Tools or Toys? The Effect of Fidget Spinners and Bouncy Bands on the Academic Performance in Children With Varying ADHD-Symptomatology

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Abstract

Fidget tools – such as fidget spinners and bouncy bands – are advertised by manufacturers to improve academic performance in children. Therefore, these tools are often used in the classroom setting, either as a universal tool for all children or specifically for children with elevated ADHD-symptomatology. However, there is a paucity of ecologically valid research on the effectiveness of these tools in elementary school children. This study examined the effect of fidget spinners and bouncy bands on mathematics and listening performance of 233 children (53% boys, $M_{\text{age}} = 9.10$) in their regular classroom setting. ADHD-symptomatology was assessed by parent report and children's movement was objectively measured by accelerometers. Linear mixed-effect models revealed that fidget spinners had an overall detrimental effect on academic performance, regardless of ADHD-symptomatology. Likewise, for the bouncy band an overall negative effect on children's performance was found. However, further exploratory analyses suggested that for children with more symptoms of inattention the use of a bouncy band may reduce the negative effect of these symptoms on mathematics performance. Based on these findings, we advise against the use of fidget spinners or bouncy bands as universal therapeutic classroom tools to improve academic performance in elementary school children. More research is warranted on the potential beneficial effect of bouncy bands for children with elevated inattention symptoms.

Keywords: fidget spinner; bouncy band; elementary school children; ADHD; academic performance

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Tools or Toys? The Effect of Fidget Spinners and Bouncy Bands on the Academic Performance in Children With Varying ADHD-Symptomatology.

Schools are increasingly experimenting with various fidget tools in the classroom setting, with the idea that this could ultimately improve academic performance. It is presumed that the use of fidget tools in the classroom may facilitate children's activity levels and by doing so, enhance their academic performance. Indeed, manufacturers of fidget tools often claim that their devices promote academic performance in the classroom, especially in children that are characterised by attentional difficulties such as children with attention-deficit/hyperactivity disorder (ADHD) (Williams, 2017).

ADHD affects about 2% to 7% of the school-aged children (Posner et al., 2020; Sayal et al., 2018). However, evidence suggests a continuous distribution of ADHD-symptoms in the population, associated with similar underlying mechanisms and academic underachievement in a dimensional way (Arildskov et al., 2021; Chen et al., 2008; Kirova et al., 2019; Polner et al., 2015). Clinical ADHD cases hence represent the extreme of the continuous distribution of ADHD-symptoms in the population and thus, many more children in a classroom along this continuum may benefit from such fidget tools.

A commonly used fidget tool is the fidget spinner; a device that can be rotated between a child's fingers. Also other fidget tools, such as the bouncy band; an elastic band that is attached to the legs of a chair with the aim of promoting leg movement whilst sitting, are finding their way into the classroom. Despite all the positive claims made about these fidget tools and their use in classroom practices, there is a paucity of research on the effectiveness of these devices (Schecter et al., 2017).

Nevertheless, the use of movement accommodating techniques during class may be a promising way to enhance performance, especially for children with elevated levels of ADHD-symptomatology. Research suggests that the higher activity observed in children with

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ADHD should not simply be seen as an impairing deficit associated with the disorder. Instead, high activity levels may rather play a functional role, helping these children to perform better (Sarver et al., 2015). This beneficial effect can be explained by its influence on children's arousal state (Zentall & Zentall, 1983).

Every individual has an optimal state of stimulation or arousal (Hebb, 1955), at which performance peaks according to the Yerkes-Dodson Law (1908). Children with ADHD are assumed to be easily under-aroused, which negatively affects their task performance (Zentall & Zentall, 1983). More recent, extensive research along these lines (see for a meta-analysis, Metin et al., 2012) has led to the state regulation deficit (SRD) model of ADHD (Sergeant, 2000; Sonuga-Barke et al., 2010; van der Meere, 2005). The SRD model proposes that every individual needs to adapt their arousal level to perform optimally a task at hand. Especially children with ADHD experience difficulties regulating and adapting their arousal levels. As a result, they show greater susceptibility to drift into a state of under-arousal, expressed for example in inattentive behavior, which negatively affects their task performance. The higher activity levels often seen in individuals with ADHD are hereby argued to function as a compensatory mechanism to increase arousal levels towards a more optimal state, namely by seeking additional stimulation through increased activity (e.g. wiggling in their chair, moving, standing up), and hence improving task performance (Alberts & van der Meere, 1992; Börger & van der Meere, 2000; Sonuga-Barke et al., 2010).

Support for such a functional relationship between activity levels and performance was also found by Sarver et al. (2015). In their laboratory study they explored the relationship between gross motor movement frequency and working memory performance in 52 children with and without ADHD. Overall, higher activity levels in children with ADHD predicted significantly better working memory performance. At the same time, typically developing (TD) children seemed to perform worse on working memory tasks when they exceeded a

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certain threshold in their activity level (Sarver et al., 2015). Furthermore, in a meta-analysis of 63 mainly laboratory studies, Kofler et al. (2016) concluded that high cognitive demands are related to higher activity levels in children with ADHD relative to their peers. Taken together, these experimental findings suggest that a particular activity level may be needed to facilitate task-relevant arousal levels necessary to engage in cognitive tasks, such as mathematics and listening tasks at school. Especially children with elevated ADHD-symptoms, may benefit from increased activity levels (Sarver et al., 2015).

Fidget tools, such as fidget spinners and bouncy bands, could enable higher activity levels of children in a classroom setting (Hartanto et al. 2016; Sarver et al., 2015). In this way, these tools could be seen as a practical way to enhance arousal in children with ADHD-symptoms towards a more optimal state, necessary to perform more adequately (Sarver et al., 2015). There is, however, a sparsity of research into the effects of these tools. Few studies investigated the effect of the use of fidget spinners on performance or attention, while only one study tested the effect of the use of bouncy bands.

Three studies on fidget spinners reported a negative effect on attention or performance (Graziano et al., 2018; Hulac et al., 2020; Soares & Storm, 2019), while one study reported a positive effect of fidget spinners on on-task behaviour in children with ADHD (Aspiranti & Hulac, 2021). This positive effect however, did not result in better assignment completion and was found only in an underpowered study (*N* = 3) (Aspiranti & Hulac, 2021). During a multimodal intervention study, Graziano et al. (2018) found a negative association between the use of fidget spinners and systematically observed attention in 48 preschool children with ADHD. Furthermore, when starting to use the fidget spinner, children exhibited decreased, instead of increased, gross motor activity levels as measured by accelerometers. Soares and Storm (2019) evaluated the effect of fidget spinners on memory performance and self-reported attention of 98 undergraduate students. Participants who were instructed to use a

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fidget spinner while watching an educational video, scored significantly worse on a memory test compared to participants not using a fidget spinner. Moreover, participants reported more attentional lapses while using fidget spinners. More recently, Hulac et al. (2020) conducted a classroom study to explore the effect of fidget spinners on the academic performance of elementary school children (N = 54). Results showed a decrease in performance when children were offered a fidget spinner while taking a math achievement test. It was argued that these negative outcomes were potentially caused by a novelty effect (Hulac et al., 2020; Soares & Storm, 2019), the human tendency to elevate engagement in a novel technology (Tsay et al., 2018). This novelty effect could have resulted in increased distraction, leading to hampered performance (Hulac et al., 2020; Soares & Storm, 2019). Others have argued that a fidget spinner does not create enough gross motor activity to have impact on the functional relationship between activity and cognitive performance (Graziano et al., 2018; Sarver et al., 2015).

If fidget spinners indeed insufficiently increase gross motor activity to regulate arousal levels as proposed by Graziano et al. (2018), then bouncy bands may be a more effective fidget tool, as they elicit more gross motor activity due to movements with legs and feet. Furthermore, these movements do not directly interfere with completing written assignments, compared to a fidget spinner operated by hands. Another advantage of the use of a bouncy band is that it may be less distractive, as this tool is not present in the direct visual field of the child in contrast to a fidget spinner.

To date, only one peer-reviewed study evaluated the effect of bouncy bands on on-task behaviour in elementary school children (Flippin et al., 2020). Results based on systematic classroom observations showed no effect of the bouncy bands on observed attention compared to a baseline condition. However, the study may have been underpowered as only a small number of children (N = 47) participated in this pilot study. Further, no measurements

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of activity level, performance, or ADHD-symptomatology were included in this study (Flippin et al., 2020).

To address the scarcity in the literature and to meet some shortcomings of the existing studies, the current study was the first to systematically investigate the effect of the use of fidget spinners and bouncy bands on academic performance in comparison with a baseline condition, in a large sample of elementary school children. Children were instructed to complete ecologically valid mathematics and listening tasks in their regular classroom setting. Concurrently, we assessed ADHD-symptomatology by parent report questionnaires and objectively measured activity levels during the tasks using accelerometers.

Three research questions were investigated in this study. First, the effect of presenting a fidget spinner or a bouncy band on academic performance was investigated (Q1). Secondly, to shed more light on the role of ADHD-symptomatology in the effect of both tools on children's performance, the moderating role of ADHD-symptomatology was explored (Q2). Third, activity level (measured at the ankle) was examined as a possible mediator in the expected positive effect of a bouncy band on performance, while taking the moderating role of ADHD-symptomatology into account (Q3).

Based on previous findings (Hulac et al., 2020; Soares & Storm, 2019) we hypothesised for the first research question (Q1) that a fidget spinner would have a negative effect on academic performance. The effect of the bouncy band on performance remains inconclusive. The one study that explored the effects of a bouncy band did not find an overall effect (Flippin et al., 2020). However, based on theory one would expect a potential positive effect, especially in children with more ADHD-symptoms. With regards to the second research question (Q2), for the fidget spinner, if any, a negative moderating effect of ADHD-symptomatology was expected, with the detrimental performance effect of a fidget spinner being more pronounced in children with more ADHD-symptoms, due to their increased

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susceptibly to distraction. On the other hand, given the potential of a bouncy band to enhance gross motor activity, a positive effect on performance was expected in children with more ADHD-symptoms. Finally, we hypothesised that a potential positive effect of the bouncy band on performance in children with more ADHD-symptoms would be mediated by their higher activity levels (Q3).

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Methods

Participants

Thirteen classes, ranging from second to fifth grade, were recruited from two elementary schools. Both schools were situated in the same moderately urban area in Flanders, Belgium. In May, 133 children in the second, third, and fourth grade of the first school were tested. In September of the next school year, an additional 110 children of the second school were tested in the third, fourth, and fifth grade, to account for the difference in educational level of the children of the two schools between May and September.

In total, 243 children from 13 classes participated in this study. Ten children were excluded from the final sample due to various reasons, such as Down syndrome (n = 1), neurological disorder (n = 1), physical impairments hindering participation (e.g., a broken arm or leg, n = 4), non-compliance (such as refusal to make the tasks of the study, n = 2), and missing age of the child in the parent report questionnaire (n = 2). As such, the final sample consisted of 233 children (53% boys) between 7 and 11 years old (see Table 1). Most mothers completed higher education, with either a bachelor's degree (30.04%) or a master's degree (52.79%). Six children had a clinical diagnosis of ADHD according to their parents and used medication to treat ADHD. All participating children were also rated by their parents on the Disruptive Behavior Disorder Rating Scale (DBDRS), providing an overall estimation of ADHD-symptomatology in our sample. All children were sufficiently fluent in Dutch to understand the instructions for the experiment. Parents provided written informed consent before the start of the experiment. The study was approved by the ethical committee of the KU Leuven (Social and Societal Ethics Committee, Faculty Psychology and Educational Sciences, G- 2018 05 1226).

Table 1

Detailed Description of the Final Sample

	Final sample
	n = 233
Demographic variables	
Child age *M* (*SD*)	9.10 (0.87)
Child sex (% male)	53
Maternal education[a] *n* (%)	
Did not finish primary school	2 (0.86)
Primary school	4 (1.72)
Middle school[b]	2 (0.86)
Secondary school	32 (13.73)
Professional bachelor's degree	70 (30.04)
Master's degree or higher	123 (52.79)
Diagnoses of children (parent report) *n* (%)	
ADHD	5 (2.15)
ADHD + DCD	1 (0.43)
DCD	1 (0.43)
ASD	1 (0.43)
Learning disorders	4 (1.72)
ADHD-medication *n* (%)	
Psychostimulants	6 (2.58)
DBDRS	
Norm score ADHD-AT *M* (*SD*; range)	11.09 (1.60; 10-17)
Norm score ADHD-H/I *M* (*SD*; range)	10.97 (1.46; 10-16)
Clinical score ADHD-AT and/or ADHD-H/I *n (%)*	7 (3.00)
Subclinical score ADHD-AT and/or ADHD-H/I *n (%)*	14 (6.01)

Note. ADHD = Attention-Deficit/Hyperactivity Disorder, DCD = Developmental Coordination Disorder, ASD = Autism Spectrum Disorder, DBDRS = Disruptive Behavior Disorder Rating Scale, AT = Inattention scale of DBDRS, H/I = Hyperactivity/Impulsivity scale of DBDRS.

[a] Maternal education was assessed as rough estimate for socioeconomic status and is expressed as highest degree earned (Rekenhof, 2017).

[b] Middle school is the first two years of secondary education.

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Procedure

The design and execution of this experiment was first pilot tested in one class with 12 participating children. After this pilot test, final adjustments were made in wording, instructions, and live coding. These pilot data are not included in the final sample.

In the current study children were allowed to use the fidget spinners in the classroom for a few hours the day before the experiment to reduce potential novelty effects. Similarly, the bouncy bands were attached to their chairs three hours before the start of the experiment. All experiments took place in the afternoon, lasting approximately 120 minutes during which their regular teacher remained in the classroom. Before testing, accelerometers were attached to the dominant ankle of each child. To prevent children from changing their behaviour (e.g., moving more or less) children were not informed that these were accelerometers but instead were told the devices were thermometers. During the experiment, children completed both a mathematics task and a listening task in three conditions: (1) a baseline condition, similar to a regular classroom test taking situation; (2) a fidget spinner condition in which every child received a fidget spinner, with the instruction that they could use it as much or as little as they liked; and (3) a bouncy band condition in which the bouncy bands were attached to their chairs, and all children were instructed to put their feet on the elastic band and told they could use the bouncy band as much or as little as they liked. The order of conditions and the combination of task versions and conditions were counterbalanced between the different classes to account for order and task effects. After all participating classes from a school were tested, children were debriefed on the purpose of the experiment.

Materials

Fidget Spinners

All fidget spinners consisted of a ball bearing in the centre of a three-lobed flat structure in black plastic (ZURE, dimensions = 95 mm x 40 mm). These small devices can be used by holding the centre part while spinning the surrounding lobes with little effort.

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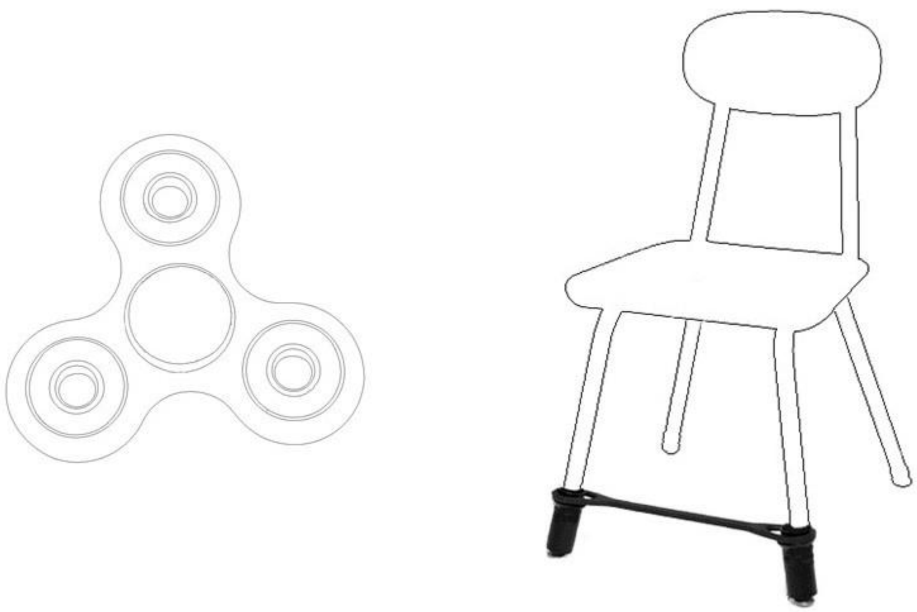
Bouncy Bands

The bouncy bands used in this study consisted of two plastic tubes and an elastic band (Bouncy Band®, dimensions: tube = 10.16 cm long, 3.81 cm diameter, elastic band = 34.29 cm long). The rubber band was looped around the top of the tubes which were attached around the two front legs of a chair.

Figure 1

Schematic Representation of the Fidget Tools



Note. Fidget spinner (left) and bouncy band attached to a chair (right).

Measures

Mathematics Task

Nine mental arithmetic tasks were developed for this study, based on the Kortrijk Arithmetic Test Revision (Kortrijkse Rekentest Revisie, KRT-R; Baudonck et al., 2006), a well validated task to assess arithmetic ability in children of different ages. The KRT-R measures mental arithmetic abilities as well as number knowledge. For each grade, three similar tasks (one per condition) were developed, consisting of 45 items each. Within each grade, performance on the different versions of the task correlated significantly ($p < .01$) with r ranging between .614 to .816. Children were instructed to complete as many items as possible in ten minutes and not to write down intermediate steps (as it was a mental arithmetic task). Performance outcome was measured as the number of correctly solved exercises.

Listening Task

In total, six listening tasks were created specifically for this study. Three tasks of similar difficulty level were designed for the youngest group (second graders in May and third graders in September), and likewise three tasks were designed for the older group (all other children). All stories were chosen based on AVI classification (a standardized measure of reading level of Dutch and Flemish children; Visser, 1997), to ensure an adequate difficulty level. Taking into account the shorter attention span in younger children, shorter stories (3 minutes) were provided for the youngest group in contrast to the older group (5 minutes). All stories were recorded by the same researcher. Open ended questions (youngest group: $n = 5$; older group: $n = 6$) and multiple-choice questions (youngest group: $n = 3$; older group: $n = 4$) were created for each story. Taking into account the difference in total number of items between the younger and the older group, performance was measured as the percentage of correctly answered questions. Within each difficulty level performance on the different versions of the task correlated significantly ($p < .01$) with r ranging between .402 to .598.

Live Coding

Interaction with fidget spinners and bouncy bands was live coded independently by two researchers present in the classroom. While performing the academic tasks in the fidget

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spinner and bouncy band conditions, a child received a score of 0 when no interaction with the fidget spinner (i.e., the fidget spinner was laying still and was not touched by the child) or the bouncy band (i.e., the feet of the child were not touching the bouncy band) was observed. The child received a score of 1 when an interaction with the fidget tool was observed at one point throughout that specific condition. The Phi coefficient was used to calculate interrater reliability of these scores (Grant et al., 2017). Interrater reliability was strong (Akoglu, 2018) for both the mathematics task (fidget spinner condition: $\Phi = .547$, $p < .001$; bouncy band condition: $\Phi = .306$, $p < .001$) and the listening task (fidget spinner condition: $\Phi = .813$, $p < .001$; bouncy band condition: $\Phi = .420$, $p < .001$). As some children finished writing down their answers on the items of the listening task faster than others, behaviour was only coded for the part of the task where children were actively listening to the task.

To ensure that the coding behaviour of the researchers during the fidget spinner and the bouncy band condition did not influence performance across conditions, the same two researchers also pretended to code children's behaviour throughout the baseline condition.

Activity Level

Children wore accelerometers throughout the experiment to obtain an objective measure of activity level. The wGT3X-BT ActiGraph device (ActiGraph LLC, Pensacola, FL, USA), which is able to detect three-dimensional acceleration, was attached to the dominant ankle of the child. The dominant ankle of each child was determined by asking the child to stand up and imagine with which foot they would kick a ball. Activity level is measured at the ankle to quantify gross motor movement in the bouncy band condition. To this end, movement across three axes was measured at 30 Hz, time-locked to the tasks, and collapsed into 1s epochs. Mean vector magnitude of the three axes was calculated for the mathematics task as well as for the listening part of the listening task. When children made gross motor movements unrelated to the experiment (e.g., leaving their chair to get something at the other

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side of the classroom), which interfered with the accurate measurements of activity level related to the task, vector magnitude was scored as missing for that specific variable (*n* = 11). Due to a technical issue with one accelerometer and unforeseen off task behaviour of one child (i.e., leaving his desk to sit in the reading nook after finishing all items of the mathematics task well before the end of the 10-minute period), activity level data of two additional children was also scored as missing. Activity level will not be taken into account when examining the effect of the fidget spinner, given the irrelevance of leg movements while using a fidget spinner.

Disruptive Behavior Disorder Rating Scale (DBDRS)

To assess symptoms of inattention and hyperactivity/impulsivity, parents filled out the inattention and hyperactivity/impulsivity scales of the Dutch version of the DBDRS (Oosterlaan et al., 2008), a parent rating scale based on DSM-IV criteria (equal to DSM-5 criteria). Flemish norms are available and adequate psychometric properties have been reported (Oosterlaan et al., 2008; Van Eck et al., 2010). The internal consistency of the different scales of de DBDRS in the current sample was good with Cronbach's alphas of .883 for the inattention scale and .833 for the hyperactivity/impulsivity scale.

Statistical Analysis

All analyses were conducted in the statistical computing environment R (version 4.1.0; R Core Team, 2020). Descriptive analyses were performed to investigate the distribution of the data. Since the data reflect a multilevel structure with three levels (school, class, and individual), intraclass correlations (ICCs) were calculated to examine this assumption. ICCs showed that the school level explained less than 10% of the variance in the data (which is considered a rather low intraclass correlation; Hox et al., 2018), wherefore only two levels were included in the linear mixed-effect models: individual and classroom level. All models

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were fitted twice: once to the data of mathematics performance and once to the data of listening performance.

To address the first research question (Q1), a random intercept model with condition as predictor variable was fitted, investigating the difference between all three conditions in both mathematics and listening performance (Model 1, see Figure 2). Type III Wald chi-square tests were used to assess the overall condition effect, after which dummy coding was applied to allow pairwise examination of differences in performance in both experimental conditions against the baseline condition. Additionally, a post hoc Tukey test was performed to examine the difference in performance between the fidget spinner and bouncy band condition.

Figure 2

Visual Representation of Model 1

In order to investigate the moderating role of ADHD-symptomatology (Q2), ADHD-symptomatology was added to the model as a predictor variable at the level of the individual. Additionally, an interaction term between condition and ADHD-symptomatology was added to investigate the potential moderating role of the number of symptoms on the effect of condition on performance (Model 2, see Figure 3). The model was fitted for both symptoms of inattention and hyperactivity/impulsivity separately. As with Model 1, Type III Wald chi-square tests were used to assess the overall condition effect and interaction effect, after which dummy coding was applied to allow pairwise examination of differences in performance in both experimental conditions against the baseline condition.

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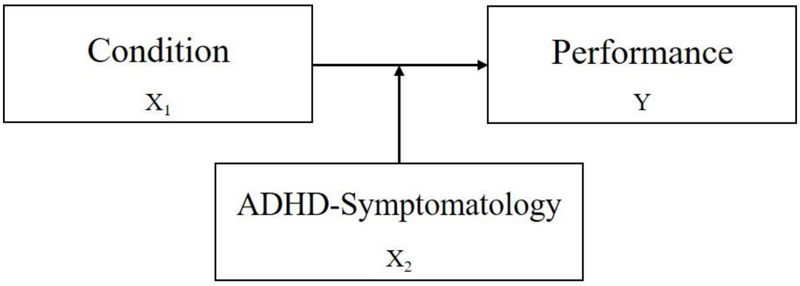
Figure 3

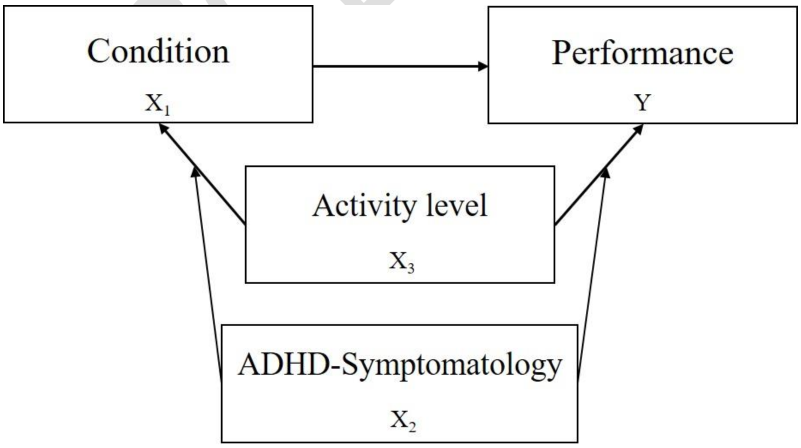
Visual Representation of Model 2



Lastly, to investigate the mediating role of activity level in the effect of condition and examine the moderating role of ADHD-symptomatology in this mediation (Q3), activity level was added as predictor variable to Model 2, as well as two- and three-way interaction terms with both condition and ADHD-symptomatology (Model 3, see Figure 4). In this last model, only data from the baseline and bouncy band condition were included, given the irrelevance of leg movements while using a fidget spinner. Again, the model is fitted for symptoms of inattention as well as hyperactivity/impulsivity separately.

Figure 4

Visual Representation of Model 3



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Results

Preliminary Analyses

Use of Fidget Spinner and Bouncy Band

Twelve children out of 233 participants (5.5%) never interacted with the fidget spinner during the mathematics task and nine children (3.9%) never interacted with the fidget spinner during the listening task.

Observational data for the bouncy band condition was missing for one class. One child out of the remaining 212 participants (0.5%) never interacted with the bouncy band during the mathematics task and eight children (3.8%) never interacted with the bouncy band during the listening task.

Since the objective of this study was to investigate the performance effect of presenting children with a fidget tool, children who did not engage with these tools, were also included in the analyses. However, to explore whether including these children influenced our results, all analyses were additionally repeated without these specific children. The exclusion of these children did not substantially change the results of this study. These supplementary results can be found in Appendix A.

Data Distribution

A visual inspection of the data displayed a positive skewness of the activity level data recorded during the mathematics and listening tasks. Therefore, a square root transformation was used to account for this non-normality of the data. Data of other variables were approximately normally distributed. All predictor variables were transformed into z-scores to improve interpretability of the coefficients (i.e., centralise the intercept at the mean and interpret slopes as standard deviations).

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Condition and Performance (Q1)

Mathematics Performance

Condition was found to be a significant predictor of mathematics performance (χ^2 = 23.31, $p < .001$). Table 2 depicts the coefficient estimates for both the fidget spinner condition and the bouncy band condition as a predictor of mathematics performance. Children performed significantly better in the baseline condition compared to the fidget spinner condition (β = -1.99, $p < .001$) or the bouncy band condition (β = -1.13, p = .007). Comparing performance in the fidget spinner condition and the bouncy band condition did not yield a significant difference (β = -0.86, p = .094). Mean scores can be found in Table 3.

Listening Performance

A similar result was found for listening performance. Again, condition was a significant predictor of performance (χ^2 = 21.71, $p < .001$), with children performing significantly better in the baseline condition compared to the fidget spinner condition (β = -8.56, $p < .001$) or the bouncy band condition (β = -5.73, p = .002). A direct comparison between the fidget spinner condition and the bouncy band condition did not yield a significant difference in performance (β = -2.83, p = .286). All coefficient estimates for listening performance can be found in Table 4 and mean scores can be found in Table 3.

ADHD-Symptomatology as Moderator (Q2)

Mathematics Performance

In Model 2, the potential moderating role of ADHD-symptomatology in the effect of condition on performance was investigated. When comparing all three conditions in one analysis, results showed a main negative effect of inattention symptoms on mathematics

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performance ($\chi^2 = 13.11$, $p < .001$), but not of hyperactivity/impulsivity symptoms ($\chi^2 = 2.04$, $p = .153$). Further results did not show a significant interaction effect between condition and ADHD-symptomatology, neither for inattention symptoms ($\chi^2 = 5.84$, $p = .054$), nor for hyperactivity/impulsivity symptoms ($\chi^2 = 4.65$, $p = .098$). However, the planned pairwise comparison of the experimental conditions against the baseline condition revealed a significant interaction between symptoms of inattention and the effect of the bouncy band on performance compared to the baseline condition ($\beta = 0.83$, $p = .048$). This implies a different effect of the bouncy band depending on the number of inattention symptoms. Figure 5 indicates that for children with less ADHD-symptoms, there was a negative effect of the bouncy band on performance, compared to the baseline condition. Contrary, children with more ADHD-symptoms seemed to perform better in the bouncy band condition, compared to the baseline condition. However, this effect was not sufficient to reach the performance level of children with less ADHD-symptoms, who overall performed better across conditions. The pairwise comparison did not reveal a significant interaction effect of symptoms of hyperactivity/impulsivity and the bouncy band on performance.

The planned pairwise comparison of the fidget spinner condition against the baseline condition revealed no interactions between ADHD-symptomatology and the fidget spinner condition.

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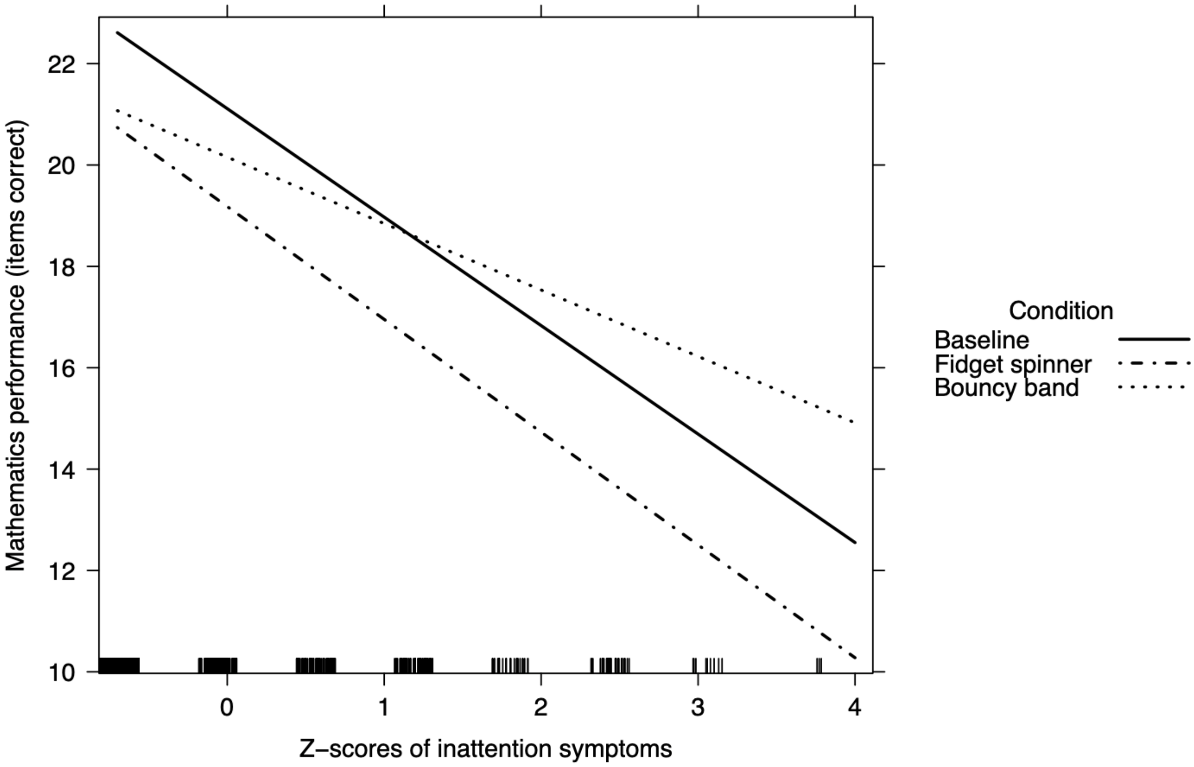
Figure 5

The Effect of Condition and Symptoms of Inattention on Mathematics Performance



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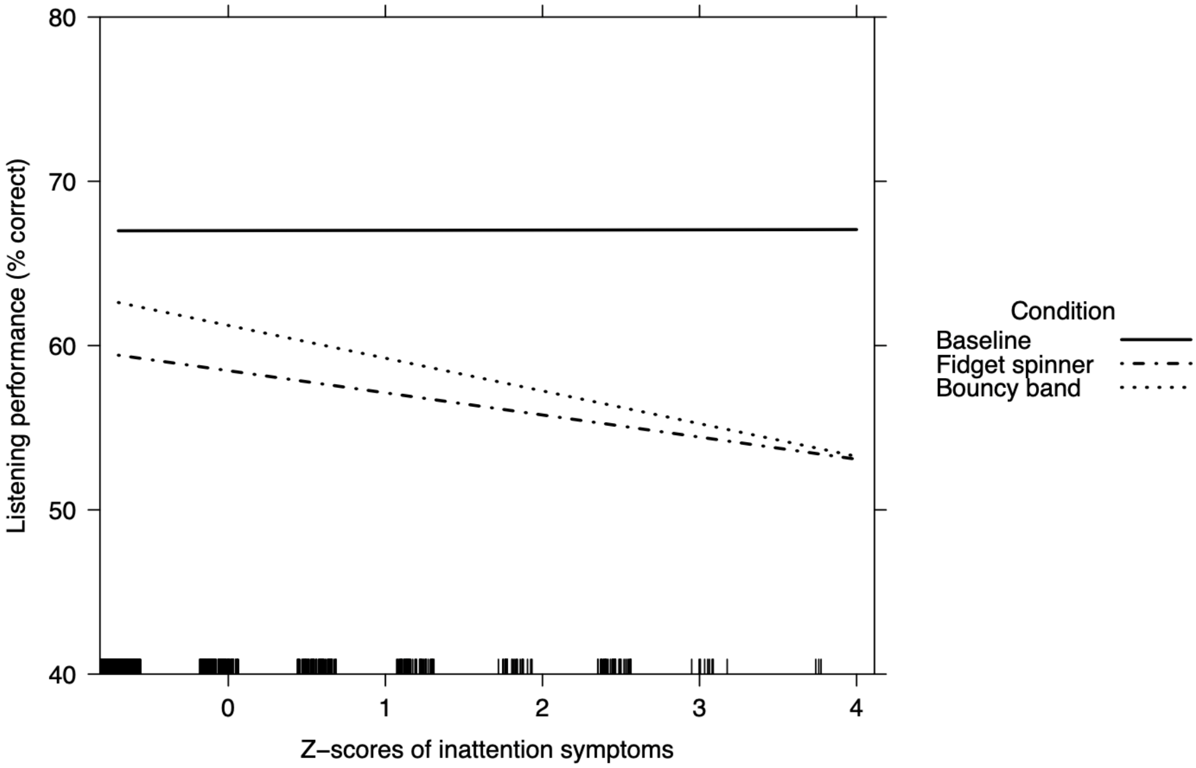
Listening Performance

No main effect of ADHD-symptomatology on listening performance was found, neither for symptoms of inattention (χ^2 = 0.90, *p* = .342), nor hyperactivity/impulsivity symptoms (χ^2 = 2,25, *p* = .134). Moreover, no significant condition x symptomatology interaction effects were found (inattention: χ^2 = 1.16, *p* = .559; hyperactivity/impulsivity: χ^2 = 0.26, *p* = .877). In contrast to mathematics performance, a pairwise comparison of the experimental conditions against the baseline condition did not reveal any significant interaction effects. Hence, the negative effect of both fidget tools on listening performance was not dependent on parent reported ADHD-symptomatology.

Figure 6

The Effect of Condition and Symptoms of Inattention on Listening Performance



Mediating Effect of Activity Level and the Moderating Role of ADHD-Symptomatology (Q3)

Mathematics Performance

To further explain the interaction effect of the bouncy band and symptoms of inattention, the possibility of a mediating effect of activity level was examined. First, differences in activity level between the baseline and bouncy band conditions were inspected, as well as the relationship between activity level and ADHD-symptomatology. Results showed a significant effect of condition on activity level ($\chi^2 = 32.14$, $p < .001$), with children moving more in the bouncy band condition ($M = 75.82$; $SD = 91.18$) compared to the baseline condition ($M = 42.62$; $SD = 42.06$). Symptoms of inattention ($\chi^2 = 0.32$, $p = .574$) or hyperactivity/impulsivity ($\chi^2 = 2.48$, $p = .115$) did not predict the activity level during the task.

Finally, Model 3 was fitted to the data to examine if the effect of the bouncy band on performance was mediated by the activity level of the children while performing the mathematics task. Since Model 2 revealed the absence of a moderation effect of symptoms of hyperactivity/impulsivity on mathematics performance and symptoms of hyperactivity/impulsivity did not predict activity level, only symptoms of inattention are included in Model 3.

Regarding the mediating role of activity level, results showed that neither the main effect of activity level, nor two- or three-way interaction effects were significant in the model (see Table 2). This indicates there was no mediating effect of activity level in the relationship between condition and mathematics performance, nor a moderating role of inattention symptoms on this relation.

Listening Performance

As Model 2 did not indicate a moderating effect of ADHD-symptomatology on listening performance, the possible mediating effect of activity level and the interaction with ADHD-symptomatology was not examined.

Additional Exploratory Analyses

During the live coding of children's interaction with the bouncy band it became obvious that a proportion of children hardly used the bouncy band to move, but rather used it as a footrest. Visual inspection of the movement data revealed that some children moved less during the bouncy band condition, compared to the baseline condition. Therefore we deemed it possible that the expected mediation effect of activity level was obscured by the children who did not use or barely used the bouncy band. This inspired additional exploratory analyses

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of our mediation model in those children who showed most activity during the bouncy band condition, to examine whether the hypothesized positive effect of movement was more pronounced in these children. To assure that these additional analyses only included children who used the bouncy band the most, we selected 25% of children with the highest activity levels (*n* = 57) during the bouncy band condition of the mathematics task for further analyses. The exploratory analyses were not performed on the listening data for the same reason Model 3 was not fitted to the listening data, i.e., Model 2 did not reveal a moderating effect of ADHD-symptomatology on listening performance.

Fitting Model 3 to symptoms of inattention in this small subsample of children (*n* = 57) revealed a main effect of symptoms of inattention (χ^2 = 5.18, *p* = .023), as well as significant two-way interactions for both inattention x condition (χ^2 = 5.16, *p* = .023) and inattention x activity level (χ^2 = 7.37, *p* = .007). Finally, also a significant three-way inattention x condition x activity level interaction was found (χ^2 = 4.00, *p* = .045). In Figure 7, a visual representation of these effects is depicted in these 57 children, based on the found coefficients of the regression model after fitting the data. A visual inspection of this three-way interaction effect suggested that within those 57 children who moved the most, the children with higher activity levels during the mathematics task in the bouncy band condition were less negatively impacted by the reported symptoms of inattention in the bouncy band condition than in the baseline condition. However, as this result was only found in a small subsample of children (*n* = 57), these results should be interpreted with the necessary caution.

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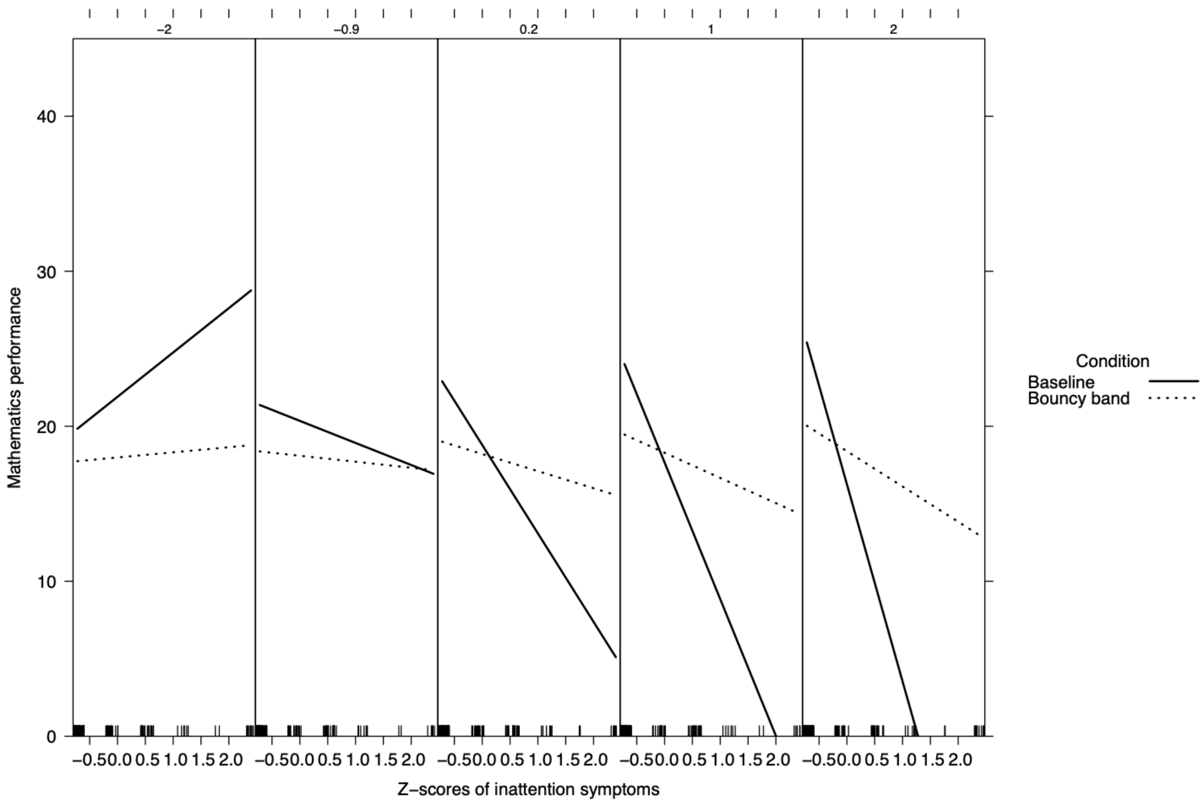
Figure 7

Graphical Representation of the Three-Way Interaction Found when Fitting Model 3 for Mathematics Performance in the Subsample of Children who Showed Most Activity During the Bouncy Band Condition (n = 57)



Note. Each panel represents a different activity level, ranging from less active (left) to most active (right). The corresponding z-scores of activity level are reported at the top of each panel.

Table 2

Multilevel Analysis for Mathematics Performance

Model	Model 1 *Condition*	Model 2 *Condition and ADHD-symptoms*		Model 3 *Condition, ADHD-symptoms, and activity level*
		AT	H/I	AT
Fixed parameters	β(*SE*)	β(*SE*)	β(*SE*)	β(*SE*)
Main effects				
Intercept	21.23(1.13)***	21.11(1.17)***	21.17(1.13)***	21.13(1.24)***
Fidget Spinner	-1.99(0.41)***	-1.93(0.41)***	-1.89(0.41)***	
Bouncy Band	-1.13(0.41)*	-0.96(0.41)*	-1.07(0.41)*	-0.98(0.41)*
ADHD-symptoms		-2.14(0.59)***	-0.80(0.59)	-2.12(0.60)***
Activity level				-0.31(0.55)
Interaction effects				
Fidget x ADHD		-0.09(0.42)	-0.40(0.41)	
Bouncy x ADHD		0.83(0.42)*	0.49(0.42)	1.01(0.41)*
Bouncy x Activity level				0.09(0.57)
ADHD x Activity level				-0.77(0.48)
Bouncy x ADHD x Activity level				0.24(0.57)
Random parameters	Var(*SD*)	Var(*SD*)	Var(*SD*)	Var(*SD*)
Class-level variation	12.39(3.52)	13.48(3.67)	12.24(3.50)	15.60(3.95)
Child-level variation	56.29(7.50)	53.93(7.34)	56.47(7.52)	55.82(7.47)

Note. AT = Inattention scale of BDRS, H/I = Hyperactivity/Impulsivity scale of DBDRS.
*p < .05, **p < .01, ***p < .001.

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Table 3

Mean Performance Across Tasks and Conditions

	Mean (*SD*)
Mathematics performance	
Baseline condition	21.19 (9.40)
Fidget spinner condition	19.24 (9.19)
Bouncy band condition	20.10 (9.52)
Listening performance	
Baseline condition	66.66% (22.88)
Fidget condition	58.1% (26.46)
Bouncy band condition	60.93% (26.99)

Table 4

Multilevel Analysis for Listening Performance

Model	Model 1 *Condition*	Model 2 *Condition and ADHD-symptoms*	
		AT	H/I
Fixed parameters	β(*SE*)	β(*SE*)	β(*SE*)
Main effects			
Intercept	67.08(3.26)***	67.00(3.30)***	66.65(3.25)***
Fidget Spinner	-8.56(1.87)***	-8.53(1.90)***	-8,33(1.90)***
Bouncy Band	-5.73(1.87)**	-5.77(1.90)**	-5,39(1.90)**
ADHD-symptoms		0.02(1.60)	-2.17(1.57)
Interaction effects			
Fidget x ADHD		-1.36(1.90)	0.46(1.90)
Bouncy x ADHD		-2.01(1.90)	0.97(1.90)
Random parameters	Var(*SD*)	Var(*SD*)	Var(*SD*)
Class-level variation	107.1(10.35)	109.7(10.48)	105.5(10.27)
Child-level variation	142.1(11.92)	145.7(12.07)	139.0(11.79)

Note. AT = Inattention scale of BDRS, H/I = Hyperactivity/Impulsivity scale of DBDRS.
**p* < .05, ***p* < .01, ****p* < .001.

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Discussion

Despite all therapeutic claims made by manufacturers about fidget spinners and bouncy bands, research on the effectiveness of these tools remains rather scarce. This is especially disconcerting, since more and more schools are experimenting with these devices in the classroom, either as a universal tool for all children or specifically for children with elevated ADHD-symptomatology. To the best of our knowledge, the current study was the first ecologically valid classroom study to examine the effect of both fidget spinners and bouncy bands on academic performance in a large sample of elementary school children, while taking ADHD-symptomatology into account. Additionally, children's activity levels during the mathematics and listening tasks were objectively measured with accelerometers placed at the ankle, to explore the possible mediating mechanism of activity level in the effect of bouncy bands.

First (Q1), the effect of a fidget spinner and a bouncy band on mathematics and listening performance in all children was investigated. Results showed an overall decline in academic performance when children were given a fidget tool. The detrimental effect of both fidget tools was found for the mathematics task as well as the listening task and remained after excluding the small number of children who never interacted with the tools. Based on these results, a key message of our study is that neither a fidget spinner nor a bouncy band are suitable as a universal classroom tool since these tools hamper, instead of enhance, academic performance in most children.

In a second step (Q2), the moderating role of ADHD-symptomatology was examined, as these fidget tools are often specifically targeted towards these children. Regarding the fidget spinner, results showed no moderating effect of ADHD-symptomatology, with the fidget spinner being as detrimental in children with as without elevated ADHD-symptomatology.

A different pattern was observed for the bouncy band, with a distinct effect of this tool on children's mathematics performance, depending on the number of inattention symptoms. That is, children with more inattention symptoms performed worse on the mathematics tasks compared to children with less symptoms, as could be expected based on previous research (Lou & Feldman, 2007). However, when children were presented with a bouncy band, the negative effect of inattention symptoms on the mathematics performance was smaller, compared to baseline. This finding is of particular interest given the potential ability of a bouncy band to reduce, although not normalise, the negative effect of inattention symptoms on mathematics performance. Intriguingly, symptoms of inattention did not interact with the effect of the bouncy band on children's listening performance, nor was there any interaction between reported symptoms of hyperactivity/impulsivity and children's mathematics and listening performances.

In a third step (Q3), activity level during the task was examined as a possible mediator to shed light on the proposed mechanism that a bouncy band elicits gross motor activity and in this way optimises the suboptimal arousal level in children, especially in those with more ADHD-symptoms and, hence, improve their performance (Sergeant, 2000; Sonuga-Barke et al., 2010; van der Meere, 2005). Indeed, results showed a significant increase in children's activity level when they were presented with a bouncy band, compared to baseline. Nevertheless, results failed to demonstrate a mediating role of children's activity level in the effect of bouncy bands on mathematics performance, even when taking symptoms of inattention into account.

Notwithstanding the overall elevated gross motor activity level in children during the bouncy band condition, a large heterogeneity in these activity levels existed. Therefore, exploratory analyses were conducted, including only the 25% children who moved most when presented with a bouncy band. Tentative results suggest that in this particular subset, the

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negative effect of inattention symptoms on children's mathematics performance was less pronounced, compared to baseline, when these children moved most with the bouncy band, suggesting that activity is a mediating mechanism but only in those children moving most.

Several explanations for the obtained findings in this study are considered, starting with the overall negative effect of the fidget spinner. First, the use of a fidget spinner by hand in the direct visual field of the child requires some deliberate attention that cannot be given to the academic task at hand. It is well established in cognitive psychology that multitasking comes with a performance cost (Kirschner & De Bruyckere, 2017; Krampe et al., 2011), in particular in children with more ADHD-symptoms (Ewen et al., 2012). Moreover, illustrated anecdotally, several children in our study demonstrated all their fidget spinning abilities, balancing the device on their nose, knee, pencil, or shoe. Noteworthy, a strict fidget spinner policy where participants could use the fidget spinner only in their hands, did not improve performance either in a previous study (Soares & Storm, 2019).

Second, as already mentioned by Graziano et al. (2018), a fidget spinner may simply not induce enough gross motor activity to influence children's arousal level. Indeed, fidget spinners require mostly fine hand motor activity (in contrast to gross motor movement of feet with the bouncy band). We could, however, not verify this quantitively in the current study, since the accelerometers were placed at the ankle of the children.

Finally, some researchers (e.g., Soares & Storm, 2019) have suggested that the absence of beneficial effects may be related to novelty effects. However, all the children in our study could already use the fidget spinner in the classroom for several hours prior to testing. Furthermore, due to the widespread popularity of the fidget spinner (Williams, 2017), most children were already familiar with this tool.

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To conclude, the negative effect of a fidget spinner on the academic performance in our study, regardless of ADHD-symptomatology, adds to a growing body of literature demonstrating detrimental effects of fidget spinners both in children with ADHD (Graziano et al., 2018) and TD children (Hulac et al., 2020), as well as adolescents (Soares & Storm, 2019).

Several explanations are also considered for the effects of the bouncy band. First, the already mentioned novelty effect could have led to an increased distraction for the bouncy band as well, resulting in an overall negative effect on children’s performance. Further, based on the SRD account it was hypothesized that a bouncy band would have a positive effect in children with more ADHD-symptoms. That is, children with more ADHD-symptoms are presumed to experience a state of under-arousal (Sergeant, 2000; Van der Meere et al., 2005; Zentall & Zentall, 1983). Therefore, particularly in children with more ADHD-symptoms, increased activity levels could optimise the arousal-state, and hence improve performance.

Indeed, our findings demonstrated a positive effect of the bouncy band on mathematics performance in children with more inattention symptoms. Also, at group level the bouncy band did induce higher activity levels compared to baseline. Taken together, this aligns with previous laboratory work by Sarver et al. (2015), where higher activity levels predicted better performance, but only in children with ADHD.

However, a positive effect of the bouncy band was not found on the listening performance in children with more inattention symptoms, nor on the mathematics or listening performance in children with more hyperactivity/impulsivity symptoms. The absence of a positive effect on the listening task can potentially be explained by the design of the task. That is, the listening task included only few questions to accommodate for the limited phonological memory capacities of elementary school aged children, resulting in a limited distribution of data for this task. With regard to the absence of a positive effect of the bouncy

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band on mathematics performance in children with more symptoms of hyperactivity/impulsivity, one could argue that these children already compensate as much as they can for their under-arousal state, since these children are evaluated by their parents as motoric or verbal hyperactive in normal, thus baseline, conditions. A bouncy band could therefore have less additive impact on the arousal state of these children.

In contrast to our hypothesis, the positive effect of the bouncy band on mathematics performance in children with more inattention symptoms was not mediated by their activity level, based on total sample analysis. This could indicate that other mechanisms than activity are at stake in this effect. On the other hand, exploratory analyses in a subset of children displaying high activity levels when presented with a bouncy band, suggested a similar positive effect of the bouncy band in children with more symptoms of inattention as shown in total sample analyses, however, this time mediated by children's activity level.

The discrepancy between both analyses regarding the mediating role of children's activity level in the performance effect of the bouncy band may be related to the large heterogeneity in activity levels in the total sample, not necessarily driven by ADHD-symptomatology. As it was a naturalistic classroom setting, and even though we used a high degree of experimental control, our manipulations also induced some unforeseen effects. For example we observed that some children could not touch the floor with their feet, as their classroom chairs were too high for their body length. Hence, during baseline condition, this resulted in some children swinging their legs back and forth. When presented with a bouncy band, some of these children used this tool merely as a kind of footrest and stopped swinging their legs. Potentially, these and other unexpected and uncontrollable effects of our manipulations in the classroom setting may have obscured the mediational role of activity in the performance effect of the bouncy band in total sample analyses.

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Limitations and Future Research

Despite the strong ecological validity of our study, some limitations should be considered. First, most children scored low on ADHD-symptomatology as measured by the DBDRS (Oosterlaan et al., 2008). Although potentially a limitation, the present mixture of TD children along with some children with clinical levels of ADHD (4.72% in our sample) is also representative of everyday classroom practices and prevalence rates of ADHD in school aged children. Of note, information on ethnicity was not collected and most mothers completed higher education, therefore our results may not be representative of children from different ethnicities and socioeconomic backgrounds.

Second, based on the state regulation deficit account, one could argue that only children with state regulation difficulties would experience beneficial effects of a fidget spinner or a bouncy band. Wåhlstedt et al. (2009) demonstrated that only a subgroup of children with ADHD exhibits state regulation difficulties. Therefore, a measure of state regulation difficulties is recommended in future research to shed more light on which subgroup of children could eventually benefit from the bouncy band.

Third, mathematical and listening tasks were used as ecologically valid performance measures, since these tasks are often used in schools. However, the listening task only included few questions to accommodate for the limited phonological memory capacities of elementary school aged children. Consequently, the distribution of data was limited for this task. Exploratory analyses also revealed a task effect, indicating differences in difficulty level between the three versions of the listening task. However, as all versions of the listening task were counterbalanced across classrooms and conditions, the effects of the bouncy band and fidget spinner found in the current study cannot be attributed to the difference in difficulty level between the three versions.

Finally, although the children in our study could use the fidget spinner and the bouncy band for several hours prior to testing, this habituation period may have not been long enough to overcome a novelty effect. This limitation is particularly applicable to the bouncy band, given its novelty for most children, compared to the popular and well-known fidget spinner. Therefore, it is preferable to extend the habituation period in future studies when investigating the effects of relatively unfamiliar tools, such as a bouncy band.

Conclusion

For the fidget spinner, a robust negative effect on academic performance was found regardless of ADHD-symptomatology. The results of this study, hence, add to a growing body of literature demonstrating negative outcomes of fidget spinners both for children with ADHD (Graziano et al., 2018) and TD children (Hulac et al., 2020), or adolescents (Soares & Storm, 2019). Given all the evidence, we strongly advise against the use of fidget spinners as a therapeutic tool in the classroom or during other learning activities (e.g., homework), both for TD children and for children with more ADHD-symptoms. Although the popularity of fidget spinners is nowadays somewhat waning, other fidget tools are making their entry in schools (e.g., fidget cube, fidget pop it). As with the fidget spinners, manufacturers are making strong therapeutic claims about these tools. However, given the similarities with a fidget spinner, we advise educators to adopt a reticent approach towards the use of these tools/toys in the classroom.

Regarding the bouncy band, the obtained effects were somewhat less straightforward. Overall, a negative effect of the bouncy band on children's academic performance was found. Therefore, based on these findings, we also advise against the use of bouncy bands as universal classroom equipment in elementary schools. However, for some children with inattention symptoms a bouncy band can potentially reduce, although not normalize, the negative effect of these symptoms on mathematics performance. This potential beneficial

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effect of a bouncy band in a certain subsample of children should be addressed in future research with a longer habituation period and more sensitive questionnaires to provide educators with more insight in the therapeutic use of this tool.

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Appendix A: Results Without Children not Interacting With the Tools

To examine the robustness of our findings and the possible impact of children in our sample who did not interact with the fidget tools, analyses were repeated without these children. More specifically, twelve children did not interact with the fidget spinner during the mathematics task (5.5%) and nine children during the listening task (3.9%). One child did not interact with the bouncy band during the mathematics task (0.5%) and eight during the listening task (3.8%). All results described in this appendix are based on the analyses of our sample, after removing these children. A summary of the results regarding the mathematics and the listening task can be found in Table A.1 and A.2 respectively. Mean performance and standard deviations for both tasks across the different conditions can be found in Table A.3.

Mathematics Performance

Condition was still a significant predictor of performance, with children performing significantly worse in the fidget spinner and bouncy band condition, compared to the baseline condition (see Table A.1, Model 1).

Regarding the second research question (Q2), investigating the potential moderating role of ADHD-symptomatology, results were similar to the complete sample. Inattention symptoms remained a significant predictor of mathematics performance (χ^2 = 11.53, $p <$ .001), and a significant interaction effect between symptoms of inattention and the effect of the bouncy band on performance was found as well (see Table A.1, Model 2). This confirms the moderating role of inattention symptoms in this subsample, similar to what was found in the complete sample. In contrast to the complete sample, symptoms of hyperactivity/impulsivity did become a significant predictor of mathematics performance (χ^2 = 4.71, p = .030), with children with more symptoms, performing worse. However, we did not find a moderating effect of symptoms of hyperactivity/impulsivity, as the interaction effect did not reach significance (see Table A.1, Model 2). Pairwise analysis revealed that the predicting role of the bouncy band condition was not significant anymore, although it almost reached significance (β = -0.84, p = .060).

Examining the mediating effect of activity level while taking into account the moderating role of ADHD-symptomatology, by fitting the data to Model 3, yielded similar results to the complete sample, i.e., no interaction effects with activity level were found.

Listening Performance

Similar results were found with regards to research question one, investigating the predicting role of condition on performance.

Regarding the second research question, investigating the potential moderating role of ADHD-symptomatology, results were similar to results of the complete sample as well. In contrast, the main effect of inattention symptoms was significant (χ^2 = 6.52, p = .011), with children with more symptoms, performing worse. However, pairwise comparisons of both conditions against the baseline condition, revealed that the main effect of ADHD-symptomatology was no longer significant, and interaction effects remained non-significant.

Similar to the results of the complete sample, Model 2 did not indicate a moderating effect of ADHD-symptomatology on listening performance. Therefore, the possible mediating effect of activity level and the interaction with ADHD-symptomatology was not examined in this subsample.

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Table A.1

Multilevel Analysis for Mathematics Performance Without Children not Interacting With the Tools

Model	Model 1 *Condition*	Model 2 *Condition and ADHD-symptoms*		Model 3 *Condition, ADHD-symptoms, and activity level*
		AT	H/I	AT
Fixed parameters	β(*SE*)	β(*SE*)	β(*SE*)	β(*SE*)
Main effects				
Intercept	21.17(1.10)***	21.03(1.12)***	21.08(1.09)***	21.10(1.19)***
Fidget Spinner	-2.10(0.45)***	-2.04(0.45)***	-1.99(0.45)***	
Bouncy Band	-1.04(0.45)*	-0.84(0.45)	-0.98(0.45)*	-0.90(0.41)*
ADHD-symptoms		-2.17(0.64)***	-1.34(0.63)*	-2.21(0.65)***
Activity level				-0.04(0.60)
Interaction effects				
Fidget x ADHD		0.09(0.45)	-0.38(0.47)	
Bouncy x ADHD		0.96(0.45)*	0.66(0.45)	1.17(0.45)**
Bouncy x Activity level				-0.25(0.63)
ADHD x Activity level				-0.73(0.55)
Bouncy x ADHD x Activity level				0.30(0.64)
Random parameters	Var(*SD*)	Var(*SD*)	Var(*SD*)	Var(*SD*)
Class-level variation	10.55(3.38)	11.41(3.67)	10.29(3.21)	13.26(3.64)
Child-level variation	57.98(7.61)	56.00(7.48)	57.34(7.57)	57.41(7.58)

Note. AT = Inattention scale of BDRS, H/I = Hyperactivity/Impulsivity scale of DBDRS.
*p < .05, **p < .01, ***p < .001.

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Table A.2

Multilevel Analysis for Listening Performance Without Children not Interacting With the Tools

Model	Model 1 *Condition*	Model 2 *Condition and ADHD-symptoms*	
		AT	H/I
Fixed parameters	β(*SE*)	β(*SE*)	β(*SE*)
Main effects			
Intercept	67.80(3.34)***	67.73(3.29)***	67.32(3.36)***
Fidget Spinner	-8.65(2.03)***	-8.62(2.07)***	-8.39(2.07)***
Bouncy Band	-5.70(2.03)*	-5.75(2.07)*	-5.32(2.07)*
ADHD-symptoms		-1.39(1.67)	-1.70(1.65)
Interaction effects			
Fidget x ADHD		-2.09(2.07)	0.43(2.07)
Bouncy x ADHD		-2.68(2.07)	0.36(2.07)
Random parameters	Var(*SD*)	Var(*SD*)	Var(*SD*)
Class-level variation	108.3(10.41)	105.8(10.28)	111.7(10.57)
Child-level variation	110.8(10.53)	105.4(10.27)	104.6(10.23)

Note. AT = Inattention scale of BDRS, H/I = Hyperactivity/Impulsivity scale of DBDRS.
**p* < .05, ***p* < .01, ****p* < .001.

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Table A.3

Mean Performance Across Tasks and Conditions

	Mean (*SD*)
Mathematics performance	
Baseline condition	21.16 (9.40)
Fidget spinner condition	19.05 (9.24)
Bouncy band condition	20.12 (9.61)
Listening performance	
Baseline condition	67.17% (22.43)
Fidget condition	58.52% (26.18)
Bouncy band condition	61.47% (27.03)

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