on their own work or look at the teacher instead of look around the room or talk with a neighbor.

In some ways, this study may have a similar function to a study conducted by Favell et al. (1982), who encouraged three students to replace significant self-injurious behaviors with the use of sensory devices. This suggests that sensory devices may be used as differential reinforcement of an alternative behavior (DRA). In the current study, the fidget devices may have functioned as a replacement for disruptive behaviors, but the teacher reported that they continued to interfere with work completion tasks. DRA may be affected by the relative behavioral contrast of competing stimuli. In other words, when a child with ADHD is given the choice between disruptive behavior and academic stimuli that are not reinforcing, the child may choose the disruptive behavior. However, when choosing between the fidget spinner and disruptive behavior, the fidget spinner may provide a denser reinforcement schedule than the disruptive behaviors. This behavioral contrast (Murphy et al., 2003) is critical for explaining the effects of the fidget spinner.

Providing access to the fidget spinner during classwork is an important characteristic of our study. Often, teachers provide students with ADHD access to movement or sensory tools (e.g., putty, therapy balls, exercise ball seats, fidget spinners) as a reward for good behavior. This leads the students to react to the tool as a fun object to play with instead of a device to help with focus. In our study, the fidget spinner was provided concurrently with the demanding task. This allowed students to see the fidget spinner more as a device to help with attention and with schoolwork and less as a reward for good behavior or contingent on work completion.

Some studies have suggested a habituation effect for fidget devices (i.e., Graziano et al., 2020; Hulac et al., 2020), whereby students' use of the fidget device decreased across time. The current group of students did not display this habituation. With on-task behavior being consistent across the study, the reinforcing effect of the fidget device did not appear to change. It is possible that, for students with ADHD, the habituation that may occur with repeated presentation of the fidget spinner may be attenuated (Sagvolden et al., 2005). An additional explanation is that these students only had access to the fidget device during one instructional time per day, meaning the device's reinforcing properties may have restrengthened following a separation from the spinner.

A list of rules was provided prior to the implementation of the intervention, giving students a guideline of how to use the fidget spinner in an academic setting. Although our aim for providing rules was to reduce inappropriate fidget spinner behavior (e.g., throwing the fidget spinner or spinning it on the elbow or nose), the present analysis does not allow us to differentiate between the effects of actually giving the rules and the effect of the fidget spinner itself. During both baseline and intervention, the teacher regularly provided both

individual and group behavioral prompts to students, such as to keep their eyes on their own work, work quietly, and not talk to their neighbors. The additional list of rules provided prior to the intervention may have been an extra prompt and antecedent for students to follow the teacher's behavioral prompts.

When examining the acceptability measures for the fidget spinner intervention, two of the three students indicated they liked using the fidget spinner, the fidget spinner helped them stay on task, and the fidget spinner helped them do more work. Carl said that he did not like the fidget spinner, but when asked to elaborate on why he did not like it, he just said, "I dunno," and put his head back down on his desk. These measures indicate the fidget spinner intervention may have high face validity and acceptability for some students, but not for all. Anecdotally, several other students in the class came up to the observers and asked if they could use a fidget spinner too. One peer even said that it was not fair that some students were allowed to use toys that were typically not allowed. These comments may suggest that, when used in an antecedent context to prevent behavior as was the case in this study, the students view the fidget spinner as more of a toy or a reward instead of a device to help with attention or sensory needs. Students' perceptions may be altered if the fidget spinner was instead used as a reward contingent on appropriate behavior.

Despite increases in students' on-task behavior, the teacher reported low levels of acceptability on all items. Although the teacher viewed the graphs and saw that the data indicated large increases in on-task behavior during fidget spinner use, she still viewed the fidget spinner as a toy and not as a device to help with attention. There was a difference between the teacher's requested target behaviors at the beginning of the study (disrupting others and not focusing on their work) and the end of the study (completing assignments accurately). The teacher recognized that the students were no longer disrupting others, talking, or looking around the room, but she reported they still were not completing work. Sometimes a teacher may be unsatisfied with an intervention if it fails to solve all of a student's academic and behavioral problems. Even though an intervention may reduce one problem (i.e., off-task behavior), a teacher may still view the intervention as a failure for not solving all problems (assignment completion and accuracy). Perhaps as students' on-task behavior increased, the teacher's expectations shifted to become more rigorous, requiring different contingencies as the intervention progressed. A more sensitive definition of on-task behavior or a data collection system that records active on-task behavior (e.g., writing on the worksheet) versus passive on-task behavior (e.g., looking at the worksheet) may help the teacher understand what specific behaviors were being affected by the fidget spinner intervention.

Teachers' perceptions can strongly affect the success of evidence-based practices or interventions (Foster, 2014). Thus, teachers may not trust research and prefer to rely on their own experiences or anecdotal views from colleagues (Hornby et al., 2013). Teachers may be unlikely to implement an intervention if it seems to ignore conventional professional wisdom or fails to incorporate teachers' views (Cook et al., 2008; Hornby et al., 2013). Behavioral consultants working with teachers should consider that preconceived and/or unrealistic expectations of an intervention's effectiveness may still result in lower levels of teacher satisfaction even when an intervention is objectively effective at improving an important dependent variable.

Limitations and Future Research

There were several limitations to the current study. We did not differentiate between passive and active engagement when measuring on-task behavior. Active engagement is more likely to result in work completion, whereas passive engagement may increase learning and reduce disruption. In other words, in the current study, a student may have had their eyes on their work, may have been coded as on task, but did not actually complete any part of the assignment. Although this study did investigate on-task behavior, there was no measure of work completion or work accuracy. Such a measure should be considered in future research studies and may increase teacher satisfaction with this particular intervention.

In order to understand whether using the fidget spinner increases both active and passive on-task behavior, a behavioral observation system that accounts for different types of on-task behavior, such as the Behavioral Observation of Students in Schools (Shapiro, 2011), could be used in future investigations. Future studies could measure work completion and accuracy alongside on-task behavior when using the fidget spinner to determine whether the students are actually engaged in active and accurate academic activities or simply not causing disruptions. Future researchers could also examine the use of the fidget spinner across different settings and conditions, such as providing them to different groups

of students in the classroom, using them just during silent reading time, or using them during timed academic tasks.

The current study did not calculate the amount of time the fidget spinner was in active use. Sometimes the students just held the spinner, and sometimes they set it on the desk for a few minutes. Although the students had the opportunity to use the fidget spinner and had exposure to the fidget spinners for the full language arts center block, we did not time how long each student was actually spinning the fidget spinner or the number of times the students touched or spun the spinner. Additionally, because we did not measure whether students moved more using the fidget spinners, we cannot determine whether movement from using the fidget spinners facilitates on-task behavior. A measure of active fidget spinner use could have helped us determine whether the change in behavior was due to the fidget spinner use, the set of rules, or the presence of the observers. Future studies could time the active use of the fidget spinner and compare it to the intervals of on-task behavior to determine whether the intervals in which the fidget spinner was in active use related to higher levels of on-task behavior. Additionally, researchers could examine whether the amount or type of movement changed when using the fidget spinners by either recording different types of movement (e.g., pencil tapping, knee bouncing, wiggling, walking around the room) or using accelerometers to gauge the total amount of movement.

Finally, it is unclear whether the unique aspects of the fidget spinner itself were the active ingredients in increasing on-task behavior, or if the fidget spinner could be replaced by some other object such as a ballpoint pen, stress ball, or even an inert stick. Future research studies would need to investigate whether the simple hand movements facilitated by the fidget spinner are necessary, or if the combination of the item along with the rules provided the actual change in behavior.

Implications for Practice

Although students in the current study increased their time on task during the fidget spinner intervention, it is important to recognize the difficulties in determining whether a student is actually on task. In the current study, we used the definition of orienting the eyes toward work material or the person speaking or following specific teacher directions. However, it is impossible to measure internal thought processes through observation; only observable overt behaviors can be measured. For example, when Allison was supposed to be completing a worksheet, if she was looking at the worksheet but not actually writing, she may have been reading the passage or thinking of an answer while looking at the paper. Conversely, she may have been thinking about recess or her new hairstyle. With the current definition of on-task behavior, both instances would be considered on task as long as she was oriented to the assignment. In either instance, Allison was quieter and less disruptive than she would have been if she were talking to a neighbor, rolling around on the floor, or wiggling around in her seat.

It is important for behavioral consultants to obtain an accurate definition of problematic behavior prior to beginning an intervention. In our study, the teacher first endeavored to decrease the disruptive behavior of the students with ADHD. However, at the conclusion of the study, she lamented that the students still did not complete their work. Although the intervention may have decreased initial problematic behavior, it became clear at the conclusion of the study that the teacher's ultimate goal was to increase student work productivity. Therefore, candid discussions should occur before, during, and after a behavioral intervention to ensure that everyone is on the same page and happy with student progress.

Conclusion

The present study provides the first known use of fidget spinners as an intervention device to increase on-task behavior for students with ADHD. For the current sample, the spinner intervention appeared to be effective at meetings its goal. Although substantial evidence suggests that the widespread deployment of fidget devices may not be useful for most students (Graziano et al., 2020; Hulac et al., 2020), there may be a select group of students for whom a fidget device interferes with more disruptive problematic behaviors that are symptomatic of ADHD. Whether those improvements in symptoms relate to improved functional outcomes should be investigated in future research studies.

Appendix

Fidget Spinner Procedural Checklist

Rater: _____ Date: _____ Interrater? Y / N

First Intervention Session:

_____ Provide fidget spinner to student

_____ Show student how to correctly use fidget spinner

_____ Show student list of rules and read rules to student

_____ Prompt student repeat rules

_____ Student repeats rules until s/he can say them without extra prompting

_____ Prompt student to demonstrate correct fidget spinner use

Y / N Student was able to repeat rules and demonstrate correct fidget spinner use

All Intervention Sessions:

_____ Give student fidget spinner at the beginning of Language Arts centers (~ 8:30 a.m.)

_____ Observe student from 8:45 – 9:15 a.m.

_____ Observer is seated so s/he can see the direction of eyes of each observed student

_____ No researcher/student interaction during observation

_____ No prompts to encourage fidget spinner use are given

Y / N Did student engage in any fidget spinner misuse? (e.g., throwing, putting in mouth, spinning on elbow/nose/other body part, giving to another student)

_____ After observation, if student engaged in fidget spinner misuse, remind student of rules

_____ Total Treatment Items Correctly Administered

Declarations

Conflict of interest Kathleen B. Aspiranti declares she has no conflict of interest; David M. Hulac declares he has no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained for all participants included in the study.

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