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Parental perspectives on the use of fidget toys and sensory-seeking profiles in autistic and neurotypical children

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Abstract
This study addresses the research gap concerning whether the use of fidget toys or fidget spinners specifically are perceived to support children and positively influence their behavioural and emotional wellbeing as well as investigating how these perceptions relate to children's sensory-seeking profiles. 129 parents/carers of autistic children ($n=53$) and neurotypical (NT) children ($n=76$) completed an online survey. The survey consisted of questions relating to the benefits and risks of fidget toys as well as statements about their own child's fidget toy use. The Sensory Profile 2 was used to obtain parents perspectives on their child's sensory behaviours. The main findings demonstrated that parents of autistic children perceived fidget toys and fidget spinners to be overall more beneficial than NT parents, especially in relation to reducing anxiety. Higher sensory-seeking scores for both autistic children and NT children were associated with greater parental agreement for fidget toys and fidget spinners being beneficial. Parents of autistic children with higher sensory seeking scores found fidget toys to reduce anxiety and spinners to be less distracting. Whereas, parents of NT children with higher sensory seeking scores perceived both fidget toys and spinners to help their child concentrate. Implications include that educators should consider parental views when forming policies about the use of fidget toys. Findings also imply that the sensory profiles of autistic and NT students should be considered in relation to the use of fidget toys.

Keywords Autism · Sensory processing · Sensory-seeking · Fidget toys

Sensory processing

Sensory processing involves recognising and regulating sensory information as well as responding appropriately (Gourley et al., 2013). Sensory processing difficulties are associated with neurodevelopmental conditions such as autism (Critz et al., 2015). Moreover, fidgeting can occur in children who have sensory processing difficulties, and it can also be the result of physical responses to internal feelings such as nervousness, boredom or anxiety (Cohen et al., 2018). It is important to identify appropriate means to assist their needs to encourage equal opportunities in terms of learning and social experiences. One such example of this is through the use of fidget toys. However, there is inconclusive evidence for the benefits of fidget toys, especially for children with sensory processing difficulties. This study sought to investigate parental perspectives about whether fidget toys were beneficial for autistic children and/ or neurotypical (NT) children and their sensory profiles were also examined using the Sensory Profile Questionnaire (SPQ 2, Dunn, 2014).

The SPQ 2 (Dunn, 2014) was established for caregivers to report their child's responses to various sensory stimuli and for professionals to measure factors that affect children's sensory processing in their daily lives. The SPQ assesses four categories; low registration (passive response to sensory stimuli), sensory sensitivity (discomfort to sensation), sensation seeking (seeks/creates sensation in the environment) and sensation avoiding (limits exposure to sensory stimuli) (Dunn, 1997). The SPQ has been used to identify any differences in the sensory needs of autistic and NT children. Tomchek and Dunn (2007) conducted a comparative study using the Short Sensory Profile and found significant differences

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with regards to the category under responsive/seeks sensation with the autistic group seeking sensation for a variety of sources including auditory, vestibular, tactile and proprioception in order to satisfy their needs. Sensory seeking behaviours can manifest as excessive movements, fidgeting or even licking an object with the intention of gaining enhanced stimulation (Ben-Sasson et al., 2009). In order to overcome the challenges that sensory processing difficulties may present, fidget toys are often used as a sensory based intervention within the classroom (van der Wurff et al., 2021).

The role of fidgeting within the classroom environment has been negatively perceived as a form of inattention (Lis et al., 2010). Carson et al. (2001) suggest that educators view attentive students as those who are sitting still. Pine et al. (2007) discovered that when 65 NT children aged six to eight were prohibited from making hand gestures on a lexical retrieval task, they struggled to provide as many correct answers compared to when they were allowed to use gestural movements. The consequences of suppressing fidgeting movements could in fact hinder children's ability to thrive in a classroom environment (Lengel & Kuczala, 2010). Therefore, professionals such as occupational therapists and educational psychologists have introduced fidget toys to serve as coping mechanisms for assisting sensory needs (Benson et al., 2019).

Fidget toys and fidget spinners

Anxiety

Autistic people often present sensory seeking behaviours, in particular tactile ones in an attempt to self-regulate anxiety (Miller et al., 2007). Anxiety is a common concern in the autistic population (White et al., 2009). Fidget toys can serve as a means to self-regulate, allowing children to discreetly reach their optimal level of arousal necessary for attention and on-task behaviour (van der Wurff et al., 2021). Marketers of the fidget spinner have purported benefits of reduced stress for children with particular needs, despite a lack of scientific evidence to show beneficial use of a fidget spinner (Schecter et al., 2017). Given the prevalence rates of sensory processing difficulties and anxiety in autistic children, there are very limited studies assessing the effectiveness of fidget toys in this population. A study by Ledford et al. (2020) involved four autistic children (aged 3–6) who were allowed to choose a fidget toy during a group activity, and it was shown that children's engagement did not improve and that their focus was on manipulating the fidget toy rather than attending to the teacher. Similar results were found by Cihon et al. (2020) who evaluated auditory attention while using a fidget spinner device in two autistic participants and they found no positive effect on their overall levels of concentration. The benefits of fidget toys outside of the classroom has been evidenced in a study by Fletcher-Watson and May (2018) who found that fidget toys helped reduce anxiety levels for autistic people during an arts festival. As this accommodated their sensory needs and enabled individuals to self-regulate their social interaction.

Concentration and distraction

Other studies have assessed the use of fidget toys in NT populations. Stalvey and Brassell (2006) introduced the use of stress balls for 29 sixth-grade students during independent and teacher-led tasks and found an increase in concentration and a reduction in the frequency of distractions and inattention. In Da Câmara et al.'s (2018) study involving interviews, observations, and workshops with 28 children aged six to 11, 24 parents and two teachers, it was identified that fidgeting was the result of a variety of reasons; engaging in cognitive tasks such as reading, thinking, and learning, as a way to expend energy, and to regulate emotion. Boredom was found to be the most common reason for a child to fidget. Children chose fidget toys to satisfy particular desires or emotions; children would squeeze a toy when angry but would press, click or tap when performing a cognitive task.

The impact of fidget toys on concentration levels is widely debated by practitioners (Schecter et al., 2017), as there has been conflicting evidence whether fidget toys, and spinners in particular have any benefits with others arguing they have the potential to distract students. Tombu and Jolicoeur (2004) suggest that using a fidget toy is a secondary task which could detract attention from the primary task. This was evident in studies with university students; Gligoric et al.'s (2012) study identified "fidgeting" as one of the most common factors which results in a lack of focus in lectures. Whereas the results of Farley et al. (2013) highlighted that fidgeting increased retention of lecture material, suggesting that it was used to optimise attention. This is reinforced by Slater's (2012) study which revealed that fidget toys provided a positive impact on behaviour and refocused students' attention.

In terms of fidget spinners, Hulac et al.'s. (2020) study with 54 third-grade NT students indicated impaired academic performance on maths tasks when the fidget spinner was used in comparison to when it was not. Soares and Storm's (2019) study also observed a negative effect of fidget spinners on memory in college students. The researchers suggested the decline in academic performance could be due to the features of the fidget spinner (bright colours and noise) which could be distracting not only for those students using them but also other students in the classroom. Fidget spinners have been argued to be more demanding than other fidget toys – they require cognitive, visual and motor resources. However, there has been a positive relationship found between fine motor skills and academic achievement in NT children (Cameron et al., 2012). Therefore, fidget spinners could indirectly support success in the classroom by enhancing fine

motor skills, or they could hinder children's ability to engage in classroom activities by requiring attention and can therefore contribute negatively to learning experiences.

Only one study to date has considered children's sensory processing and the effects of fidget tools to improve attention and arithmetic performance with 271 Dutch primary school children aged seven to eight years old (van der Wurff et al., 2021). Three sensory tools were chosen (tangle, ear muffs and wobble cushion) for children to utilise during test conditions. It was predicted that the wobble cushion and the tangle to be beneficial for participants with a high sensory threshold and categorised with registration and sensory seeking patterns. In contrast, the earmuffs were expected to be effective for children with a low threshold who are sensitive to stimuli or avoid sensation (sensitivity and avoiding patterns). However, there were no positive effects of any of the sensory tools and even some evidence of impaired performance.

Harmfulness

The increased concern of fidget toy use could be linked to the reported risks of the toys. The marketers of the fidget spinner failed to provide any warnings associated with misuse of the toy. After undergoing examination, it was concluded that some fidget spinners may elicit nickel- or cobalt allergic contact dermatitis (Ahlström et al., 2018), and due to the increasing number of injuries emerging related to fidget spinners, the US Consumer Product Safety Commission (CPSC) issued formal public safety tips concerning the ingestion of fidget spinner parts (Khalaf et al., 2018). The literature concerning school policy forbidding fidget spinners is predominantly focussed on the negative impact they have on students' education and their physical hazards (Schecter et al., 2017).

The current study

Although previous research has examined the impact of the use of fidget toys in clinical and educational settings, the benefits and risks of fidget toy use are of ongoing debate as there is insufficient evidence to suggest whether fidget toys help or hinder children's emotional wellbeing and academic progress. In particular, very few studies have examined whether the use and benefit might depend upon the person's sensory profile or neurodivergence. The current novel study will address this gap by examining the perspectives on fidget toys and spinners by parents of autistic children and NT children. This research will establish, for the first time, whether children's sensory-seeking profile will determine the effectiveness of fidget toy use. It was hypothesised that parents of autistic children (compared to NT parents) will perceive fidget toys and spinners to be (1) more beneficial, (2) help concentration (Slater, 2012) and to (3) reduce anxiety (Fletcher-Watson & May, 2018) due to the sensory needs of autistic children. Furthermore, parents of NT children will view fidget toys as (4) more harmful (Schecter et al., 2017) and (5) more likely to cause a distraction (Hulsac et al., 2020) compared to parents of autistic children. Finally, parents will perceive fidget toys to be (6) more beneficial for children who have higher sensory seeking scores (van der Wurff et al., 2021).

Method

Participants

184 parents and carers of children aged between 3 and 16 were recruited via online platforms. Respondents ($n=55$) were excluded from the data analysis if they did not complete any questions beyond the demographics section (section A), if their child did not meet the age criteria of 3–16 years old, if their child had ADHD in addition to ASD (due to sensory needs being largely associated with ADHD) and finally, if they lived outside of the UK. The final sample included 129 respondents (76 respondents for NT children and 53 respondents for autistic children). Table 1 provides demographic information about the children that they reported about.

Materials

The survey was piloted amongst five parents and five professionals, participants were asked the following questions: (1) What they thought of the questions, (2) Whether the order made sense, (3) What questions they found difficult to answer and (4) Any question they had expected but were not asked. The responses to this pilot study informed and confirmed the research parameters were appropriate. The survey contained four sections: section A asked for demographic information about their child (e.g., child's date of

Table 1 Demographic information about the respondents' children

Group	Autistic ($n=53$)		NT ($n=76$)	
Total				
Child's gender	Female	Male	Female	Male
N %	15 (28%)	38 (72%)	38 (50%)	38 (50%)
Child's age (average years; SD)	9.85 (3.45)		8.76 (3.43)	
Children with additional diagnosis	19 (36%)		7 (9%)	
Child's type of schooling				
Mainstream	17	32%	66	87%
Mainstream with SEN	25	47%	9	12%
Special school	7	13%	0	0%
Other	4	8%	1	1%

Note: Other co-occuring conditions for the autistic group included anxiety, Tourette's syndrome, dyslexia, delayed speech, dyspraxia, asthma, hyperopia, Marfan's syndrome and 22q11.1 deletion syndrome

birth, gender, whether they were autistic or NT and type of schooling they attended). In section B respondents rated statements about the uses, benefits, and risks of fidget toys in general using a 5-point Likert scale (1 = definitely yes, 2 = yes, 3 = maybe, 4 = not very much, 5 = not at all). Respondents were then required to respond to the same statements but about the uses, benefits, and risks of fidget spinners for their child (see Online Resource 1 for the statements used). Section C included demographic questions about the respondent (e.g., relationship to child, geographical location). In the final section respondents completed the Child Sensory Profile questionnaire 2 (Dunn, 2014) which is designed to evaluate the sensory needs of children based on nine sections; auditory, visual, touch, movement, body position, oral, conduct, social emotional attention. Parent / carer responses were measured on a 6-point Likert scale against the sensory quadrants assigned to individuals based on the frequency of sensory behaviours occurring (0 = N/A, 1 = Almost never/10% or less (no quadrant), 2 = Occasionally/ 25% (registration), 3 = Half the time/ 50% (sensitivity), 4 = Frequently/ 75% (avoiding), 5 = Always/ 90% or more (seeking). The quadrants were calculated in accordance with the sensory profile manual.

Design and procedure

Ethical approval was obtained from Kingston University. Parents and carers were contacted through the distribution of a flyer which contained survey details via schools, social media sites and personal contacts. Respondents were required to access the survey using the URL link on the flyer. The survey was completed using Qualtrics. The online self-report survey contained open and closed ended questions. An information sheet which included details of the study was at the beginning of the survey. Respondents were made aware that the purpose of the study was to investigate the benefits and risks of fidget toy use. Participants signed an online consent form before answering any questions. At the end of each survey, participants were directed to a debrief sheet which thanked them for their participation and gave the contact details of the research team in case there were any further questions or if the participant wanted to withdraw their data from the study. The survey took approximately 20 min to complete.

Data Analysis

Statistical analysis of quantitative data was performed using the Statistical Package for Social Sciences software (SPSS). Chi-square tests were run to investigate the perspectives between parents of autistic children and parents of NT children. Cross-tabulations were produced to explore the proportions of participants' answers using a five-point Likert scale (1 = definitely yes, 2 = yes, 3 = maybe, 4 = not very much, 5 = not at all). Due to the small sample size, a Spearman's rho correlation was run to establish if there was a relationship between responses from parents about their child using a five-point Likert scale and the sensory seeking scores from the Sensory Profile questionnaire 2 (Dunn, 2014). The Likert scores were reversed for the correlational analyses to facilitate the interpretation of the results.

Results

Differences between the groups of respondents

Two groups of participants were examined; respondents of autistic children ($N = 53$) and those of NT children ($n = 76$). Comparisons of the child's gender revealed that there were more males in the autistic group than the NT group, $\chi^2(1) = 6.073$, $p = .018$. Age comparisons revealed no significant difference between the two groups of children that respondents completed the questions on, $t(127) = 1.771$, $p = .079$. Respondents were more likely to report that their child had additional diagnoses in the autistic group than the NT group, $\chi^2(1) = 13.769$, $p < .001$. The unstandardised residuals that were calculated for the type of schooling the children attended showed fewer NT children in a mainstream setting with SEN unit and more in mainstream education compared to the autistic group, $\chi^2(3) = 41.413$, $p < .001$.

In order to establish whether the children in both groups (autistic and NT) have a similar experience of fidget toy and fidget spinner use, respondents were asked to report whether they have used a fidget toy/spinner and the frequency of their child's use. As can be seen in Online Resource 2, there was no significant difference in whether they had used fidget toys in general, $\chi^2(1) = 1.985$, $p = .205$ or the use of fidget spinners $\chi^2(1) = 1.066$, $p = .302$ between the two groups. However, in terms of frequency and how often the toys were used, unstandardised residuals showed that the autistic group were less likely to never use fidget toys and the NT group were less likely to use it more than once aweek. This showed that autistic children used fidget toys more than NT children.

Benefits and risks related to fidget toys

A chi-square test of independence revealed that there was a significant association between having an autistic child and perceiving fidget toys to be more beneficial than having a NT child, $\chi^2(4) = 26.456$, $p < .001$. The cross tabulations in Table 2 reveal that a larger proportion of respondents for the autistic group responded with *'definitely yes'* in 15 out of 53 (28%) compared to 4 out of 76 (5%) for respondents in the

NT group. Overall, respondents in the NT group were more likely to respond that fidget toys were *'not at all'* (8%), *'not very much'* (20%) and *'maybe'* (26%) beneficial for their child.

There was also a significant group difference for perceiving fidget toys as helping with concentration; χ^2 (4) = 16.148, p = .003. Respondents in the autistic group were more likely to respond that *'yes'* (34%) and *'definitely yes'* (13%) to fidget toys aiding concentration in comparison to NT parents responding *'yes'* (14%) and *'definitely yes'* (1%).

There was a significant finding for anxiety responses, χ^2 (4) = 17.478, p = .002 with more respondents of autistic children reporting *'yes'* (32%) or '*definitely yes'* (30%) that fidget toys reduce anxiety for their child, in contrast to respondents of NT children with 13% reporting *'yes'* and 9% with *'definitely yes'*. Chi-square tests of independence revealed that no significance was observed for respondents of NT children viewing fidget toys as more harmful, causing more of a distraction or for being reported as fun than respondents of autistic children (see Table 2).

Table 2 Perspectives on the benefits and risks of fidget toys for the respondents' child

Group		Autistic *n* (%)	NT *n* (%)	Group difference
Fidget toys are beneficial for my child				χ^2 (4) = 26.456, p < .001.
	Definitely yes	15 (28%)	4 (5%)	
	Yes	21 (40%)	13 (17%)	
	Maybe	4 (8%)	20 (26%)	
	Not very much	5 (9%)	15 (20%)	
	Not at all	1 (2%)	6 (8%)	
Fidget toys help my child to concentrate on the task at hand				χ^2 (4) = 16.148, p = .003.
	Definitely yes	7 (13%)	1 (1%)	
	Yes	18 (34%)	11 (14%)	
	Maybe	10 (19%)	25 (33%)	
	Not very much	8 (15%)	7 (9%)	
	Not at all	5 (9%)	14 (18%)	
Fidget toys distract my child from the task at hand				χ^2 (4) = 4.635, p = .327.
	Definitely yes	1 (2%)	4 (5%)	
	Yes	3 (6%)	10 (13%)	
	Maybe	21 (40%)	20 (26%)	
	Not very much	9 (17%)	9 (12%)	
	Not at all	13 (25%)	15 (20%)	
Fidget toys reduce anxiety for my child				χ^2 (4) = 17.478, p = .002.
	Definitely yes	16 (30%)	7 (9%)	
	Yes	17 (32%)	10 (13%)	
	Maybe	10 (19%)	21 (28%)	
	Not very much	2 (4%)	9 (12%)	
	Not at all	3 (6%)	11 (14%)	
Fidget toys are harmful for my child				χ^2 (4) = 4.984, p = .289.
	Definitely yes	1 (2%)	0 (0%)	
	Yes	3 (6%)	1 (1%)	
	Maybe	4 (8%)	5 (7%)	
	Not very much	5 (9%)	13 (17%)	
	Not at all	35 (66%)	39 (51%)	
My child finds using a fidget toy fun				χ^2 (4) = 3.007, p = .557.
	Definitely yes	13 (25%)	17 (22%)	
	Yes	20 (38%)	30 (39%)	
	Maybe	6 (11%)	6 (8%)	
	Not very much	7 (13%)	4 (5%)	
	Not at all	0 (0%)	1 (1%)	

In the open-ended questions, respondents from both groups commented that fidget toys were used for positive purposes; the benefits of fidget toys included providing a good distraction and enabling concentration, keeping children calm, easing anxiousness and for sensory regulation. However, the risks of fidget toys were seen to cause too much of a distraction for the user and other children if they are used in a class setting. Respondents commented on their misuse and how they could provide health hazards such as choking.

Benefits and risks related to fidget spinners

A chi-square test of independence revealed that there was a significant association between having an autistic child and perceiving fidget spinners to be more beneficial than having a NT child, $\chi^2(4) = 12.376$, $p = .015$. The cross tabulations in Table 3 reveal that respondents for the autistic group were more likely to say *'definitely yes'* with 6 out of 53 (11%) responses compared to 2 out of 76 (3%) responses in the NT group. The autistic group was also more likely to say *'yes'* with 30% for the autistic group and only 9% for the NT group.

Respondents of NT children perceived fidget spinners to be more fun for their child than respondents of autistic children, $\chi^2(4) = 10.100$, $p = .039$. Similar to fidget toy analyses, there was a significant finding for fidget spinners reducing anxiety for the autistic group compared to the NT group, $\chi^2(4) = 17.157$, $p = .002$.

Chi-square tests of independence revealed that no significance was observed for the autistic group concerning fidget spinners helping concentration. There was also no significance found for respondents of NT children viewing fidget toys as more harmful or causing more of a distraction ($p > .1$). See Table 3 for all fidget spinner analyses.

Relationship between respondents' perceptions and children's sensory profiles

It was predicted that there would be a positive relationship between autistic children's sensory seeking scores and whether their respondents perceived fidget toys to be more beneficial, and similarly a positive relationship between sensory seeking scores and for fidget toys increasing concentration and reducing anxiety. A sub-sample of the respondents completed the Sensory Profile Questionnaire 2 (Dunn, 2014) for their child ($n = 37$ for autistic group and $n = 42$ for NT group). Autistic children had significantly higher sensory seeking scores ($M = 51.19$, $SD = 17.02$) compared to NT children ($M = 24.024$, $SD = 18.15$), $t(77) = 6.834$, $p < .001$.

In order to observe whether sensory processing difficulties impact on the use of fidget toys and fidget spinners as well as the views of the respondents, we examined if there were any differences in the children's sensory seeking score in relation to their fidget toy use in each group (autistic and NT). Autistic children who used a fidget toy ($n = 30$) did not have higher sensory seeking scores, compared to those who did not ($n = 7$), $F(1, 9.931) = 4.337$, $p = .064$. Similarly, there was no difference in sensory seeking score between the NT children who used a fidget toy ($n = 32$), compared to those who did not ($n = 10$), $t(40) = -0.942$, $p = .352$. For the fidget spinner, there was a difference in sensory seeking scores, $F(1,27.502) = 6.245$, $p = .019$ between autistic children who use a fidget spinner ($n = 14$) and those who do not ($n = 25$). This was not the case for the NT group, as children who used a fidget spinner ($n = 17$) did not differ from those who did not use a fidget spinner ($n = 25$) in their sensory seeking scores, $F(1, 24.722) = 1.965$, $p = .173$ (see Online Resource 3 for mean scores).

To examine whether parental agreement with the statements relating to fidget toys and spinners being beneficial, helping concentration and reducing anxiety for their child related to their child's sensory seeking scores, non-parametric spearman rho's one-tailed correlations were run for each group separately (see Table 4). First, correlations explored the statements about fidget toys for *my child* and the child's sensory seeking score. In the autistic group, there was a significant positive correlation between parents' rating of how beneficial fidget toys are and sensory seeking scores; the higher the sensory seeking score, the more parents agreed that fidget toys were beneficial, $r(36) = 0.398$, $p = .008$. For those with higher sensory seeking scores, respondents reported that fidget toys were less harmful; there was a significant negative correlation between harmful ratings and sensory seeking scores, $r(37) = -0.445$, $p = .003$. There was also a significant positive correlation between parents' agreement that fidget toys reduce anxiety and their child's sensory seeking score, $r(37) = 0.521$, $p = <.001$. The higher the sensory score, the more fidget toys were seen to reduce anxiety. All other correlations were not significant ($p > .05$).

Similar to the autistic group, in the NT group, there was a significant positive correlation between respondents' agreement that fidget toys are beneficial for their child and sensory seeking scores, $r(42) = 0.274$, $p = .040$; the higher the sensory seeking score, the more beneficial fidget toys were perceived to be. In addition, there was a significant positive correlation between the respondents' rating of how fidget toys help with concentration; the higher the child's sensory score, the more fidget toys were perceived to help with concentration, $r(42) = 0.411$, $p = .003$. All other correlations were not significant ($p > .05$).

With respect to perceptions of fidget spinners and sensory-seeking scores, non parametric spearman's rho correlations showed that for the autistic group, there was a significant positive correlation between beneficial ratings and sensory seeking scores; the more respondents agreed

Table 3 Perspectives on the benefits and risks of fidget spinners for the respondents' child

Group		Autistic *n* (%)	NT *n* (%)	Group difference
Fidget spinners are beneficial for my child				$\chi^2(4) = 12.376$, $p = .01$.
	Definitely yes	6 (11%)	2 (3%)	
	Yes	16 (30%)	7 (9%)	
	Maybe	7 (13%)	17 (22%)	
	Not very much	10 (19%)	19 (25%)	
	Not at all	9 (17%)	13 (17%)	
Fidget spinners help my child to concentrate on the task at hand				$\chi^2(4) = 8.749$, $p = .068$.
	Definitely yes	7 (13%)	1 (2%)	
	Yes	6 (11%)	5 (7%)	
	Maybe	15 (28%)	20 (26%)	
	Not very much	13 (25%)	15 (20%)	
	Not at all	7 (13%)	17 (22%)	
Fidget spinners distract my child from the task at hand				$\chi^2(4) = 1.289$, $p = .863$.
	Definitely yes	2 (4%)	5 (7%)	
	Yes	8 (15%)	9 (12%)	
	Maybe	18 (34%)	22 (29%)	
	Not very much	11 (21%)	10 (13%)	
	Not at all	9 (17%)	12 (16%)	
Fidget spinners reduce anxiety for my child				$\chi^2(4) = 17.157$, $p = .002$.
	Definitely yes	8 (15%)	4 (5%)	
	Yes	19 (36%)	8 (11%)	
	Maybe	10 (19%)	24 (32%)	
	Not very much	7 (13%)	7 (9%)	
	Not at all	4 (8%)	15 (20%)	
Fidget spinners are harmful for my child				$\chi^2(4) = 5.645$, $p = .130$.
	Definitely yes	0 (0%)	0 (0%)	
	Yes	2 (4%)	3 (4%)	
	Maybe	5 (9%)	8 (11%)	
	Not very much	6 (11%)	17 (22%)	
	Not at all	35 (66%)	39 (51%)	
My child finds using a fidget spinner fun				$\chi^2(4) = 10.100$, $p = .039$.
	Definitely yes	11 (21%)	14 (18%)	
	Yes	18 (34%)	30 (39%)	
	Maybe	11 (21%)	2 (3%)	
	Not very much	6 (11%)	7 (9%)	
	Not at all	2 (4%)	5 (7%)	

with the statement that fidget spinners are beneficial for the child, the higher their child's sensory seeking score, $r(37) = 0.282$, $p = .045$. There was also a significant negative correlation for sensory seeking scores and how much parents agreed that fidget spinners are distracting, the higher the sensory seeking score, the less distracting they were perceived to be for their child, $r(37) = -0.283$, $p = .045$. All other correlations were not significant ($p > .05$). Whilst in the NT group there was only one significant positive correlation for the child's sensory seeking score and concentration; respondents who agreed more that fidget spinners can help their child concentrate, had a child with a higher sensory seeking score, $r(42) = 0.269$, $p = .042$.

Discussion

The primary purpose of the current study was to examine the benefits and risks of fidget toys and fidget spinners from the perspectives of parents and carers of autistic children compared to NT children and examined for the first time how parental views might relate to the children's sensory-seeking

Table 4 Spearman rho correlations for parental views about fidget toys / fidget spinners and sensory seeking scores in autistic and neurotypical children

Group	Autistic		NT	
Statements	Fidget toys (*r* value)	Fidget spinners (*r* value)	Fidget toys (*r* value)	Fidget spinners (*r* value)
Beneficial	0.398 **	0.282 *	0.274*	0.211
Concentration	0.247	0.188	0.411**	0.269*
Distraction	−0.114	−0.283 *	−0.138	−0.163
Anxiety	0.521 **	0.196	0.237	0.214
Harmful	−0.445 **	−0.148	0.234	−0.128
Fun	0.247	−0.149	0.089	0.020

* $p < .05$, ** $p < .01$

profile. Findings of this study demonstrated that parents of autistic children perceived fidget toys and fidget spinners to be generally more beneficial than NT parents, especially in relation to reducing anxiety. They perceived fidget toys to improve concentration more than parents of NT children. Higher sensory-seeking scores in autistic children were associated with greater parental agreement for fidget toys and fidget spinners being beneficial, for fidget toys reducing anxiety and being less harmful, and for fidget spinners being less distracting, whilst higher sensory scores in NT children were associated with better concentration. The current study shows that the perceived benefits of fidget toys depends on the sensory processing style of the child as well as the type of sensory toy involved, which suggests that these individual differences need to be taken into account in school policies.

As expected, parents of autistic children perceived fidget toys and fidget spinners to be more beneficial in comparison to NT children. This finding corroborates previous research suggesting that autistic children display difficulties with sensory processing and often seek ways to stimulate their needs (Ashburner et al., 2008). Fidget toys have therefore been offered to regulate the sensory needs of individuals who need to expend energy or control impulses (Thompson & Raisor, 2013). While previous studies found that fidget toys can improve concentration (Slater et al., 2012; Stalvey & Brassell, 2006) and fidget spinners can negatively impact mathematical ability (Hulac et al., 2020) and memory (Soares & Storm, 2019) for NT children, no research to date has examined how fidget toys can benefit autistic individuals. The current study evidenced that fidget toys are perceived to help autistic children to concentrate; this is because their heightened sensory needs are accommodated, allowing them to focus on tasks. However, there was no difference between parents of autistic and NT children with regards of viewing fidget spinners to help with concentration. This could be due to the fact that manipulating a fidget spinner requires fine motor skills and cognitive ability which again might benefit some individuals but not all (Cohen et al., 2018). Therefore, the use of fidget spinners could be cognitively taxing when children are required to pay attention to a task. Open-ended responses by parents of NT children revealed that fidget spinners are generally considered as fad toys and fashionable items. This contrasts with the opinions of parents of autistic children in open-ended responses who acknowledged that fidget spinners could benefit those with sensory needs. However, the plethora of benefits seen by parents of autistic children for the use of fidget toys in general were not endorsed for fidget spinner use.

In regards to anxiety, our results indicate that parents of autistic children consider fidget toys and fidget spinners to reduce anxiety for their child more than parents of NT children. The current findings support the existing literature that autistic individuals are more likely to have anxiety and the use of fidget toys can help manage this (Hulac et al., 2020; Wood et al., 2020). Previous studies such as Da Câmara et al. (2018) found that NT children aged six to 11, choose a particular fidget toy to suit their emotional needs. For example, when a child is angry, they prefer a toy that they can squeeze. One parent in the autistic group commented that fidget spinners can be beneficial for children who like spinning things. So, although Da Câmara et al.'s (2018) study was not with autistic children, it could support the idea that the characteristics of fidget spinners could provide benefits such as satisfying anxious feelings for autistic children.

Similarly to the findings in the open-ended questions by parents of NT children, fidget spinners have been previously regarded as fad toys. Indeed, our findings also show that NT parents provide their children with fidget toys for enjoyment instead of for sensory needs.Yet, our correlational evidence suggests that parents of NT children who had higher sensory seeking profiles also perceived fidget toys to help with concentration.

There was no evidence to suggest that fidget toys or spinners were perceived to be harmful. A possible explanation for this is that the term 'harmful' could be considered to have different meanings across the participant population. It could be interpreted that fidget spinners are harmful to children's educational outcomes in terms of their potential to distract (Soares & Storm, 2019) rather than physical health risks (Reeves et al., 2018).

With the inclusion of sensory-seeking scores, we could ascertain that higher sensory-seeking scores in autistic children were associated with greater parental agreement for fidget toys and spinners being beneficial, for fidget spinners being less distracting, for fidget toys as reducing anxiety and being less harmful. Higher sensory-seeking scores in NT children were also associated with greater agreement that fidget toys were beneficial and for both fidget toys and spinners increasing concentration. These findings imply that the

use of a fidget toy and spinner can satisfy sensory needs of individuals who are sensory-seeking and therefore, require additional stimulation (Ashburner et al., 2008), whether they have a diagnosis or not.

Limitations and Future Research

The current study sheds light on an area that requires more empirical research in order to eradicate the negative assumptions of fidget toy use which could potentially meet the needs of individuals with sensory processing difficulties who benefit from sensory-based intervention (Barton et al., 2015). Although the findings advance our understanding of fidget toy use, limitations were identified. The heterogeneity of the autistic population makes it difficult to generalise the findings to deduce that fidget toys will be beneficial for all autistic children. Our study showed that the benefits of sensory toys relate to the sensory-seeking profile of the autistic individual. However, other cognitive aspects could also play a role in whether fidget toys provide any benefits (i.e., overall intellectual abilities or working memory abilities). Much of the research surrounding fidget toy/ spinner use takes place within clinical or educational settings, this could explain why there is limited research detailing parental perceptions. Although our study is the first to examine parental perceptions, parents might not observe the use of fidget toys at home as a focus tool in comparison to the school environment where students are given fidget toys to help complete tasks. In addition, Schecter et al. (2017) pointed out that some schools have banned the use of fidget spinners due to the scientifically unfounded nature of their perceived benefits. It is thus possible that parental perceptions might be influenced by their child's school policy and what has been reported in the media. As such, questions relating to concentration and distraction could be unreliable because children might not be required to concentrate in the home as much as in school and parents might not be as reliable when it comes to observing the benefits of fidget toys and spinners. Still, it is important to examine parental views as parents are key stakeholders in a child's development and learning and a family-centred approach to education is vital for the success of autistic students (Hagner et al., 2012).

Future research should directly observe the use of fidget toys and spinners during cognitive tasks in order to assess whether they positively impact academic progress. It would also be advantageous to gain the opinions of autistic children to find out why and when they would choose to use a fidget toy and how it satisfies their needs. Younger children are exposed to learning through play (Ailwood, 2003) so they are receiving ways to self-regulate. It would therefore be interesting to identify whether older children are more in need of fidget toys because they are not readily available during their learning experiences. Furthermore, future studies could examine a child's severity of autism and whether they are sensory seeking and benefit from fidget toy use.

Implications

The findings from the current study highlight the importance of taking an individual-centred approach to the benefits and use of fidget toys in that all children with higher sensory seeking behaviours might benefit from fidget toys, but especially autistic children and that the type of fidget toy may serve different functions, with fidget spinners helping to reduce anxiety whilst other fidget toys might be better to aid concentration. This finding stresses the importance of reducing the misconception that fidgeting will generally cause a lack of focus (Pine et al., 2007). This is important as previous beliefs and misconceptions could affect whether parents and professionals allow the use of fidget toys but also impact on the child's choice to use them to satisfy their sensory needs. In Da Câmara et al.'s (2018) study, children chose fidget items that they thought parents and teachers would approve of, such as items that did not look like toys and were accessible within the classroom or at home (pencils, rubbers and hair ties). Seeing that fidget toys have a number of benefits, especially for those with sensory seeking profiles, access to fidget toys would be advantageous for social and emotional purposes (Fletcher-Watson & May, 2018) as well as for successful learning inside and outside of the classroom environment (Blair & Diamond, 2008).

Conclusion

This study was the first of its kind in gaining parental perspectives on fidget toy and fidget spinner use for autistic and NT children. It contributes to the insufficient literature surrounding the effectiveness of sensory tools to support individuals with a sensory seeking profile. It encourages parents and professionals to consider the beneficial consequences of fidget toy use, guided by individuals' sensory profiles in order to implement the correct interventions and reconsider school policies that ban the use of fidget toys.

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Authors contribution EB and JVH conceived the study, responsible for the study design, data analysis, data interpretation and drafting/reviewing the manuscript. MR participated in the study design, in data collection, data interpretation and drafting the manuscript. All authors read and approved the final manuscript.

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Data availability The dataset generated and analysed for the current study are not publicly available as permission from participants was not obtained.

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

Ethical approval Approval was obtained from the ethics committee of the Faculty of Business and Social Sciences, Kingston University. The procedures used in this study adhere to the tenets of the Declaration of Helsinki and the British Psychological Society's Code of Ethics and conduct.

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