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Functioning and participation problems of students with ASD in higher education: which reasonable accommodations are effective?

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ABSTRACT

Students with autism spectrum disorder (ASD) experience various functioning and participation problems in higher education, which may cause difficulties such as drop out or low grade point averages. However, it remains unclear how often and during which teaching and evaluation methods the functioning and participation problems occur and which reasonable accommodations are effective in dealing with them. These gaps in the literature are addressed in this survey-based study. In total, 43 students with ASD, 30 student counsellors and 43 students without a disability of institutions of higher education in Flanders (Belgium) participated in the study. The results show that students with ASD most frequently experience problems with verbal and non-verbal communication, are oversensitive to change and have difficulty distinguishing the gist of the syllabus from the details. Furthermore, it is shown that, on average, these problems arise mostly during classical teaching and evaluation methods. Finally, the perceived effectiveness of reasonable accommodations is dependent on the functioning and participation problem experienced by the student with ASD in higher education. In conclusion, both personal and environmental characteristics should be taken into account when selecting and implementing reasonable accommodations for these students.

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Functioning; participation; reasonable accommodations; ASD; higher education

Background

Autism spectrum disorder (ASD) is a neurodevelopmental disorder, defined by persistent deficits in social communication and social interaction, and restricted, repetitive patterns of behaviour, interests or activities (APA 2013). Research previously showed that ASD is a persistent disorder, meaning that children who receive an ASD-diagnosis have a large chance of still meeting the criteria for ASD in adulthood (e.g. Billstedt, Carina Gillberg, and Gillberg 2007). However, because of the developmental trajectory of ASD, the two core symptoms of ASD may be experienced differently by children, adolescents and adults (Seltzer et al. 2003). In addition, there is a large heterogeneity of symptoms experienced by individuals

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with ASD due to the genetic, neurobiological and phenotypic differences between these individuals (Jeste and Geschwind 2014). As a result of the heterogeneity and the evolution of symptoms, problems can differ considerably between individuals with ASD, and may also vary between different stages of life and in different settings (e.g. home, school or leisure time). Therefore, it is important for research to map the symptoms and interpersonal variability of ASD in each stage of life and across different settings.

One of the domains that remained understudied is education for students with ASD in higher education. Nonetheless, this research is warranted because there is an increased number of students with ASD enrolling in higher education (e.g. VanBergeijk, Klin, and Volkmar 2008). Shattuck et al. (2012) already showed that approximately 35% of the individuals with ASD were enrolling in higher education. Additionally, the 2014 annual report of the University of Leuven suggested that the number of students with a psychiatric disability attending higher education was increased by 6% compared to 2013 (University of Leuven 2014). Students with a psychiatric disorder, including students with ASD, are one of the largest groups of students with a disability attending higher education in this university (University of Leuven 2014). Despite the increase in enrolment in higher education, these students with ASD have a larger chance of repeating courses or dropping out of higher education without a degree in comparison to their typically developing peers (e.g. White, Ollendick, and Bray 2011). In order to decrease the academic failure of students with ASD in higher education, institutions are obligated to implement reasonable accommodations (UN Convention 2006). Reasonable accommodations should increase the participation chances of these students. Harrison and colleagues defined reasonable accommodations as

> changes to practices in schools that hold a student to the same standard as students without disabilities but provide more benefit to students with a disability (i.e. differential boost) to mediate the impact of the disability on access to the general education curriculum. (Harrison et al. 2013, 6)

However, there are no regulations or guidelines available regarding which accommodations should be offered and how they should be implemented (Smith 2007). Kettler (2012) previously mentioned that, before selecting and implementing effective reasonable accommodations, both the personal characteristics of the students with a disability, including ASD-specific behaviour, and environmental characteristics of the institutions of higher education should be investigated.

Firstly, the personal characteristics of students with ASD, namely the functioning and participation problems these students experience in higher education, have been investigated only minimally. One recent study by Jansen et al. (forthcoming)mapped the functioning and participation problems of students with ASD using the International Classification of Functioning, Disability and Health (ICF; WHO 2001). This study showed that the functioning and participation problems experienced by students with ASD are present in different domains of functioning (see Figure 1). Firstly, students with ASD may experience problems with executive functioning, such as planning and organising and cognitive flexibility (Berger et al. 2003; Jansen et al., forthcoming; Olu-Lafe, Liederman, and Tager-Flusberg 2014). Secondly, problems with verbal and non-verbal communication and learning strategies were mentioned (Jansen et al., forthcoming; Zürcher et al. 2013). Thirdly, students with ASD can face problems with social relationships and social interaction (Berger et al. 2003; Orsmond et al. 2013). Finally, other sets of problems of students with ASD include stereotypical movements, sensitivity to change and problems with handling stress (Jansen et al., forthcoming).

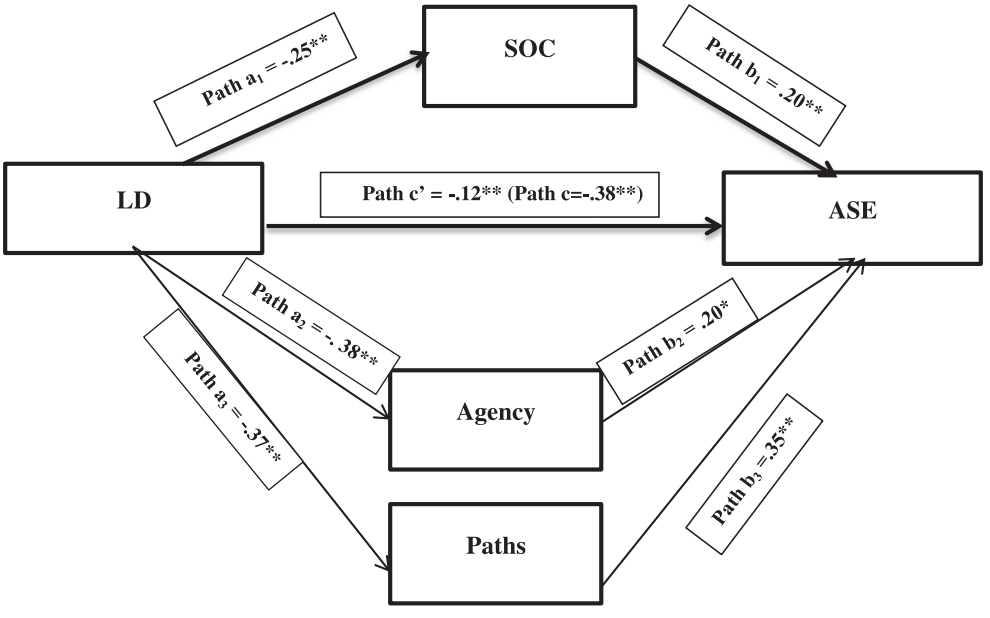

Figure 1. Direct and Indirect effect of LD on ASE through SOC, Agency, Paths (beta scores).
Note. ASE=Academic Self-Efficacy; LD=learning disabilities; SOC=Sense of Coherence. *$p < .05$; **$p < .01$.

By using the ICF framework, Jansen et al. (forthcoming) emphasised the importance of environmental factors when investigating the functioning and participation problems of students with ASD. These environmental factors, for example, addressed through reasonable accommodations, interact with the personal characteristics, such as the experienced functioning and participation problems (Jansen et al., forthcoming; Kettler 2012). In accordance with these results, teaching and evaluation methods may also interact with the effectiveness of reasonable accommodations and have a direct impact on students with ASD in higher education. Other environmental characteristics, such as the availability of classrooms for taking the exams in smaller than usual groups or the number of supervisors available for reading aloud or staying during the extended examination duration, are less important for the individual students with ASD and have a more indirect link to the encountered functioning and participation problems.

As stated before, it is important to gain insight into both the personal characteristics (i.e. functioning and participation problems) of students with ASD and the environmental characteristics (i.e. teaching and evaluation methods) of the institution of higher education. However, it remains unclear how often the functioning and participation problems (Jansen et al., forthcoming) occur and during which teaching and evaluation methods they emerge most. These gaps in literature will be addressed. Knowledge regarding functioning and participation problems offers insight into which reasonable accommodations are most effective for students with ASD in higher education. At this point, it remains unclear how institutions of higher education could support students with ASD in which reasonable accommodations should be offered to these students (Barnhill 2016). By also addressing this issue, this study will add value to existing research (Gelbar, Smith, and Reichow 2014). Previous research that studied the effectiveness of reasonable accommodations mostly included students with

ASD in a larger group of students with a disability. Therefore, the results were not ASD specific and could not be generalised for this specific group. Nevertheless, recent qualitative studies with interviews and focus groups did demonstrate that students with ASD experience a need for reasonable accommodations and that these accommodations could have a positive effect on the experienced functioning and participation problems and the academic success of the students (Jansen et al., forthcoming; Van Hees, Moyson, and Roeyers 2015). However, a large-scale empirical study has not yet been conducted.

With this study we wanted to tackle the gaps in the literature with respect to students with ASD in higher education and so the following research questions were examined: (1) How frequently did the identified functioning and participation problems occur for students with ASD in higher education?, (2) During which teaching and evaluation methods did these problems emerge? and (3) Which reasonable accommodations were perceived to be effective in dealing with the experienced functioning and participation problems?

Method

Participants

Three groups of participants were recruited for this study, namely students with ASD, typically developing controls (TDC) and student counsellors. Students with ASD were included to answer the three research questions based on their own experience. To examine whether the functioning and participation problems identified for students with ASD are in fact specific for included students with ASD (i.e. research question 1), TDC were recruited. Finally, student counsellors were enrolled because of their experience with a variety of students with ASD. Student counsellors are professionals who work in an institution of higher education and support students with a disability in general, and students with ASD in particular with different problems such as planning and organising problems, test anxiety or communication problems. The counsellors were asked to give a general insight into the most common functioning and participation problems of student with ASD in their institution of higher education in order to investigate whether the self-reported specific problems of the students with ASD correspond to the general insight of the student counsellors (i.e. research question 1).

To be eligible to participate in the study, students with ASD had to be (1) enrolled in an institution of higher education in Flanders, Belgium, (2) currently offered reasonable accommodations, and (3) diagnosed with ASD by a psychiatrist or a multidisciplinary team. Student counsellors read the diagnostic report and verified if all criteria described in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA 2013) were present for the specific student with ASD in higher education before reasonable accommodations were offered. TDC could participate in the survey if they (1) were enrolled in an institution of higher education in Flanders, Belgium, and (2) had no known disability. Finally, student counsellors were eligible to participate when they (1) were working as a student counsellor in an institution of higher education in Flanders, Belgium and (2) were emotionally and practically supporting students with ASD as a part of their job as student counsellor, for example, by organising workshops with respect to stress and anxiety, or by helping students plan their study time.

Based on these inclusion criteria, 43 students with ASD, 30 student counsellors and 250 students without a disability were eligible to participate in this study. Forty-three out of 250 students without a disability were individually matched to the 43 participating students with ASD based on three characteristics, namely gender, the number of years enrolled in higher education and their enrolment in a specific educational programme group (i.e. (1) Humanities and Social Sciences, (2) Science, Engineering, and Technology, and (3) Biomedical Sciences). Firstly, with 16 female students in both groups (37.2%), the participants were predominantly male ($\chi^2(1) = 0.00$, $p > 0.05$). Secondly, all students were enrolled in higher education for about three years (ASD: $M = 3.14$, SD = 1.66; without a disability: $M = 3.02$, SD = 1.58; $t(84) = 0.33$, $p > 0.05$). Thirdly, most students were enrolled in the Humanities and Social Sciences group (ASD: $n = 26$, 60.5%; without a disability: $n = 27$, 62.8%) and the Science, Engineering and Technology group (ASD: $n = 15$, 34.9%; without a disability: $n = 13$, 30.2%; $\chi^2(2) = 0.36$, $p > 0.05$). Initially, the aim was to match the students based on their enrolment in either a professional or an academic educational programme. Results showed that significantly more students with ASD were enrolled in an academic educational programme ($n = 22$, 51.2%) than students without a disability ($n = 9$, 20.9%; $\chi^2(1) = 8.52$, $p < 0.01$) and thus matching the two groups was not possible.

Furthermore, no other significant differences were found when comparing the two groups of students. On average, all students were enrolled in the second year of the bachelor programme (ASD: $M = 2.14$, SD = 1.19; without a disability: $M = 2.35$, SD = 0.92; $t(84) = 0.91$, $p > 0.05$) and in their current institution of higher education for approximately two to three years (ASD: $M = 2.67$, SD = 1.64; without a disability: $M = 2.37$, SD = 1.20; $t(84) = 0.98$, $p > 0.05$).

When looking at the demographic characteristics of the student counsellors, it became clear that the participating counsellors were mainly female ($n = 25$, 83.3%) and had between 1 and 22 years of experience as a student counsellor ($M = 10.20$, SD = 6.98). Finally, most student counsellors were employed in different university colleges ($n = 29$; 96.7%), while only one student counsellor was working at a university (3.3%).

Procedure

Student counsellors of seven different institutions of higher education in Flanders (Belgium) received an information letter by email explaining the design and goals of the study and an invitation to participate. This information letter was forwarded by the student counsellors to students with ASD, who were registered as a student with a disability, and to TDC in their institution of higher education. Additionally, students were also recruited during lectures and via social media. An informed consent invitation to participate was sent to students with ASD, TDC and student counsellors who expressed their interest in participating towards the researcher. The participants were asked to read and sign this document if they agreed to participate in the study. The study was approved by the ethical committee of the department of Applied Psychology, Thomas More University College.

Measures

A self-constructed questionnaire, administered online using Qualtrics software, was used to answer the research questions. On average, it took about one hour to complete the questionnaire for students with ASD and about 20 minutes for student counsellors and TDC.

Functional and participation problems

A previous literature review by Jansen et al. (forthcoming) revealed 11 different functioning and participation problems students with ASD can encounter in higher education. Participating students with ASD and students without a disability were asked if they experienced these 11 functioning and participation problems (e.g. 'I experience problems with verbal and nonverbal communication') in order to rate how frequently reported functioning and participation problems occur within both groups of students. Here, a yes-or-no answer was required. In addition, student counsellors had to rate the most common functioning and participation problems (e.g. 'Students with ASD experience problems with verbal and nonverbal communication') of students with ASD enrolled in their institution of higher education on a scale from 1 (totally not present) to 10 (always present). If the answer was equal to or larger than 5, the answer was considered to be a 'yes'-answer. The frequency was calculated based on these yes-answers.

Teaching and evaluation methods

When students with ASD had given a 'Yes'-answer and thus reported a specific problem in higher education, they were asked during which teaching and evaluation methods this problem usually occurs (e.g. 'During which types of teaching and evaluation methods do you experience this problem with verbal and nonverbal communication?'). The students were given 14 different teaching and evaluation methods, which were described in the European Credit Transfer System (ECTS), for example, a lecture, a multiple choice exam or writing a paper. An overview of these methods can be found in the results section (Table 3). The student with ASD had to tick off during which types of methods these problems emerged for each experienced functioning and participation problem. It was possible to tick off multiple methods.

Effective reasonable accommodations

Based on a literature study, reasonable accommodations were predetermined (e.g. Harrison et al. 2013; Kettler 2012). However, because the scarcity of literature regarding reasonable accommodations for students with ASD, a panel of six academic and professional experts were invited to supplement the list of reasonable accommodations available for students with ASD on the one hand and to appoint the specific reasonable accommodations to particular functioning and participation problems on the other hand. The accommodations were appointed to the specific problems by taking into account the specific objective of each reasonable accommodation. For example, the problem 'difficulty handling stress' was linked to the following reasonable accommodations: exam deferral (i.e. to reduce their stress level during the exam period), taking the exam in smaller than usual groups and extended examination duration (i.e. to reduce the stress during the exam itself).

Students with ASD received the experienced functioning and participation problems combined with the list of reasonable accommodations. Firstly, students had to indicate whether they effectively used the reasonable accommodation in higher education (e.g. 'Was exam deferral offered to you to deal with your difficulty handling stress?'). Secondly, students with ASD had to rate the experienced (when the reasonable accommodations was offered to them) or the expected (when they were not using the accommodation) effectiveness on a 5-point Likert scale (1 – very ineffective to 5 – very effective). In order to avoid a low sample size and to guarantee a reliable image for students with ASD, reasonable accommodations

were perceived to be effective, and therefore listed in the results section, if (1) they had an overall score of 3 out of 5, and if (2) 3 or more students with ASD rated the experienced effectiveness (and thus used the reasonable accommodation).

Analyses

Descriptive statistics

In order to analyse the occurrence of the functioning and participation problems (i.e. research question 1) and the perceived effectiveness of the reasonable accommodations (i.e. research question 3), descriptive statistics, namely frequencies, ranges, means and standard deviations, were used. Additionally, to compare the data from the students with ASD to the data of students without a disability and the students counsellors (i.e. research question 1), chi square statistics were used. This comparison was made to explore inter-informant differences and to examine whether the functioning and participation problems are ASD-specific or if they occur in a general population of students in higher education.

Two-mode partitioning

The probability with which the functioning and participation problems occurred during the different teaching and evaluation methods was examined by a two-mode partitioning (Schepers and Hofmans 2009; Schepers, van Mechelen, and Ceulemans 2006). Since both variables consisted of a large number of items, this statistic was used to reduce the number of functioning and participation problems and the number of teaching and evaluation methods by simultaneously grouping them into different clusters. If two functioning and participation problems are equally likely to emerge during the same teaching and evaluation methods, these problems are assigned to the same cluster. Correspondingly, two teaching and evaluation methods were clustered together if different functioning and participation problems are emerging to a similar extent.

Because the number of clusters in the solution had not been determined previously, the CHull procedure was used, meaning that the best fitting model was selected based on its interpretability and the goodness-of-fit versus the complexity balance (Ceulemans and Kiers 2006; Schepers, Ceulemans, and Van Mechelen 2008). When this model was selected, the two-mode partitioning yields a core matrix. In this core matrix, the strength of the relationship between each cluster of functioning and participation problems and each cluster of teaching and evaluation methods is represented. No rule of thumb has been described in literature with regard to the interpretation of these core values. Here it was decided to interpret these values in terms of probabilities, meaning that, if the core value is 0.65, students with ASD have a 65 per cent chance of experiencing a specific cluster of functioning and participation problems during a specific cluster of teaching and evaluation methods.

Results

Functional and participation problems

The results regarding the frequency of experienced functional and participation problems are shown in Table 1.

Table 1. Functional and participation problems of students with and without ASD according to the students and student counsellors.

	Students with ASD		Students without ASD		Student counsellors	
	N	%	*N*	%	*N*	%
Problems with verbal and non-verbal communication	29	67.4	8	18.6	22	73.3
Oversensitivity to change	29	67.4	7	16.3	22	73.3
Problems distinguishing gist from detail	29	67.4	12	27.9	16	53.3
Problems planning and organising[a]	26	61.9	18	41.9	22	73.3
Problems with global information processing	25	58.1	8	18.6	18	60.0
Problems with social interaction	23	53.5	8	18.6	22	73.3
Problems handling stress	22	53.7	11	25.6	20	66.7
Problems with cognitive flexibility	20	46.5	3	7.0	19	63.3
Problems directing and shifting attention	16	38.1	5	11.6	12	40.0
Problems applying learning strategies[a]	12	29.3	9	20.9	14	46.7
Stereotypical, repetitive movements[a]	9	20.9	8	18.6	6	20.0

[a]Non-significant difference between students with and without ASD ($p > 0.05$).

Two-third of the participating students with ASD mentioned problems with verbal and non-verbal communication, sensitivity to change and problems distinguishing the gist of the syllabus from the detail. When comparing the results of these students with ASD to the answers of student counsellors, no significant differences were found (all: $\chi^2(1) > 0.01$, $p > 0.05$). Finally, when looking at the results of students without a disability, results showed that these students experienced all functioning and participation problems significantly less frequently compared to students with ASD, except for problems with planning and organising ($\chi^2(1) = 3.42, p < 0.05$), problems applying learning strategies ($\chi^2(1) = 0.78, p < 0.05$) and experiencing stereotypical, repetitive movements ($\chi^2(1) = 0.787, p < 0.05$). This indicates that these three functioning and participation problems occurred to the same extent in both groups of students.

Functional and participation problems during teaching and evaluation methods

The two-mode partitioning resulted in a model with three clusters of functioning and participation problems (Table 2) and five clusters of teaching and evaluation methods (Table 3). This 3 × 5 model accounted for 66.59% of the variance in how often specific functioning and participation problems occurred during particular teaching and evaluation methods.

Table 4 shows the core values that display the chance of occurrence of each cluster of functioning and participation problems during each cluster of teaching and evaluation methods.

Table 2. Clusters of functional and participation problems.

Cluster 1	Cluster 2	Cluster 3
Social interaction and communication	Inefficient study skills	Coping skills and behaviour
Problems with verbal and non-verbal communication	Problems distinguishing gist from detail	Problems handling stress
Problems with social interaction	Problems with global information processing	Problems planning and organising
Problems with cognitive flexibility	Problems directing and shifting attention	Stereotypical, repetitive movements
Oversensitivity to change	Problems applying learning strategies	

Table 3. Clusters of ECTS teaching and evaluation methods.

Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Classical teaching methods	Activating teaching methods	Classical evaluation methods	Alternative evaluation methods	Activating evaluation methods
Lecture	Excursion	Closed book exam	Multiple choice exam	Self or peer evaluation
Practical	Internship	Writing a paper Oral exam	Open book exam Practical exam Bachelor or master thesis Portfolio	Process evaluation

Table 4. Core values of the two-mode partitioning displaying the chance of occurrence of each cluster of functioning and participation problems during each cluster of teaching and evaluation methods.

	Classical teaching methods	Activating teaching methods	Classical evaluation methods	Alternative evaluation methods	Activating evaluation methods
Social interaction and communication	0.46	0.41	0.22	0.18	0.22
Inefficient study skills	0.61	0.18	0.53	0.35	0.13
Coping skills and behaviour	0.42	0.37	0.59	0.43	0.22

Firstly, the results show that the chances of experiencing social interaction and communication problems are highest during classical and activating teaching methods (probabilities, respectively, 0.46 and 0.41). The probability of encountering social interaction and social communication problems during the three clusters of evaluation methods (probability between 0.22 and 0.18) is lower. Secondly, when looking at the inefficient study skills, it became clear that students with ASD have a high chance of experiencing these problems during classical teaching and evaluation methods (probability of 0.61 and 0.53). The students mentioned lower chances of experiencing these problems during alternative evaluation methods and activating teaching and evaluation methods (probability between 0.35 and 0.13). Finally, it was shown that students with ASD have a high chance of experiencing problems with coping skills and behaviour during classical evaluation methods (probability of 0.59), alternative evaluation methods (probability of 0.43) and classical teaching methods

(probability of 0.42), while the chances of experiencing coping problems are low during activating teaching and evaluation methods (probability respectively 0.37 and 0.22).

Effective reasonable accommodations

The perceived effective reasonable accommodations (i.e. if the reasonable accommodation had a score of three or more out of five according to students with ASD who used the reasonable accommodation) for each functional and participation problem were listed in Table 5. For two functioning and participation problems, namely problems with verbal and non-verbal communication and problems with social interaction, no effective reasonable accommodations were found and therefore were not included in Table 5.

With respect to the cluster 'social interaction and social communication', extended examination duration was reported as most effective for students with ASD in higher education experiencing problems with cognitive flexibility, while students with ASD who are oversensitive to change perceived the reasonable accommodation 'receiving the schedule of an excursion in advance' as most effective. When looking at the cluster 'inefficient study skills', students with ASD mentioned that 'extended examination duration' was effective in dealing with all four functioning and participation problems of this cluster. Finally, when looking at the cluster 'coping skills and behavior', exam deferral was perceived as the most effective reasonable accommodation to deal with problems with handling stress and planning and organising according to students with ASD in higher education. Additionally, taking the exam in smaller than usual groups was mentioned as the only effective reasonable accommodation when dealing with stereotypical, repetitive movements. Other reasonable accommodations which were perceived as effective for specific functioning and participation problems can be found in Table 5.

The results also indicated that the experienced effectiveness of reasonable accommodations according to students with ASD who did not use the reasonable accommodation but did experience the specific functioning and participation problem was typically lower than the perceived effectiveness of reasonable accommodations reported by students with ASD who did use the reasonable accommodation. Significant differences were marked in Table 5 using an asterisk (*).

Discussion

Previous literature already stated that students with ASD are in need of reasonable accommodations in order to provide equal participation chances in higher education for these students (Jansen et al., forthcoming; Van Hees, Moyson, and Roeyers 2015). Before being able to select and implement effective reasonable accommodations, it is important to have insight into both the personal characteristics (i.e. functioning and participation problems) of students with ASD and the environmental characteristics (i.e. teaching and evaluation methods) of the institutions of higher education. With this study we wanted to add to existing insights by examining following research questions: (1) How frequently did the identified functioning and participation problems occur for students with ASD in higher education?, (2) During which teaching and evaluation methods did these problems emerge?, and (3) Which reasonable accommodations were perceived to be effective to deal with the experienced functioning and participation problems?

Table 5. Effective reasonable accommodations for the functional and participation problems within each cluster.

		n used (%)	*M* (SD)[a]	Range	M (SD)[b]
Social interaction and communication					
Problems with cognitive flexibility	Extended examination duration	16 (80.0)	3.88 (0.96)	2–5	2.50 (1.92)*
	Extended time for tasks	4 (20.0)	3.75 (0.50)	3–4	3.06 (1.65)
Oversensitivity to change	Planning of excursion in advance	9 (32.1)	3.89 (0.78)	3–5	3.05 (1.47)
	Not staying the night at an excursion	3 (10.7)	3.33 (1.53)	2–5	2.16 (1.34)
	Designated seating in exam room	5 (17.9)	3.00 (1.58)	1–5	2.43 (1.27)
	Picture overview of tutors	3 (10.7)	3.00 (1.00)	2–4	1.92 (1.08)**
Inefficient study skills					
Problems distinguishing gist from detail	Extended examination duration	21 (72.4)	3.62 (1.24)	1–5	3.00 (1.60)
	Extended time for tasks	3 (10.3)	3.00 (1.73)	2–5	2.81 (1.33)*
Problems with global information processing	Extended time for tasks	7 (28.0)	3.86 (1.07)	2–5	2.61 (1.29)
	Extended examination duration	19 (76.0)	3.79 (1.08)	2–5	2.17 (0.98)*
Problems directing and shifting attention	Extended examination duration	14 (93.3)	3.71 (1.27)	1–5	1.00 (/)
	Exam deferral	5 (33.3)	3.60 (1.52)	1–5	2.50 (1.51)
	Taking the exam in smaller groups	8 (53.3)	3.50 (1.41)	1–5	2.14 (1.35)
	Reading exam questions aloud	3 (20.0)	3.33 (1.16)	2–4	1.67 (0.99)
Problems applying learning strategies	Extended examination duration	12 (100.0)	3.42 (1.56)	1–5	/
	Exam deferral	4 (33.3)	3.25 (1.71)	1–5	2.75 (1.28)
Coping skills and behaviour					
Problems handling stress	Exam deferral	7 (31.8)	4.29 (0.76)	3–5	3.33 (1.63)
	Taking the exam in smaller groups	6 (27.3)	4.33 (0.82)	3–5	2.44 (1.55)
	Extended examination duration	14 (63.6)	4.14 (1.10)	1–5	3.00 (1.77)
	Alternative exam format	3 (13.3)	3.00 (0.00)	3	2.74 (1.49)*
Problems with planning and organising	Exam deferral	8 (30.8)	4.00 (1.31)	1–5	2.89 (1.49)
	Support from student counsellor	17 (65.4)	3.88 (0.86)	3–4	1.89 (1.05)**
	Exam questions one by one	3 (11.5)	3.33 (0.58)	3–4	1.87 (0.92)*
	Visual time indication	11 (42.3)	3.27 (1.27)	1–5	2.67 (1.29)
Repetitive movements	Taking the exam in smaller groups	3 (33.3)	3.33 (0.58)	3–4	1.50 (0.84)

[a]Perceived effectiveness rated by students with ASD who used the reasonable accommodation to deal with the specific functioning and participation problem.
[b]Expected effectiveness rated by students with ASD who did not use the reasonable accommodation but did experience the specific functioning and participation problem.
*Significant difference between the experienced and perceived effectiveness of an accommodation ($p < 0.05$). **Significant difference between the experienced and perceived effectiveness of an accommodation ($p < 0.01$).

Research question 1: occurrence of the functioning and participation problems

To examine the first research question, a multi-informant approach was used and student counsellors, students with ASD and students without a disability were recruited. The results showed that students with ASD mentioned problems with verbal and non-verbal communication, oversensitivity to change and distinguishing gist from the detail as most frequently present. Student counsellors also reported that students with ASD have most problems with verbal and non-verbal communication and that these students are very sensitive to change.

In addition, student counsellors stated that these students also frequently encounter problems with planning and organising and with social interaction. These results are in line with the literature specifying that the most common problems for individuals with ASD are social interaction and communication on the one hand and stereotypical, repetitive behaviours and movements on the other (APA 2013; Billstedt, Carina Gillberg, and Gillberg 2007). When comparing data from the students with ASD with data from the student counsellors, no significant differences were found. This indicates that student counsellors have a good idea of the problems students with ASD generally experience in higher education.

Furthermore, students without a disability were included in order to determine whether the problems, which are experienced by students with ASD, are specific for the included students with ASD or if they occur to the same extent in the general population of students in higher education. By comparing the results of the students with ASD and the answers of students without a disability, three non-significant differences emerged. This means that, according to the students, stereotypical, repetitive movements, problems with planning and organising, and problems with applying learning strategies occur to the same extent for both groups of students. However, other explanations should be considered. It is possible that students with ASD have difficulties with self-insight and thus underreported these problems in the questionnaire (Frith and Happé 1999; Johnson, Filliter, and Murphy 2009). Previous research already suggested that students with ASD could have more problems with planning and organising and applying learning strategies compared to TDC (e.g. Jansen et al., forthcoming). Although it is not reported in this study, when comparing the answers of the TDC with the results of the student counsellors, only a significant difference with regard to stereotypical, repetitive movements was found. Another explanation for the lack of group differences within the student population on these three functioning and participation problems could be that students with ASD already learned how to plan and organise or apply effective learning strategies as a result of previous interventions (e.g. during secondary education). Unfortunately, our data-set does not allow us to test this hypothesis. With respect to stereotypical, repetitive movements, only a small number of students with ASD mentioned that they experienced this specific problem in higher education. Nevertheless, stereotypical, repetitive movements are included in the criteria for diagnosing ASD in the DSM-5 and literature already suggested that this problem is specific for individuals with ASD (APA 2013). However, it has already been shown that the occurrence of stereotypical, repetitive movements decreases when students with ASD age (e.g. Billstedt, Carina Gillberg, and Gillberg 2007).

Research question 2: problems during the teaching and evaluation methods

With respect to the second research question, a two-mode partitioning was used to reduce the number of functioning and participation problems and the number of teaching and evaluation methods. The methods were clustered into five different groups, namely classical teaching methods, activating teaching methods, classical evaluation methods, alternative evaluation methods and activating evaluation methods. In the literature, teaching and evaluation methods are also mostly divided into classical teaching and evaluation methods and activating teaching and evaluation methods (e.g. Struyven, Dochy, and Janssens 2008).

Simultaneously, the functioning and participation problems were divided into three clusters, namely social interaction and communication, inefficient study skills, and coping

skills and behaviour. The first cluster corresponds to the first of two diagnostic criteria described in DSM-5 namely 'social interaction and communication' (APA 2013). The second cluster contains inefficient study skills, which are mostly looked at as one subset of skills for students with and without disabilities in higher education (e.g. Mortimore and Ray Crozier 2006). With respect to students with ASD, problems with these study skills were also found by Jansen et al. (forthcoming). The last cluster of functioning and participation problems was the most heterogenic cluster of functioning and participation problems and is related to problems with handling stress and poor coping skills and behaviours of students with ASD. These problems can provoke stereotypical, repetitive movements and cause problems with planning, organising and time management or students with ASD (e.g. Glennon 2001).

Probability indices of the two-mode partitioning indicated that the chance of experiencing social interaction and communication problems is most pronounced during classical (e.g. during a practical) and activating teaching methods (e.g. during an excursion). During these teaching methods, students are challenged to work together, and thus communicate and interact, with other students and the professor. This is very demanding for students with ASD (e.g. Jansen et al., forthcoming; Orsmond et al. 2013). During other teaching and evaluation methods, students with ASD are less forced to work and study together and – as such – can prevent the emergence of specific functioning and participation problems.

Moreover, results showed that the chances of experiencing problems with inefficient study skills were more probable during the classical teaching and evaluation methods. During these teaching methods, lecturers provide large amounts of information when addressing the group of students. It is possible that, because of their problems with directing and shifting attention, students with ASD find it difficult to focus on the important information and are distracted by, for example, other students (Jansen et al., forthcoming). Furthermore, when studying and during classical evaluation methods, students with ASD have problems with selecting good learning strategies, processing information globally and distinguishing gist of the syllabus from the detail (Jansen et al., forthcoming). As a result, they are at risk of answering questions with too much detail and to make more mistakes during the classical evaluation methods. During alternative or activating evaluation methods, this risk is smaller because of the design of these exams. For example, during multiple choice exams students with ASD can only mark the right question while during oral exams or practical exams professors can interrupt the students when they are giving too much detail.

Finally, students with ASD who experience problems with coping skills and behaviour were most likely to encounter these problems during classical teaching and evaluation methods and during alternative evaluation methods. It is possible that students with ASD feel stressed during these teaching and evaluation methods, for example, when following a course together with a large group of students, and that the elevated stress level can provoke stereotypical, repetitive movements (Glennon 2001). Because of their raised stress level, students with ASD are likely not to go to the lectures or have to take some time off to relax. When they experience these elevated stress levels, the planning of students with ASD will change and they risk problems with rearranging their study or leisure time. During exam periods, the stress level of students with ASD is also elevated, causing problems with planning and organising and again leading to stereotypical, repetitive movements.

Research question 3: perceived effectiveness of reasonable accommodations

Results regarding the third research question indicated that, in general, extended examination duration is the most effective reasonable accommodation for social interaction and communication problems and inefficient study skills. In line with the literature, it can be concluded that extended examination duration was also most used by the participating students with ASD (Kettler 2012). In addition, students with ASD perceived exam deferral and taking the exam in smaller than usual groups as most effective to deal with problems with coping skills and behaviours. Here, it is assumed that these students who received the accommodation exam deferral have more time to plan and organise their study time and thus reduce their stress during the exam period. Also, taking the exam in smaller than usual groups can reduce the stress level of students with ASD resulting in less stereotypical, repetitive movements (e.g. Glennon 2001).

Furthermore, it also became clear that a single reasonable accommodation is not effective in dealing with all specific functioning and participation problems. For example, it was shown that support from the student counsellor is only effective in dealing with planning and organising problems and not for other functioning and participation problems (see Table 5: Coping skills and behaviours). Additionally, results indicate that problems that cannot be neutralised by the use of reasonable accommodations in higher education are primarily associated with the (mandatory) social communication and interaction problems of ASD rather than with the (more heterogeneous) restrictive, repetitive behaviours and interests (DSM-5; APA 2013). As such, additional support outside the educational context for ASD core symptoms will be necessary.

In addition, the range of the perceived effectiveness varied for each reasonable accommodation (see Table 5). For example, when looking at the perceived effectiveness of extended examination duration when dealing with problems cognitive flexibility, the effectiveness score ranged from 2 to 5. This showed that there is a large heterogeneity in the perceived effectiveness of each reasonable accommodation for the individual students with ASD experiencing a specific functioning and participation problem. As a result, it can be concluded that the perceived effectiveness of a specific accommodation is individually determined.

Lastly, students with ASD, who experienced a specific functioning and participation problem but were not offered the reasonable accommodation, did rate the expected effectiveness of the accommodation. This expected effectiveness was often rated lower, and in some cases even significantly lower, than the perceived effectiveness rated by students with ASD who were using the accommodation. One explanation could be that the student counsellors tailored the reasonable accommodations perfectly to the needs of the student with ASD meaning that these reasonable accommodations were only effective for students using them and would not be effective for students with ASD who were not offered these reasonable accommodations. Alternatively, it has already been suggested that students with ASD have a hard time imagining which reasonable accommodations would be helpful because of their lack of insight into their own problems and the lack of experience and knowledge regarding accommodations in higher education (Magnus and Tøssebro 2014).

Limitations

We recognise that this study has its limitations. Firstly, it is noticeable that significantly more students with ASD were enrolled in an academic educational programme in comparison to a professional educational programme than students without a disability. This could mean that the participating students with ASD constitute a specific subset of probably very high functioning individuals that effectively found their way into academic programmes. It is possible that these students experience less or different functioning and participation problems compared to the average student with ASD in secondary education who did not find their way into higher education.

Secondly, the items of functioning and participation problems and of the teaching and evaluation methods were reduced by the use of two-mode partitioning. This statistical analysis was used to make the data more manageable and generally show during which teaching and evaluation methods the problems of students with ASD emerge most. This does not imply that the detailed results are not important and student counsellors should not take into account individual differences between students with ASD in higher education.

Thirdly, classical teaching and evaluation methods are very frequently used in university colleges and universities. As such, the chances of experiencing functioning and participation problems are higher during these methods than during alternative or activating methods. Because of the frequent use of classical teaching and evaluation methods, it is possible that the perception of students with ASD is biased even when various functioning and participation problems occur to the same extent during all methods.

Fourthly, reasonable accommodations were listed in the results section if three or more students with ASD rated the experienced effectiveness in order to avoid a too low sample size. This entailed that some reasonable accommodations were removed from the results because only one or two students used the reasonable accommodation, regardless of whether the accommodation was perceived as effective or not. Because the effectiveness of reasonable accommodations is individually determined, it is important for student counsellors to also take into account other reasonable accommodations that were not listed in the results.

Finally, students with ASD had to rate the perceived or experienced effectiveness of each reasonable accommodation. This is a subjective parameter of effectiveness and does not provide an answer to the question whether the accommodation also has an objective effect on the test scores of students with ASD in higher education. Further research should focus on this objective effectiveness of reasonable accommodations.

Implications for practice

As pointed out by the results of the first research question, there is a large heterogeneity between students with ASD when it comes to experiencing specific functioning and participation problems. Because of this heterogeneity and these individual differences, it is essential to map the specific functioning and participation problems before selecting and implementing effective reasonable accommodations. The specific problems of each individual student with ASD should be clarified during the intake session with the student counsellor. Additionally, the environmental characteristics, which impact the experienced functioning and participation problems and the selection of reasonable accommodations, should be identified in order

to adjust the selection of reasonable accommodations to the context of the institution of higher education. Because of their direct impact on the functioning and participation of individual students with ASD in higher education, teaching and evaluation methods were investigated in this study. It became clear that these environmental characteristics have an influence on the experience of functioning and participation problems. However, also other environmental characteristics such as policy and organisational limitations should be explored before suggesting reasonable accommodations to students with ASD.

When functioning and participation problems and environmental characteristics are mapped, student counsellors can suggest reasonable accommodations. The results of this research goal, which were summarised in Table 5, gave a good indication of which reasonable accommodations are effective when dealing with specific functioning and participation problems. Selection and implementation of reasonable accommodations should be discussed with the student with ASD in order to select accommodations that are tailored to the needs of the individual.

Finally, our data indicated that two specific functioning and participation problems, namely problems with verbal and non-verbal communication and social problems, could not be neutralised by offering a reasonable accommodation. Therefore, it is possible that students with ASD need additional support to help them overcome specific functioning and participation problems. Student counsellors should have a good knowledge about the additional support to be able to refer these students to coaches or therapists, specialised organisations or multidisciplinary teams. Again, it is important that this additional support is tailored to the needs of the individual student with ASD in order to be effective in dealing with the specific problems.

In summary, this study showed that students with ASD frequently experience functioning and participation problems in higher education and that the occurrence of these problems may be different during various teaching and evaluation methods. Reasonable accommodations should be selected based on the personal characteristics (i.e. the experienced functioning and participation problems) of each individual student and the environmental characteristics (e.g. the teaching and evaluation methods) of the educational programmes of each institution of higher education in order to be effective. Therefore, student counsellors should take into account the context of the institution and the large variability between students with ASD when implementing reasonable accommodations in higher education.

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