Attention Is Not the Solution: Experiences of University Students With ADHD With

Remote Learning

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Abstract

This research explored the experiences of ADHD students with remote learning in relation to their university education and wellbeing. Since symptoms of ADHD affect the individual's attention and various skills such as time management, it was expected that remote learning may introduce new challenges as well as benefits due to novel opportunities offered by technology. Semi-structured interviews were conducted with seven university students from one city in the Netherlands and one student from Germany. The collected data was analysed with thematic analysis. Remote education was generally perceived as having a negative influence on the student's university experience and wellbeing. Key factors mentioned included reduced social interaction, disrupted schedules and increased procrastination, resulting in time management issues, reduced external pressure and finally reduced performance. However, the interviewees found recorded lectures and the availability of all relevant information in one document as well as social support as beneficial. The interviewees themselves mentioned several suggestions concerning improvements for future university education, including a support system from universities, which would offer study groups and information on organisation skills. Furthermore, interactivity during lectures could be improved and mandatory attendance may increase external pressure. The findings of this study suggest that remote education may introduce new barriers for students with ADHD. A major strength of this study was the participant engagement which led to target-group centred suggestions. Future research should address the suggestions offered in this research and explore intervention for social integration in remote settings and reducing stigma surrounding received support.

Keywords: ADHD students, remote learning, wellbeing, university experience

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Since spring 2020, education has changed drastically due to the Covid-19 pandemic. A major shift occurred from in-person to remote learning, which entails students receiving education by making use of videoconferences (Milman, 2015). Specifically in the Netherlands, this shift has been very significant since the general approach to education is based on face-to-face education in small classrooms (Study in Holland, n.d.). For instance, the University of Twente, where this study is based, implements the Twente Educational Model (TOM). TOM is focused on group projects and incorporates coherent and consecutive modules, which reduces flexibility needed during the switch to remote learning (University of Twente, 2017). Subsequently, the reduced flexibility may have increased difficulties during the switch. While neurotypical students may struggle with the shift to distance learning, neurodiverse students may be at a much higher risk since they were already facing more difficulties before the switch (Canu et al., 2021). However, since remote learning also offers many new opportunities, it can also be expected that students benefit from remote learning.

Within the group of neurodiverse students, the largest subgroups consist of students with Specific Learning Difficulties (SLDs) and attention-deficit/hyperactivity disorder (ADHD) (Harbour, 2004; Henderson, 1999; Hubble & Bolton, 2021). More specifically, approximately 25% of students receiving disability support are identified with ADHD (HEATH Resource Centre, 1993; Wolf, 2001). While there are many theories attempting to explain ADHD, there is little research available concerning the impact of ADHD on students, and especially in the context of distance learning. In particular qualitative research on the individuals' feelings about

the impact of ADHD on their education and their experience at university is lacking (Caerdydd, 2017).

ADHD has been defined as a neurodevelopmental disorder since there is a delay in the development of brain areas (American Psychiatric Association, 2013). People with ADHD experience impaired functioning and neuropsychiatric problems including a variety of symptoms (Flinsenberg, 2020). These symptoms include impairments in three domains: inattention, hyperactivity, and impulsivity (Faraone et al., 2015). Statistics regarding the prevalence of ADHD are mostly estimates because the results are mixed due to the use of different diagnostic criteria and methods. This is also partly due to students not having to report their disorder to the universities (DuPaul et al., 2009). Nonetheless, comparing across the research available the prevalence of ADHD amongst university students from American samples seems to be between 2% and 8% (DuPaul et al., 2001; Heiligenstein et al., 1998; McKee, 2008; Rabiner, et al., 2008; Weyandt et al., 1995). Research on the prevalence of ADHD amongst university students in Europe is rare, but one study from Belgium found a similar prevalence in first year students (Mortier et al., 2015).

This suggested prevalence of 2%-8% is likely to be an underestimate due to the tendency for women to be underdiagnosed (Ramtekkar et al., 2010). Such underdiagnosis is explained by women being more often diagnosed with the inattentive subtype and showing predominantly internalized symptoms, compared to men who are more often diagnosed with the hyperactive or impulsive subtype of ADHD and have predominantly externalizing symptoms (Quinn & Madhoo, 2014). More specifically, women tend to have troubles with paying attention to details, staying organised, remembering things and they are often described as shy. Men on the other hand tend to be more impulsive, restless, impatient, and disruptive. Furthermore, women with

ADHD show more perfectionistic behaviours and have a higher percentage of the comorbid obsessive-compulsive disorder as well as anxiety and major depressive disorders. Since these disorders may get associated with other conditions and assumed to be the cause of the problems rather than a symptom of ADHD, women tend to get misdiagnosis more frequently (Quinn & Madhoo, 2014). Furthermore, misdiagnosis relates to negative health consequences, such as somatisation, sleeping difficulties, headaches and musculoskeletal pains that may be connected to psychiatric disorder (Egger et al., 1999; Graetz et al., 2005; Rasmussen & Levander, 2008). Hence, the experiences of female students with ADHD, including their difficulties and advantages are likely to be poorly understood.

To summarize, research has shown that ADHD is common among university students. Due to misdiagnoses and underdiagnoses in female students, ADHD is likely more common than previously found. Thus, it is important to gain understanding about how the significant changes in university education over the last years have affected students of both sexes with ADHD.

Theoretical Background

ADHD Definition and Subtypes

Before the 1970s it was widely believed that ADHD was a childhood disorder (DuPaul et al., 1991). Since then, there have been many changes in the definition and diagnostics of ADHD due to a greater understanding of the condition. One of those changes includes the elimination of the term attention deficit disorder (ADD) in 1980 with the inclusion of hyperactivity in the disorder ADHD (Paling, 2020). Up to today, there are still patients identifying themselves with ADD, some because they were diagnosed before the change and many because the hyperactivity is not necessarily present (Anderson, n.d.).

In the latest version of the Diagnostic and Statistical Manual of Mental Disorders (DSM) three ADHD representations are described that can be present in children as well as adults, though the onset of symptoms must be before the age of 12 (American Psychiatric Association, 2013). The three subtypes are predominantly inattentive, hyperactive/impulsive, and combined type (Agrawal et al., 2020). Predominantly inattentive includes symptoms such as making careless mistakes, lack of attention to detail, difficulty listening, forgetting, and loosing things, being easily distracted and poor organisational skills (American Psychiatric Association, 2013). Symptoms of the hyperactive and impulsive subtype are fidgeting, inability to engage in quiet activities, restlessness, talking excessively, interrupting others, and intruding activities of others. The combined presentation is diagnosed if criterion for both subtypes are met. The DSM criteria for each subtype can be found in Appendix A. There is a large variety of theories available that may explain ADHD. Some of the most common theories are reviewed in the following section.

Dopamine Theory. According to the dopamine theory, people with ADHD have an increased number of dopamine transporters in their brain (Levy, 1991). Therefore, more dopamine is removed in the synapses before reaching the receptors, leading to less effects of dopamine which may results in a reduction of motivation and a reduced sense of pleasure. Since dopamine is involved in memory, reward, motivation, and attention, this may explain some symptoms of ADHD including restlessness, impaired learning, and decreased attention (Cools, 2008; Mehta et al., 2019). Several studies have shown results that support the argument for an increased number of dopamine transporters in people with ADHD (Dresel et al., 2000; Krause et al., 2000; Mehta et al., 2019). These studies also explain the effectiveness of the medication for ADHD that inhibits the reuptake of dopamine with the increased density of dopamine transporters. One study in particular reported an elevation of 70% in dopamine transporters

compared to a healthy control group (Dougherty et al., 1999). However, other studies reported mixed results or did not find an increased number of dopamine transporters (e.g. Caye et al., 2018; Volkow et al., 2007).

       The Dual Pathway Model. The Dual Pathway Model describes two pathways that may explain symptoms of ADHD. Firstly, the dysregulation of thought and action pathway (DTAP) explains abnormalities in the brain as the cause for decreased inhibitory control which leads to Executive Dysfunction expressed in ADHD symptoms (Sonuga-Barke, 2002). Inhibitory deficits cause problems with controlling impulsivity, meaning it is difficult to ignore distractions (Sonuga-Barke, 2003). Moreover, the inhibitory deficits lead to difficulties in regulating feelings, actions and thoughts within different context which affects the engagement with environments negatively and can be associated with impairment. This impairment is expressed as Executive Dysfunction which entails difficulties related to skills including attention, organisation, memory, and time management (Sonuga-Barke, 2003).

       Secondly, the motivation style pathway (MSP) describes differences in the reward circuit in combination with environmental factors as the cause for delay aversion which explains symptoms of ADHD. Differences in the reward circuit involve a shortened delay of reward gradient (Sonuga-Barke, 2002). This means rewards are less effective the longer the delay between response and reward, leading to a preference for immediate rewards. Negative emotions get associated with delays because the shortened delay of reward gradient leads to inefficient responses to contextual demands connected to waiting which is viewed as a failure of response. The association of delay with negative emotion can be facilitated by external factors like the parents (Sonuga-Barke, 2002). Having unrealistic expectations and responding harshly towards

the perceived impulsiveness as a parent increases the likelihood for the child to develop an aversion to delay (Sonuga-Barke, 2002; Sonuga-Barke, 2003).

In this model the preference for immediacy is described as a functional and economic choice in contrast to other theories like the Unifying theory of ADHD by Barkley (1997), which describe this preference as impulsiveness and dysfunction. The aspect of functionality in preferring immediacy has been researched in Sonuga-Barke's study (1992), who found that the participants would wait for a larger reward if the delay was not reduced by choosing a smaller reward. Furthermore, if delay cannot be avoided, individuals with ADHD shift their attention to stimuli present in the environment, escape the experience of delay, and reduce the perception of time (Sonuga-Barke, 2003). Regarding attention deficiency, this model also supports the findings that people with ADHD can pay prolonged attention, for instance during video games (Hupfeld et al., 2019). Related to this, recent literature has questioned the existence of an attention deficiency and suggests dysfunctional attentional regulation instead (Hupfeld et al., 2019).

Several studies found results supporting the Dual Pathway Model. However, most of these studies have been conducted with children (Dalen et al., 2004; Solanto et al., 2001; Thorell, 2007). Furthermore, one study concluded that the two pathways described in the model interact with each other and are not independent (Shen et al., 2020). No study was found that tested the model with adults, but one study confirmed the lower delay tolerance and concluded that the results generally support the multiple-pathway approaches (Marx et al., 2010). Lastly, a dual component model was suggested and supported by research which views delay aversion as a contributing factor to choice-impulsivity (Marco et al., 2009). Meaning, that both impulsivity and delay aversion contribute to the preference of immediate rewards.

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The Dynamic Developmental Theory (DDT). The DDT is a comprehensive theory,

attempting to explain all the symptoms connected to ADHD (Sagvolden et al., 2005). It describes

two behavioural mechanisms. Firstly, in the theory it is explained that a smaller window of

opportunity in which rewards are effective, leads to a preference for immediate rewards,

comparable to the shortened delay of reward gradient. Based on the smaller window of

opportunity the DDT suggests that symptoms of ADHD arise when socially desirable behaviours

are not reinforced in time because children are less likely to repeat and learn these behaviours.

Secondly, the DDT additionally proposes that low levels of dopamine are connected to

dysfunctional extinction processes. This means that when a response is no longer reinforced, the

elimination of the same response takes longer than with neurotypical individuals. This may lead

to excessive behaviour such as hyperactivity (Sagvolden et al., 2005). The DDT has been

partially supported by studies conducted with children and rats but no study with adults have

been found (Aase & Sagvolden, 2006; Johansen et al., 2007; Sagvolden et al., 1998).

All theories are connecting dopamine dysregulations with ADHD. Dopamine seems to be

removed too quickly from the brain due to a high number of dopamine transporters. Thus,

dopamine has less time to exert its effects, which leads to the need for a new reinforcer.

Furthermore, the delay of reinforcement relates to negative emotions, increasing the need for a

distraction. Additionally, there seems to be only a small window in which a reward effectively

reinforces behaviours, and the effect of the reinforcer is shorter compared to neurotypical

individuals. Lastly, the elimination of a response takes longer compared to neurotypical

individuals, leading to hyperactivity. Based on these theories, attentional and motivational

deficits can be anticipated for students with ADHD during remote learning because the effects of

dopamine are decreased and reward systems dysfunctional. These deficits likely reflect

physiological differences beyond the control of students with ADHD. Therefore, literature considering the effects of these differences on students with ADHD will be reviewed in the following.

Effects of ADHD on University Students

Due to a lack of research about how ADHD affects students who receive distance education, an overview of existing knowledge about the effect of ADHD on students in general will be given first. It has been shown that students with ADHD generally have significantly lower average grades compared to neurotypical students (Heiligenstein et a., 1999). This has been explained by ADHD students having greater difficulty organising themselves, controlling and regulating their behaviour and avoiding procrastination (Turnock et al., 1998), as well as being less likely to be influenced by feedback from others, a deficiency in time and stress management (Kern et al., 1999). Furthermore, research showed that students with ADHD have significantly higher levels of internal restlessness, which may be expressed in increased distractibility and disorganisation (Weyandt et al., 2003). Also, students with ADHD showed deficiencies in concentration and test taking strategies (Du Paul et al., 2009). They also showed deficiencies in selecting main ideas, which assessed the skill of identifying relevant information and is likely related to concentration and focus (Reaser et al., 2007). Students with ADHD reported being less confident regarding their academic abilities and need to work harder for their grades (Lewandowski et al., 2008). Since all these skills are important to study successfully at a university, it is not surprising that the average grade of the students with ADHD is lower and that students with ADHD report more academic problems, especially if they do not receive any accommodations for their ADHD (Heiligenstein et al., 1999; Wolf, 2001). Also, due to

underdiagnosis, especially in women, it is likely that a lot of students face difficulties at university without understanding why.

Difficulties for students with ADHD go beyond academic problems. Generally, students with ADHD have shown to have more difficulties socially. More specifically, students with ADHD reported lower levels of social skills, social adjustment, self-esteem, as well as more psychological and emotional difficulties (Deragotis & Melisaratos, 1992; Deragotis et al., 1984; Lewandowski et al., 2008; Richards et al., 1999; Richards et al., 2002; Shaw-Zirt et al., 2005; Weyandt et al., 1998). Students with ADHD also showed more depressive symptoms in a self-report (Blase et al., 2009). Apart from their social functioning, research has shown that quality of life in general is lower compared to students without ADHD (Grenwald-Mayers., 2001). Therefore, students with ADHD seem to have more emotional distress and psychological difficulties and have a lower quality of life.

Qualitative Research About the Impact of ADHD on Students

The findings described above were mainly derived from studies that had a specific focus on aspects of ADHD or were quantitative in nature. There has been one qualitative study that examined the experiences of students with ADHD with semi-structured interviews (Caerdydd, 2017). The result of that research was a set of themes identified as relevant for students with ADHD.

Within the theme managing life at university (risky behaviour and time management) all participants reported difficulties with managing time leading to high stress levels, which is supported by the quantitative literature reviewed (Kern et al., 1999). The results in the theme friendships (early experiences and university experiences) were partly consistent with the quantitative research (Deragotis & Melisaratos, 1992; Deragotis et al., 1984; Lewandowski et al.,

2008; Richards et al., 1999; Richards et al., 2002; Shaw-Zirt et al., 2005; Weyandt et al., 1998).

Experienced bullying as well as their ADHD related aggression and lack of control over

reactions was said to negatively impact friendships and the experience at school. Compared to

the quantitative studies finding that social relationships are challenging for individuals with

ADHD, most participants were able to build strong friendships (Deragotis & Melisaratos, 1992;

Deragotis et al., 1984; Lewandowski et al., 2008; Richards et al., 1999; Richards et al., 2002;

Shaw-Zirt et al., 2005; Weyandt et al., 1998). The participants further connected these

friendships with positive experiences, regardless of still having behavioural patterns of

aggression and lack of control.

Students also mentioned a decrease in their self-opinion due to difficulties socialising in

the beginning of their university experience. While a lower self-opinion is supported by the

literature (Deragotis & Melisaratos, 1992; Deragotis et al., 1984; Lewandowski et al., 2008;

Richards et al., 1999; Richards et al., 2002; Shaw-Zirt et al., 2005; Weyandt et al., 1998), the

finding that grades have a mostly positive influence on the student's self-opinion and university

experience is novel. More specifically, Caerdydd (2017) found that grades perceived as good had

a positive influence on the student's self-opinion, while grades perceived as poorer had no

negative impact on the students experience at university. This seemed to be explained by a

general increase in academic performance over time. The students also reported that being

misunderstood by others and called lazy seemed to cause a lot of distress, which is supported by

previous literature (Flanigan, 2021). Furthermore, ADHD students comparing themselves with

neurotypical students makes them feel that neurotypical students have it easier at university

which has a negative impact on their university experience. Caerdydd (2017) highlighted that

this was a new finding in research and suggested a need for further research into this aspect.

In conclusion, students with ADHD appear to have several difficulties which likely impact their university experience. Student with ADHD have difficulties with time management and organisation skills, concentration, confidence regarding their academic abilities, social skills, mental health and regulating behaviour. Beyond that, students with ADHD appear to have a lower grade average and they reported perceived distress due to comparing themselves to neurotypical students. In the following, literature evaluating the effects of remote education on these known difficulties will be reviewed.

Effects of ADHD on Students in Distance Learning

Multiple researchers have identified a lack of research about the effects of distance learning on students with ADHD (Cheng & Lai 2020; Cinquin et al., 2019). Parker & Banerjee (2007) had informal conversations with students identified with ADHD and concluded, that distance learning in general caused more discomfort for students with ADHD because of a lack of skills specifically needed for remote learning such as communication over email. Also, remote learning requires the ability to monitor learning progress and an increased need for prolonged attention which may cause issues for students with ADHD (Ruban et al., 2003). In relation to this, it was found that students with ADHD have concerns regarding their attention and concentration with distance learning and thus experienced elevated levels of fatigue (Parker & Banerjee, 2007). Particularly concerns regarding the increased need for attention are supported by research which found that ADHD impairments are expressed as Executive Dysfunction (Sonuga-Barke, 2003). Furthermore, the Dopamine theory explains the symptom of decreased attention with an increased number of dopamine transporters. The Dual Pathway Model describes difficulties with prolonged attention caused by delay aversion. Both theories support

the suggestion that remote learning may cause more difficulties for students with ADHD since there is an increased need for self-directed attention from the students.

Self-regulated learning skills have been found to be important as well in remote learning and students with ADHD seem to have deficiencies in those (Cho, 2004). Those skills include goal setting, self-evaluation, and independent usage of technologies (Cho, 2004). Executive Dysfunction as explained in the Dual Pathway Model support the expectation that students with ADHD are likely to have difficulties with remote learning. Students with ADHD further seem to be less motivated to use and monitor these self-regulation skills and require direct instruction to develop them (Hecker et al., 2002; Reid et al., 2005; Ruban et al., 2003). Decreased motivation may be related to the Dopamine theory which explains this symptom and supports the concern of needing external motivation to develop self-regulation skills. However, direct instruction is lacking in remote learning.

Very few studies have explored the wellbeing of students with ADHD (Parker & Banerjee, 2007). Parker and Banerjee (2007) found that students with ADHD expressed the lack of daily schedules and missing their friends as well as social life as problems. The lack of schedules may be particularly problematic due to difficulties related to organisational skills found by research which are also related to Executive Dysfunction mentioned in the Dual Pathway Model (Turnock et al., 1998). Furthermore, they reported more loneliness and distress in relation to distance learning (Parker & Banerjee, 2007). Zhang et al. (2020) concluded that ADHD may lead to higher levels of social and personal distress.

In conclusion, remote education can be expected to increase difficulties for students with ADHD due to deficiencies in skills relevant for this educational model, including monitoring learning progress, prolonged attention, and self-regulated learning skills. Specifically, prolonged

attention seems to be a concern to the students. Also, remote education reduces direct instruction which may lead to less external motivation, which appears to be important for the students self-regulated learning skills. Additionally, students with ADHD expressed a lack of schedule and social life in relation to remote education. Regarding the study at hand, these previous findings will be taken into consideration during data gathering process, analysis, and interpretation.

The Current Study

There is a lack of qualitative research focused on the experiences and feelings of university students with ADHD, especially regarding remote learning. Therefore, the study at hand will focus on the experiences of students with ADHD in a forced remote learning setting (due to Covid-19), with the goal of improving remote learning as well as university experience and education in general. Apart from negative aspects of remote learning, the possibility of retaining elements that benefit ADHD students when shifting back to the former face-to-face education will be explored. Semi-structured interviews will be conducted with students who are either diagnosed with ADHD or identify themselves with ADHD to have a focus on their experiences and feelings. Following the interview, common themes will be identified through thematic analysis. Throughout the research there will be communication with the target group, including seeking feedback on the research goals and design. Involving the target group benefits the relevance, quality, and impact of research as well as it facilitates results of most use to the target community (Pollock et al., 2018). Considering the problems identified regarding the underrepresentation of women, the goal is to ensure that their opinions are represented by seeking as heterogeneous a sample as possible.

In conclusion, the research question of this study is "How can we use the experiences of ADHD students with remote learning to improve their education and wellbeing while studying at university?".

Methods

Semi-Structured Interviews

Semi-structured interviews were conducted because they give the target group space to share their experiences with minimal external influence, which is of importance considering the content and nature of the research goal. Mainly open-ended questions within predetermined topics are asked during semi-structured interviews (Harvey-Jordan & Long, 2001). While the topics are based on the interviewer's interest, the interview schedule is flexible and allows further topics to emerge from relevant participant experiences and knowledge. Conducting semi-structured interviews thus, has the benefit of giving the participants enough opportunities to share their thoughts and express their priorities while ensuring that all topics seen relevant by the researchers can be covered afterwards with more specific questions (Harvey-Jordan & Long, 2001).

Participants

The participants for this study were recruited by Snowball sampling since the target group represents a minority and is therefore difficult to reach. This study consisted of eight participants, who were ($n = 1$) or are currently studying at a university in the Netherlands ($n = 6$) or Germany ($n = 1$). They were either self-diagnosed ($n = 1$) or professionally diagnosed ($n = 7$) with ADHD. These participants were between 20 and 26 years old ($M = 22.9$, $SD = 2.3$) and the sample included four men, three women and one non-binary person. Their ethnicity was Caucasian ($n = 5$), Asian ($n = 2$) and Mixed ($n = 1$). All participants gave their informed consent

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before taking part in this study (Appendix B). No information that could reveal the participants

identities will be shared to keep them anonymous. Where specific quotes are presented that could

identify participants then their quote is paraphrased so as to keep the original meaning but

remove identifiable information.

Interview Topic Guide

Topic guides are an important method for the interviewer to keep track of what topics

have already been covered and which questions still need to be asked. While developing the

topic guide several steps were taken. Firstly, the interview questions and results of the study by

Caerdydd (2017) have been taken as a starting point for identifying relevant topics and questions.

This has been done because the study is comparable in nature and content. Based on this study,

friendships, time management and effects of grades were included as relevant topics.

Furthermore, wellbeing, with a focus on effects of misconceptions about ADHD and the ADHD

student's self-opinion were included as topics. Also, based on Caerdydd´s study (2017), a

question about the comparison to other neurotypical students was added.

The next step involved taking the theories described and the previous research on the

topic into account which led to more questions being developed. Questions added were specific

to the effects of different aspects of education on ADHD symptoms. Afterwards, based on other

qualitative studies, general questions about participants experiences with university education,

remote learning and comparison to face-to-face education were included. Based on the research

question a final topic was added concerning participants suggestions for improvement of future

education.

To ensure the topic guide was relevant to participants, three of the participants in the

sample were consulted in advance of the interviews to provide feedback on the research aims and

topic guide. Furthermore, the three participants were asked to brainstorm questions that they would find relevant concerning the research goal. This resulted in two new aspects concerning the learning environment to be included and questions about their learning habits and adaptions made to these habits due to remote learning. Moreover, one participant was asked to go through all items and point out unclear or irrelevant questions. The communication with the participants made it clear that complex and open or general questions are difficult to answer for the target group. Based on that knowledge, complex and unclear questions were modified for example by splitting them up in several specific questions and irrelevant questions were deleted. At the end, all items were organised into themes and ordered in a way that I felt confident I could conduct the interviews without losing track.

The final version of the topic guide is divided into different sections which cover different topics (Appendix C). The beginning of the topic guide includes general questions about how the student's education is going at the moment, and how their ADHD affects them personally and their education. General questions are asked in the beginning to give the participant space to talk about their experiences with minimal external influence before guiding them into more specific topics that were found relevant based on the literature. Subsequently, there are questions about how they receive remote learning, their feelings about this method and questions comparing remote with offline learning. The following part of the topic guide has an in-depth focus on the experiences of the students with specific aspects of remote learning, for example lectures, classes, and self-studying.

The next part of the topic guide covers how remote learning affected executive functions related to their ADHD like attention, memory, and handling distractions. This is followed by questions about wellbeing regarding ADHD and remote learning with further focus on topics like

mood, effects of negative emotions on the studies and changes in self-opinion. Furthermore, the topic guide includes questions about support received specific to ADHD and how ADHD affected the social life during remote learning. The last main section concerns the individuals' thoughts about the future education. Within this section, they will be asked questions like: "How would remote education need to be delivered to you so it would be as useful as possible?". At the end of this section, they will be encouraged to share any further thoughts that they would like to express. Lastly, any other questions that are relevant for interpreting the data, as well as demographic questions are included in the topic guide.

Procedure

Before conducting the interviews, ethical approval was obtained by the Ethics Committee of the Faculty of Behavioural, Management and Social Science at the University of Twente (application number: 220379). After contacting friends and acquaintances eligible for this study, more students were invited to participate within the University of Twente and association group chats including Ludica (Tennis) and Arabesque (Contemporary dance). All recruited participants were asked to contact their friends and acquaintances eligible for this study to maximise the reach. During this first contact the participants received general information over the study in form of a participant information letter. Afterwards, appointments for the interviews were made with each participant over WhatsApp or email. Each interviewee was questioned individually. The interviews with friends and acquaintances were conducted at their home or at the University according to the preference of the interviewee. All interviews with people unknown to the researcher were conducted at the University of Twente to ensure safety for both parties involved. I conducted all the interviews in English and in the months of April and May 2022.

Before the interview, written informed consent was obtained by all participants. Next, a brief introduction about the purpose and main goal of the study was given, as well as information about the process of the interview. After giving the participant time to ask questions, the audio-recording with the software oCam (v520.0) was started. During the interviews, the topic guide was used to provide structure and ensure comprehensiveness. At the end of each interview, the recording was stopped and there was an oral debrief. Each individual also received a written debrief and were able to ask questions before they left. The duration of the interviews ranged from 46 minutes to 73 minutes ($M = 59$ min, $SD = 8$).

As a preparation for the data analysis all audio-recordings were transcribed. Transcribing involves converting spoken language into written text (Kowal, & O'Connell, 2014). For the purpose of decreasing the time required for transcribing the software Amberscript was used. The transcripts were proof-read for grammatical and spelling mistakes and the content was checked by listening along while checking the transcript to ensure accuracy. Each interviewee was assigned a number and are referred to by "Interviewee X" in the transcripts. Incomprehensible words that could not be transcribed are replaced with XX, non-verbal expressions such as facial expression have not been included in the transcripts. Also, repeated phrases or words that did not change the meaning of the text were deleted to improve readability of the transcripts. Omitted parts of a quote are indicated by […] in this report.

Data Analyses

During the analysis of the transcripts the software Atlas-ti 22.0.11 was used, which facilitates coding texts and working with citations. The transcripts were analysed by using thematic analysis. Thematic analysis is a widely used method for analysing qualitative data by minimally describing large data sets with themes (Braun & Clark, 2006). During the analysis,

meaningful patterns relevant to the research are identified and described as themes. The themes were mainly developed in an inductive manner. Inductive thematic analysis is data driven and provides a less detailed but comprehensive description of the data (Patton, 1990). Since the research focuses on the individuals' experiences, inductive analysis ensures an open exploration of these experiences with little influence of presumptions and earlier findings. Furthermore, preliminary discussion with participants were held to develop the topic guide. Since previous literature was reviewed during the design of the research, theoretical thematic analysis is likely applied in the interpretation of the data as well. Theoretical thematic analysis is driven by the researcher's interest and provides a detailed analysis of relevant aspects of the data (Braun & Clark, 2006). Since the themes were identified on the surface of the data without theorizing meanings, resulting themes can be defined as semantic themes which is an appropriate level of analysis when exploring the experiences of individuals (Braun & Clark, 2012).

Thematic analysis includes several stages which were followed during the analysis. First codes were developed after transcribing the recordings of the interviews and reading each transcript multiple times to become familiar with the content. In this context, codes were segments of the transcript relevant to the research question that are given a label. Segments were coded if the content was present in several interviews, relevance of the content was perceived as high by the researcher based on previous literature or if the content appeared significant to the individual. Also, specifically unique, or unexpected experiences or opinions mentioned by the individuals were coded.

After coding all relevant information of the transcripts, the codes were grouped into potential and themes. Codes were grouped based on similarity in topics. For example, if two codes concerned aspects of time management they would be grouped together. In comparison, a

code that concerned the impact of friends would not be grouped with a code including grades. The next step entailed reviewing all themes to assess whether they cover all relevant codes and are sufficient for answering the research question. Adjustments were made if important codes were not included in a theme or did not fit into the assigned theme. Further adjustments were made for themes that did not reflect the included codes appropriately, themes that were too specific or not relevant enough on their own and themes that did not comply with the research focus. During this process new themes were identified, existing themes modified, and codes were organised into different themes. At the end of the coding process, all themes were organised into a thematic map (Figure 1) and a tabular list with definitions for each theme and anchor examples was developed (Appendix D).

Results

During the thematic analysis five themes with subthemes were developed, which are displayed in Table 1. The first theme is *social* with the subthemes *social interaction*, *social support*, *formal support,* and *stigma*. The second theme is *learning processes* and includes the subthemes *attention* and *memory*. *Learning outcomes* is the third theme, which includes the subtheme *performance*. The fourth theme is *wellbeing* and includes the subthemes *mental* and *physical wellbeing*. Lastly, suggestions from the interviewees for improvements of the future education are presented in theme *improvements*.

It was found that these themes apply for both sexes equally, thus neither the results nor the discussion will highlight any differences or similarities between sexes. Previous literature highlighted the differences between women and men with ADHD primarily due to women being diagnosed more often with the inattentive subtype and men with the hyperactive/impulsive subtype (Quinn & Madhoo, 2014). Since everyone expect for one male participant reported

being diagnosed with the inattentive subtype of ADHD, it is not surprising that there are no

differences found between men and women.

Table 1

Overview of Themes

Theme	Subtheme
1. Social	Social Interaction
	Social Support
	Formal Support
	Stigma
2. Learning Processes	Attention
	Memory
3. Learning Outcomes	Performance
4. Wellbeing	Mental Wellbeing
	Physical Wellbeing
5. Improvements	

Social

Social Interaction

The subtheme social interaction includes the participant's perceived influence of

interactions with other people on their university experience. Generally, students reported a

decrease in social interaction due to the missing physical aspect during remote education.

Because of the reduced social contact, the interviewees felt isolated and dissociated from

university. The students reported they did not feel like a student anymore. Moreover, Interviewee

6 felt less responsible for their studies and peers during remote learning because they did not see them in person and missed the human connection.

Due the missing physical aspect which led to increased studying at home, students were forced to study alone. This had a negative impact on their studying behaviour and performance as well as their university experience. Most interviewees experienced studying together with others directly or studying in a shared location like a library as beneficial regarding ADHD. Seeing others study increases the external pressure and internal motivation. One exception was Interviewee 3 who preferred to study alone.

Social Support

The subtheme social support includes the interviewees experience with support received by friends during remote education. While the general social interaction decreased during remote education, social support seemed to increase and became necessary:

> I was doing this with friends even before we went completely online. However, when we did went online, it became a lot more frequent, and I felt the need to have them help me a lot more, when we started having online classes. (Interviewee 8)

This support by friends was perceived as having a positive influence on the university experience. Most of the Interviewees explained that their friends reminded them of deadlines, studied together with them and generally produced external pressure or motivation, which induces productivity and motivation. However, Interviewee (6) who only had contact with one friend during remote learning, explained that they felt isolated, and their friend was not able to continue supporting them because it was too much. A difference to the other interviewees was that Interviewee 6 was in their first year and remote education made it difficult for that student to build friendships due to the isolation.

ADHD AND REMOTE LEARNING

Formal Support

      This subtheme concerns support offered by universities themselves including staff, which influenced the interviewee's university experience. All interviewees reported that during remote education there was no increased support offered. Teachers seemed to have a mixed influence on the interviewees experience, while study advisors were perceived as beneficial. Study advisors at the University of Twente support students with their personal circumstances and wellbeing affecting their studies by talking to them individually and giving appropriate help, like advising them on how to schedule their study time.

      Teachers appeared to lack awareness regarding ADHD: "They do not understand those kinds of things, so that it makes you feel like they do not understand who they are giving lessons to." (Interviewee 4). This may impact the quality of support offered and affect the students experience negatively. However, during remote learning teachers were more accessible and responsive because they stayed for follow up questions, compared to offline classes where they already pack their bags at the end of a class. Still, if teachers would not respond online, there was no option of walking up to them in person, making interaction less accessible.

      Interviewee 3 received tips from the study advisor and got support regarding missed deadlines which was perceived as positive. Furthermore, Interviewee 8 received regular, weekly support:

> So, she was my lifeline to help me have a little bit more of a schedule. She also is the one who suggested that I tried to start going to sleep on time and getting up at like around the same time so that my day would start, at the same point every day and I would feel like there is a little bit more normality to my schedule.

ADHD AND REMOTE LEARNING

Stigma

The subtheme stigma concerns the effect of negative attitudes based on characteristics regarding ADHD from others on the interviewee's university experience. The interviewees did not perceive a difference between remote and offline education regarding stigma. Also, the students were mainly stigmatized by peers, which had a negative effect on their experience.

The interviewees reported being judged by peers during group work due to missing deadlines or forgetting things. Some students felt misunderstood by their peers and pressured to reach their expectations which subsequently made it more difficult to perform. Interviewee 6 explained that the stigma surrounding ADHD subsequently caused them to not ask for support:

Because it is a stigma, in a sense. Because I remember we have one girl, who also has it in my classes and she in the beginning she handed in some kind of document that said that "I have ADHD. I will get longer." She can get, like, longer time to finish a project. And just in general, she has more time on things. And I never wanted that because I do not want to be seen as somebody who gets an advantage because people do not, it is not something people see. They cannot see that I have ADHD. So, they will just think, "Oh, she is just as good as us, but she will get the extra time."

Learning Processes

Attention

The subtheme attention concerns how remote education affected the ability to focus on a task related to education. All interviewees agreed that their attention in general got worse during remote education due to the changes in their schedule, the distractions at home, reduced social interaction and certain elements of the classes and lectures.

Since the students were studying and attending classes and lectures at home, their general daily schedule changed. They were able to sleep in and attend classes and lectures in bed. Due to those factors, the interviewees reported they felt dissociated from university and missed external motivation which decreased their ability to focus. Furthermore, studying at home introduced more opportunities for procrastination such as electronics, food, cleaning, and dogs:

> I do not really get into the work mindset that easily. So, because there is always stuff to do that is also there, I might as well clean my room or cook or meet a friend or read my book or something like that. There are too many distractions here, so my schedule is non-existent. (Interviewee 6)

Connected to studying at home, Interviewee 2 explained that the opportunity for a separate room during exams was removed within remote education which made it more difficult to focus due to the opportunities for procrastination.

Opportunities for procrastinations were said to be more problematic in online lectures, compared to online group work or tutorials since there is more external pressure and social interaction in the latter, making it easier to focus and resist procrastination. External pressure was specifically experienced in group work since the students felt responsible for the group members and thus attention increased: "But it does definitely help me with working, because I am also working for other people" (Interviewee 1). Besides that, distractions were reduced in online tutorials because other students were perceived as less distracting. In relation to that, smaller classes were perceived as less distracting and more engaging than big ones.

Interviewee 8 explained that not having a teacher physically in front of class, had a negative effect on their attention because it reduces external pressure: "I think the perception that my teachers could actually see me and call on me at any given time because I am actually present

there, made me behave a little bit more." (Interviewee 8). Also, the interviewees said that there were not enough breaks in lectures which made it difficult for them to focus. Additionally, Interviewee 3 stated that monologues in lectures were more challenging to follow in general.

However, some students experienced questions asked by the lecturers and polls during the online lectures as beneficial since they increase involvement. Moreover, Interviewee 3 pointed out, that they found it easier to ask questions:

I would say, people that want to participate in online lectures can more easily participate, maybe because you do not really feel looked at when you ask something, you do not really feel like people are waiting for you to finish your question and finish understanding what was being said.

Most interviewees expressed a preference for live lectures but thought lectures would be feasible in an online setting if engagement would be increased, which would benefit their attention. All interviewees experienced the recordings as beneficial but expressed concerns regarding their organisation skills and procrastination issues, since remote education decreased external pressure and disrupted their general schedule.

Memory

This subtheme includes aspects related to general daily memory, as well as memory related to retaining study material and information during lectures and classes. The interviewees reported remote education improved their memory with deadlines and meetings, if all the information was available in one document:

I feel like, maybe a bit better sometimes because everything was online documented more clearly when they were, when everything went online. So, it is easier to see them online

then to remember those deadlines from what the teacher said in the lectures and in

offline. (Interviewee 4)

However, due to the decreased social aspect in remote education interviewees were

missing social triggers such as hearing peers talk about deadlines. Interviewee 1, 2 and 7

highlighted the effect of social triggers on their ADHD related memory and time management

issues:

No, that is also very because a lot of the times I hear someone in the back would be like,

"Oh, yeah, did you know that this is due then?". And I am like, "Oh shit, no, I need to

check whether I did it", or I can tell one of my friends like, "Hey, did you do this

already?", if I know that they are forgetful about this, about that subject, but you are kind

of, I feel like if you are taking that whole element away. (Interviewee 7)

The interviewees also reported decreased memory related to retaining information during

lectures and classes because they did not actively listen during lectures due to decreased external

pressure and increased distractions. Interviewee 3 said their memory related to the study material

got worse because they started too late with studying which affected their long-term memory of

the material during remote education. The interviewee explained their decrease in memory with

the increased distractions, like social media. Another aspect mentioned by Interviewee 1 was that

the schedule was generally less filled, which made it more difficult to remember appointments

and deadlines since they could not be placed within the schedule.

Learning Outcomes

Performance

The performance of the interviewees was explored by asking whether their grades

changed after the switch to remote education. In total four participants (2, 6, 7, 8) reported

decreased grades during remote learning, mainly due to the disrupted schedule, increased

procrastination, and the missing social aspect. Also, Interviewee 1 explained, their grades would

have gotten worse if they could not have cheated during the online exams. Regarding cheating,

the interviewee did not express any moral concerns and instead explained that cheating even

reduced their attention, consequently reducing their information intake.

Due to the disrupted schedule, increased opportunities for procrastinations, inefficient

study habits and subsequently the experienced stress and disappointment, Interviewee 2 dropped

out of their minor: "So then I quit the minor, which I do not think I would have done when it was

physical, even if I hated it.". For the same reasons and the reduced social aspect, Interviewee 4

quit their studies and Interviewee 6 forgot to attend a class which led her to fail the class:

> But I would not say it is better for me personally to just be able to get up and not do
>
> anything and basically still wear my pyjamas and sit in front of the laptop. Yes, that is not
>
> a good work environment, but back to schedule. […] it feels less important to me if it is
>
> not in person meeting, and I do not feel as responsible, I guess. So, I would sometimes
>
> forget lectures, especially the less important ones. […] And then I actually failed the class
>
> once because I forgot to go more than three times. (Interviewee 6)

Some interviewees also reported that they perceived fewer barriers to skip lectures during remote

education due to the availability of recordings, which may have an influence on attendance and

thus performance. Furthermore Interviewee 7 explained, skipping lectures increased the risk to

fall behind on studying and negatively impacted the performance.

However, other Interviewees (5 and 3) experienced no decline in their grades and

Interviewee 3 did not find remote learning more challenging since they prefer studying alone.

ADHD AND REMOTE LEARNING

Wellbeing

The theme wellbeing appears to be connected to all other themes and subtheme in the following way: Remote education disrupted the students daily schedule, reduced social contact and increased procrastination. Subsequently, the students experienced more difficulties with time management, a lack of external pressure and motivation which resulted in a decreased academic performance. All these factors and specifically the reduced performance seem to impact mental as well as physical wellbeing, as mentioned by all interviewees.

Mental Wellbeing

Mental wellbeing includes how the students feel about themselves and their life as well how they cope with issues regarding their university experience. Most interviewees experienced a negative impact on their mental wellbeing during remote education.

Generally, the students experienced a decrease in performance and consequently felt more stressed, disappointed, and less motivated during remote education: "I feel like it did put way more stress on me combined with my ADHD as well, but procrastinating a bunch." (Interviewee 7). Interviewee 6 further explained they felt pressured to perform as well as during offline education while their performance decreased, leading to them feeling less happy "I am just not as happy anymore then because I feel stuck in my studies." (Interviewee 6). Another interviewee (8) experienced self-esteem issues due to the decreased performance. Subsequently the student felt depressed, and they mentioned feeling traumatized by remote education which affects the student's attention span long term.

Interviewee 1 explained that their drop in performance due to the missing social triggers led to a negative spiral:

I mean, I start doing less, I think the moment I fall behind and like, I do not live up to

what I think I am capable of doing, then I start to feel bad about that. And I really

struggle with going to work again. And that just goes further and further until at a certain

point, I do not really see a way out.

Lastly, Interviewee 8 felt that remote education made their ADHD symptoms

significantly worse which started to affect them outside of university, for instance they noticed

difficulties paying attention while watching movies. Reasons for this negative impact on their

symptoms were the lack of organisation, reduced social aspect and increased opportunities for

procrastination during remote education.

Physical Wellbeing

This subtheme addresses healthy lifestyle behaviours, experienced stress, eating

behaviours, sleep patterns and general hygiene in relation to the university experience. Physical

wellbeing was addressed by two interviewees, who both expressed a negative impact of remote

education on their physical wellbeing (Interviewee 7 & 8). Moreover, both interviewees felt the

issues experienced during remote education improved after switching back to offline education.

Interviewee 7 and 8 explained that as a consequence of the disrupted routine, their sleep

schedule was negatively impacted during remote education: "My sleep schedule was non-

existent. I think that is the biggest change. I used to be almost completely nocturnal."

(Interviewee 8). A lack of sleep can lead to many health issues like increased illness and the

interviewees felt that it affected their performance negatively. Also, due to their disrupted routine

it was also more difficult for them to take their ADHD medication, since taking it too late leads

to sleeping issues.

Moreover, one student explained that the increased need for independency in connection to organising led to more stress: "I feel like online education really asks a lot of motivation from the student to come to things, to start assignments and all that kind of stuff." (Interviewee 7). As a result of these changes their performance declined and the interviewees felt more fatigue: "The switch to online education I feel like this, just with all stress and all that, I feel like I would just do more low energy, just more tired all the time." (Interviewee 7).

Interviewee 8 further explained the poor structure during remote learning led to a negative change in their eating behaviour which was expressed in weight change due to either binge eating or fully refraining from food. Additionally, Interviewee 8 reported more sickness which may be connected to the lack of sleep, perceived stress, and their eating behaviour.

Improvements

At the end of the interview the students were asked to think about possible improvements and changes in the university education that can improve their experiences considering their ADHD. The most relevant and feasible suggestions will be outlined in the following.

Most interviewees expressed a wish for recorded lectures since it supports their individual learning style. However, some students pointed out that they watch lectures less or too late if they are available online. These students suggested making attendance during live online lectures mandatory while also uploading the recordings to add external pressure. External pressure in general was an important factor and some students mentioned that regular deadlines are very helpful. Furthermore, one interviewee suggested mandatory self-study times. Another suggestion most interviewees mentioned was that everything should be in one place. Meaning, all deadlines, documents, information, the schedule, as well as contact information and links for online meetings. This should support their ADHD related struggles with organisation, time

management and the issue with starting tasks. Furthermore, most interviewees said that lectures and classes should be more interactive. Specifically, asking questions during classes or for reading-materials, smaller classes and related teachers' skills are important for interactivity in their opinion. Moreover, lectures and classes could be shorter, and more breaks could be included. Lectures can be further improved regarding ADHD if subtitles are added, and fewer slides are used that are also more compact.

In general, a wish for a more personal approach was expressed, more support from university and increased awareness from society. Based on that, I made a suggestion to the interviewees which all the students viewed as a feasible solution to some of their issues. I asked them if they would appreciate a program from the university which would give them ADHD specific support. The university could organise study groups for ADHD students. Furthermore, the university could use those study groups to develop a data base of methods and relevant information for students with ADHD, which is based on their experiences. Therefore, the students would increase their own awareness about ADHD, receive help from their ADHD peers and would be able to work in an environment with external pressure. The interviewees reacted positively to this suggestion and liked the general approach. They further added that they would like to learn more about scheduling and time management from university.

Discussion

Summary of the Main Findings

The current study explored the experiences of university students with ADHD with remote learning, to use those to improve their education and wellbeing while studying at university. Remote learning has been perceived by the interviewees as having a negative impact on their university experience and wellbeing. The most important factors seemed to be the

disrupted daily schedule, reduced social contact and increased opportunities for procrastination in remote education. These factors led to increased time management issues, a lack of external pressure and motivation which consequently reduced their academic performance. Due to the reduced performance their mental and physical wellbeing was negatively affected and thus decreased the general university experience. However, the interviewees benefited of receiving study related information within one document, recorded lectures, easier communication with teachers and receiving ADHD specific support from study advisors as well as increased social support during remote education. These factors increased the freedom in their study behaviour, improved their time management skills and added external motivation.

Time Management and Organisation

Generally, interviewees stated that remote learning required more independency from students regarding time management and organisation which had a negative impact on their university experience. Remote education disrupted the student's schedule, decreased barriers for skipping lectures due to recording being available and led to a poor sleep schedule. Subsequently, their performance and wellbeing were impacted negatively. Previous literature has shown that symptoms of ADHD include poor organisational and time management skills, which are described as Executive Dysfunction in the Dual Pathway model (American Psychiatric Association, 2013; Sonuga-Barke, 2002). Therefore, increased independency regarding time management and organisation during remote education is problematic for students with ADHD.

Since the recordings of lectures were generally perceived as beneficial but led to decreased attendance, a solution may be mandatory live lectures. Meaning, all students must attend the remote live lectures and recordings are uploaded afterwards. Attendance could be monitored automatically to reduce the workload for lecturers. Moreover, interviewees suggested

increasing the interactivity in lectures by adding questions and polls. Increased interactivity may lead to higher attendance for all students and students with ADHD specifically since it supports their difficulties with attention and motivation (Douglas, 2021).

Beyond that, one interviewee experienced beneficial support regarding time management and organisation from their study advisor. The study advisor suggested changes in their sleep schedule and scheduled their weekly study time with them. Several sources support this positive effect since they found that direct instruction is required to develop self-regulation skills (Hecker et al., 2002; Reid et al., 2005; Ruban et al., 2003). Since direct instruction is lacking in remote education, additional support specific to time management and organisation is likely beneficial for students with ADHD. Besides study advisors, workshops, and regular group sessions for students with ADHD who struggle with these skills may be beneficial and more feasible than individual meetings. Moreover, individual meetings could instead be implemented for students who are showing difficulties, which could be detected by changes in their recorded attendance. Additionally, the automatic attendance system could also monitor missed deadlines to increase preventative measures. Furthermore, since study advisors often are not trained regarding physical and mental health support, other staff like the student psychologist could take over study skill specific workshops.

External Factors

During remote education the reduced social contact, lack of structure and changed learning environment decreased perceived external pressure and subsequently negatively influenced their experience and wellbeing. External pressure and motivation seem to be highly important for the students' academic performance and the interviewees experienced social interaction as their main source for both. The Dopamine Theory associates the reduced effects of

dopamine with a decrease in motivation, which may explain why more external pressure is needed for students with ADHD (Levy, 1991). Previous literature furthermore showed that students with ADHD are more likely to procrastinate, which is supported by the Dysfunction in the Dual Pathway model (Sonuga-Barke, 2003). Thus, external pressure may support the students in reducing procrastination and increasing their ability to focus.

One beneficial aspect during remote education mentioned by the interviewees was having all relevant information and documents available in one document, since it reduced barriers to start studying and increased motivation and attention. Previously, students expressed concerns regarding prolonged attention during remote education, supporting the finding that decreased barriers are likely beneficial (Parker & Banerjee, 2007). Considering the Dual Pathway model, removed barriers may reduce negative emotions experienced and lead to a decreased likelihood of shifting attention (Sonuga-Barke, 2002). Thus, interviewees and previous literature supports the beneficial influence of having all relevant information available in one document which should be implemented within university education in general.

In order to increase external pressure within remote education, several changes could be made. During lectures, external pressure could be added by increasing interactivity as explained before but also by introducing mandatory multiple-choice tests after each lecture. Implementing group discussion in break out rooms during lectures may increase interactivity as well as external pressure and thus benefit students with ADHD.

Interviewees generally experienced more external pressure during group work and similarly perceived studying with others as beneficial. This can be explained by the concept of body doubling which entails doing a task with other people present (Jackson, 2021). Body doubling introduces external pressure because others may be watching and reduces feelings of

isolation. As suggested and supported by the interviewees, offering students opportunities for studying in groups would likely be beneficial for students with ADHD. While this could be implemented within the mandatory classes by increasing group work, based on the interviews it appears more relevant to support the students regarding their self-studying. Thus, universities could create an online system in which study slots are offered for group studying without teacher with sign-ups.

Another finding which is supported by Caerdydds study (2017) was that friendships have a positive influence on the student's experience by supporting time management and increasing external pressure. However, during remote education and especially for first years, building friendships is difficult regardless of ADHD (Eberle & Hobrecht, 2021). Universities could support formation of friendships by creating more opportunities, especially in online settings. However, research has found that students were not able to form new friendships over online resources offered by university (Eberle & Hobrecht, 2021). Thus, there is a need for intervention to support socializing within remote education.

Lastly, interviewees reported they felt stigmatized by peers and teachers regarding their ADHD, which negatively affected their wellbeing as supported by literature (Flanigan, 2021). More importantly, the perceived stigma prevented them from asking for support, which is supported by previous literature (Deckoff-Jones & Duell, 2018). Considering the benefits of support and the interviewees suggestions for increased support, barriers for students with ADHD should be decreased by the university. Deckhoff-Jones and Duell (2018) suggested programs that could be implemented at universities which focus on integrating students with ADHD into the social environment. These programs could include peer support groups and mentoring programs to support the formation of relationships between peers and create a safe space for students to

talk about their difficulties regarding ADHD. Furthermore, Deckhoff-Jones and Duell (2018) described educational programs, which should focus on invisible disabilities and illnesses to reduce stigma within the general university population.

Strengths and Limitations

Participant engagement was of high relevance during the entire research process. Conducting research without engaging the participants may reduce the relevance of the study results because the participants needs may not be reflected enough and thus, they are less likely to accept the results (Maurer et al., 2022). During the research three participants were consulted for feedback on the research question, selection of methods and analysis of the findings. Based on their input, questions in the topic guide were added and others rephrased to reduce their complexity. Due to this, more relevant questions were asked and there were apparently less difficulties for the participants to understand the questions. Moreover, the participants were consulted during the development of themes and their input highlighted important topics that should be included. Thus, participant engagement improved the quality and relevance of the results.

Furthermore, the chosen method allowed the participants to freely express their opinion while all relevant topics were covered. This is specifically relevant considering the lack of research within this topic which requires exploration. Moreover, the balance between female and male participants is a positive aspect of the current research considering the underrepresentation of females in previous research. However, due to the strong representation of the inattentive type within the sample group it was not possible to make comparisons between sexes.

The study still included a small number of students from whom most studied at universities within the same city. Some of these students were friends of mine which may have

had an influence on the interviews as well as the analysis. Research has shown that pitfalls of conducting research on friends can include making assumptions about the meaning of statements without asking for clarification, skipping topics or questions due to prior knowledge and the participants may leave out details because they assume the researcher knows them (Unluer, 2012). Also, interviews and interpretation may be biased due to prior knowledge, assumptions, and subjectivity, leading for instance to a prioritisation of their statements and assumptions (Unluer, 2012). However, since a topic guide was used during the interviews, the likelihood of skipping themes and questions was reduced. Beyond that, previous research has shown, that insider research increases the depth of data collection, the likelihood of sensitive information being shared, and follow up conversations are more (Greene, 2014; Unluer, 2012). The extended contact with the participants was especially useful regarding the participant engagement.

Lastly, the study was conducted during the Covid pandemic which likely had an influence on the education as well as the student's wellbeing and perceived university experience. Due to the Covid 19 pandemic, social interaction in society was reduced and many people experienced a negative impact on their wellbeing. Therefore, it is difficult to separate the impacts on the participants wellbeing from remote education and the Covid 19 pandemic. Also, because of the Covid 19 pandemic, the education had to move swiftly to remote education without a proper design phase and preparation for the educators. Thus, the quality of remote education offered to the students within this study may not reflect remote education in general outside the context of a pandemic.

Practical Implications

Considering the current developments regarding technology and the changes in education due to the Covid pandemic it can be expected that university education will implement more

remote learning in the future. Although the general education was perceived by participants as not made for students with ADHD and remote education was described as the worst possible learning environment, other participants expressed hope for the future. Therefore, implications of the results should be considered to improve the university experience and wellbeing of students with ADHD.

Mandatory attendance during live lectures was perceived as a requirement for a beneficial effect of recorded lectures. While, previous literature supports the finding that recordings are beneficial, the recommendation for mandatory attendance has not been found (Fichten et al., 2021). Also, regarding lectures, mandatory post-test could be beneficial for students with ADHD since it increases engagement. Additionally, lecturers should increase usage of engaging tools such as polls and asking questions, which has been suggested by previous literature (Nordmann et al., 2022). Furthermore, lectures should have more frequent breaks and more compact slides to support attention.

In terms of specific support regarding the symptoms of ADHD, several programs could be implemented. Workshops and groups sessions with student psychologist concerning the student's wellbeing, time management and organisation could be set up. Universities are already offering many workshops and recent research suggests a need for increased focus on certain groups like students with ADHD (Gill, 2022). Study advisors should further continue to support students individually regarding study skills if needed. Moreover, the university should offer a system in which study groups can be formed via sign ups during set times for self-studying. Interviewees suggested this support system during the study and there was no research found including this approach, however the principle of body doubling supports the expected positive effects (Jackson, 2021).

Lastly, since the results of the current study as well as previous literature has shown that students with ADHD tend to not ask for support due to stigma, several programs should be implemented as suggested by previous research. Programs for integrating students with ADHD in the social environment should be implemented as well as educational programs specific to invisible disabilities and mental illnesses to reduce stigma from peers and staff, thus reducing barriers for support.

Conclusion and Further Outlook

The Covid pandemic may have forced universities to switch to remote education but looking at the future this step seemed to be inevitable. Thus, within the educational system, this should be considered as an opportunity to implement technology in a beneficial way for all students. This research has shown that students with ADHD perceived remote education has having a negative impact on their university experience and wellbeing. Main factors for this negative impact were the disrupted daily schedule, increased opportunities for procrastination in relation to time management issues and lack of external pressure. Subsequently, the reduced performance reduced their general wellbeing.

While inattention is a symptom of ADHD, the results showed that attention is not the solution to the problems faced by students. Research has shown that individuals with ADHD are very much able to pay prolonged attention if the circumstances facilitate it, for instance during video games (Hupfeld et al., 2019). Suggestions within is study focus on improving the learning environment for students with ADHD by offering various support systems and implementing smaller changes in the general approach to education. These suggestions include increasing interactivity in lectures, increasing external pressure with mandatory attendance and offering

study group systems to support self-studying. Furthermore, due to the perceived barriers caused by stigma to ask for support, programs for social integration and education are suggested.

Based on the previous research concerning students with ADHD at universities, a lack of knowledge and solutions was found. The findings of the current research demonstrate the relevance and need for further research about how the education must be improved and adjusted for students with ADHD. Specifically, interventions for social integration and interaction within remote settings are lacking in the university context. Furthermore, future research should focus on finding ways to reduce stigma surrounding invisible disabilities and mental illnesses to reduce perceived barriers for receiving support. This study contributes to the existing research by suggesting target group specific and feasible means to improve remote and offline learning at universities.

References

Aase, H., & Sagvolden, T. (2006). Infrequent, but not frequent, reinforcers produce more variable responding and deficient sustained attention in young children with attention-deficit/hyperactivity disorder (ADHD). *Journal of Child Psychology and Psychiatry, 47*(5), 457-471. https://doi.org/10.1111/j.1469-7610.2005.01468.x

Agrawal, N., Faruqui, R., & Bodani, M. (Eds.). (2020). *Oxford textbook of neuropsychiatry. Oxford University Press.*

American Psychiatric Association, D. S., & American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (Vol. 5). Washington, DC: American psychiatric association.

Anderson, D. (n.d.). *What is the difference between ADD and ADHD?* Child Mind Institute. https://childmind.org/article/what-is-the-difference-between-add-and-adhd/

Barkley, R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: constructing a unifying theory of ADHD. *Psychological bulletin*, *121*(1), 65.

Blase, S. L., Gilbert, A. N., Anastopoulos, A. D., Costello, E. J., Hoyle, R. H., Swartzwelder, H. S., & Rabiner, D. L. (2009). Self-reported ADHD and adjustment in college: Cross-sectional and longitudinal findings. *Journal of Attention Disorders*, *13*(3), 297-309. https://doi.org/10.1177/2F1087054709334446

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology, 3*(2), 77-101.

Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbooks in psychology. APA handbook of research methods in psychology, Vol. 2. Research designs: Quantitative,*

qualitative, neuropsychological, and biological (p. 57–71). American Psychological

Association. https://doi.org/10.1037/13620-004

Caerdydd, P. F. (2017). *An Exploration into the impact of ADHD on university student's*

experiences, investigating reoccurring themes from childhood to early adulthood.

(Master's thesis, Cardiff Metropolitan University).

Canu, W. H., Stevens, A. E., Ranson, L., Lefler, E. K., LaCount, P., Serrano, J. W., ... &

Hartung, C. M. (2021). College readiness: Differences between first-year undergraduates

with and without ADHD. *Journal of Learning Disabilities*, *54*(6), 403-411.

https://doi.org/10.1177/2F0022219420972693

Caye, A., Swanson, J. M., Coghill, D., & Rohde, L. A. (2019). Treatment strategies for

ADHD: an evidence-based guide to select optimal treatment. *Molecular psychiatry*,

24(3), 390-408. https://doi.org/10.1038/s41380-018-0116-3

Cheng, S. C., & Lai, C. L. (2020). Facilitating learning for students with special needs: a

review of technology-supported special education studies. *Journal of computers in*

education, *7*(2), 131-153. https://doi.org/10.1007/s40692-019-00150-8

Cho, M. H. (2004). The Effects of Design Strategies for Promoting Students' Self-Regulated

Learning Skills on Students' Self-Regulation and Achievements in Online Learning

Environments. *Association for Educational Communications and Technology*.

Cinquin, P. A., Guitton, P., & Sauzéon, H. (2019). Online e-learning and cognitive

disabilities: A systematic review. *Computers & Education, 130*, 152-167.

https://doi.org/10.1016/j.compedu.2018.12.004

ehta

Dalen, L., Sonuga-Barke, E. J., Hall, M., & Remington, B. (2004). Inhibitory deficits, delay

aversion and preschool AD/HD: implications for the dual pathway model. *Neural plasticity, 11*(1-2), 1-11. https://doi.org/10.1155/NP.2004.1

Deckoff-Jones, A., & Duell M. N. (2018). "Perceptions of Appropriateness of Accommodations for University Students: Does Disability Type Matter?" *Rehabilitation Psychology* 63 (1): 68–76. http://dx.doi.org/10.1037/rep0000213

Deragotis, L. R., & Melisaratos, N. (1992). The brief symptom inventory. *Baltimore: Clinical Psychometric Research*.

Deragotis, L. R., Morrow, J. A., Fetthing, J. A., Fetting, J., & Hallad, J. (1984). The SCL 90-R, as psychiatric screening measure in a cancer population. *American Journal of Epidemiology*, *144*, 15027.

Dougherty, D. D., Bonab, A. A., Spencer, T. J., Rauch, S. L., Madras, B. K., & Fischman, A. J. (1999). Dopamine transporter density in patients with attention deficit hyperactivity disorder. *The Lancet, 354*(9196), 2132-2133. https://doi.org/10.1016/S0140-6736(99)04030-1

Douglas, C. (2021). Strategies for Increasing Attendance for Identified Student Populations via Online Engagement Methods During the COVID-19 Pandemic.

Dresel, S., Krause, J., Krause, K. H., LaFougere, C., Brinkbäumer, K., Kung, H. F., ... & Tatsch, K. (2000). Attention deficit hyperactivity disorder: binding of [99mTc] TRODAT-1 to the dopamine transporter before and after methylphenidate treatment. *European journal of nuclear medicine, 27*(10), 1518-1524. https://doi.org/10.1007/s002590000330

DuPaul, G. J., Guevremont, D. C., & Barkley, R. A. (1991). Attention deficit-hyperactivity

disorder in adolescence: Critical assessment parameters. *Clinical Psychology Review*, *11*(3), 231-245. https://doi.org/10.1016/0272-7358(91)90102-Z

DuPaul, G. J., Schaughency, E. A., Weyandt, L. L., Tripp, G., Kiesner, J., Ota, K., & Stanish, H. (2001). Self-report of ADHD symptoms in university students: Cross-gender and cross-national prevalence. *Journal of learning disabilities*, 34(4), 370-379. https://doi.org/10.1177%2F002221940103400412

Eberle, J., & Hobrecht, J. (2021). The lonely struggle with autonomy: A case study of first-year university students' experiences during emergency online teaching. *Computers in Human Behavior*, *121*, 106804. https://doi.org/10.1016/j.chb.2021.106804

Egger, H. L., Costello, E. J., Erkanli, A., & Angold, A. (1999). Somatic complaints and psychopathology in children and adolescents: stomach aches, musculoskeletal pains, and headaches. *Journal of the American Academy of Child & Adolescent Psychiatry,* 38(7), 852-860. https://doi.org/10.1097/00004583-199907000-00015

Faraone, S. V., Asherson, P., Banaschewski, T., Biederman, J., Buitelaar, J. K., Ramos-Quiroga, J. A., ... & Franke, B. (2015). Attention-deficit/hyperactivity disorder. *Nature Reviews Disease Primers*, *1*, e15020. https://doi.org/10.1038/nrdp.2015.20

Fichten, C. S., Havel, A., Jorgensen, M., Wileman, S., Harvison, M., Arcuri, R., & Olivia, R. (2021). Let's Get Real! What Apps Do Postsecondary Students with Attention Deficit Hyperactivity Disorder Actually Find Helpful When Doing Schoolwork?. Vol. 3 No. 2 (2022): Journal of Inclusive Postsecondary Education

Flanigan, L. K. (2021). I do not have stigma towards people with ADHD (but I do think they're lazy): Using education and experience to reduce negative attitudes towards ADHD. http://dx.doi.org/10.11575/PRISM/38647

Flinsenberg, D. (2020). *Autonomy through technology: engaging executive functions in ADHD with an extended mind approach* (Master's thesis, University of Twente).

Gill, N. (2022). *The ADHDe Project* (University of Windsor).

Graetz, B. W., Sawyer, M. G., & Baghurst, P. (2005). Gender differences among children with DSM-IV ADHD in Australia. *Journal of the American Academy of Child & Adolescent Psychiatry, 44*(2), 159-168. https://doi.org/10.1097/00004583-200502000-00008

Greene, M. J. (2014). On the inside looking in: Methodological insights and challenges in conducting qualitative insider research. *The qualitative report*, *19*(29), 1-13.

Grenwald-Mayes, G. (2001). Relationship between current quality of life and family of origin dynamics for college students with attention-deficit/hyperactivity disorder. *Journal of attention disorders*, *5*(4), 211-222.https://doi.org/10.1177/2F108705470100500403

Harbour, W. S. (2004). The 2004 AHEAD survey of higher education disability services providers. Waltham, MA: Association on Higher Education and Disability.

Harvey-Jordan, S., & Long, S. (2001). The process and the pitfalls of semi-structured interviews. *Community Practitioner, 74*(6), 219.

HEATH Resource Center. (1993). College freshmen with disabilities. Washington, DC: American Council on Education.

Hecker, L., Burns, L., Katz, L., Elkind, J., & Elkind, K. (2002). Benefits of assistive reading software for students with attention disorders. *Annals of dyslexia*, *52*(1), 243-272. https://doi.org/10.1007/s11881-002-0015-8

Hinshaw, S. P. (2002). Preadolescent girls with attention-deficit/hyperactivity disorder: I.

Background characteristics, comorbidity, cognitive and social functioning, and parenting

practices. *Journal of consulting and clinical psychology*, *70*(5), 1086.

https://psycnet.apa.org/doi/10.1037/0022-006X.70.5.1086

Heiligenstein, E., Conyers, L. M., Berns, A. R., & Smith, M. A. (1998). Preliminary

normative data on DSM-IV attention deficit hyperactivity disorder in college students.

Journal of American college health, *46*(4), 185-188.

https://doi.org/10.1080/07448489809595609

Heiligenstein, E., Guenther, G., Levy, A., Savino, F., & Fulwiler, J. (1999). Psychological

and academic functioning in college students with attention deficit hyperactivity disorder.

Journal of American college health, *47*(4), 181-185.

https://doi.org/10.1080/07448489909595644

Henderson, C. (1999). College Freshman with Disabilities: A Biennial Statistical Profile.

ERIC Document Reproduction No. ED 436 900, HEATH Resource Center, Washington,

DC.

Hubble, S., & Bolton, P. (2021). Support for disabled students in higher education in England

(Research briefing number 8716). *House of commons library, UK parliament.*

Hupfeld, K. E., Abagis, T. R., & Shah, P. (2019). Living "in the zone": hyperfocus in adult

ADHD. *ADHD Attention Deficit and Hyperactivity Disorders*, *11*(2), 191-208.

https://doi.org/10.1007/s12402-018-0272-y

Jackson, O. (2021). *Ascending Diverse Learners.* (Northeastern Illinois University)

Johansen, E. B., Killeen, P. R., & Sagvolden, T. (2007). Behavioral variability, elimination of

responses, and delay-of-reinforcement gradients in SHR and WKY rats. *Behavioral and

Brain Functions,* 3(1), 1-11. https://doi.org/10.1186/1744-9081-3-60

Kern, R. M. et al. (1999). Lifestyle, personality, and attention deficit hyperactivity disorder in

young adults. *Individual Psychology* 55.2: 186.

Kowal, S., & O'Connell, D. C. (2014). Transcription as a crucial step of data analysis. *The SAGE

handbook of qualitative data analysis*, *64*-79.

Krause, K. H., Dresel, S. H., Krause, J., Kung, H. F., & Tatsch, K. (2000). Increased striatal

dopamine transporter in adult patients with attention deficit hyperactivity disorder: effects

of methylphenidate as measured by single photon emission computed tomography.

Neuroscience letters, 285(2), 107-110. https://doi.org/10.1016/S0304-3940(00)01040-5

Levy, F. (1991). The dopamine theory of attention deficit hyperactivity disorder (ADHD).

Australian & New Zealand Journal of Psychiatry, *25*(2), 277-283.

https://doi.org/10.3109/2F00048679109077746

Lewandowski, L. J., Lovett, B. J., Codding, R. S., & Gordon, M. (2008). Symptoms of ADHD

and academic concerns in college students with and without ADHD diagnoses. *Journal of

Attention Disorders*, *12*(2), 156-161.https://doi.org/10.1177/2F1087054707310882

Marco, R., Miranda, A., Schlotz, W., Melia, A., Mulligan, A., Müller, U., ... & Sonuga-

Barke, E. J. (2009). Delay and reward choice in ADHD: an experimental test of the role

of delay aversion. *Neuropsychology, 23*(3), 367.

Marx, I., Hübner, T., Herpertz, S. C., Berger, C., Reuter, E., Kircher, T., ... & Konrad, K.

(2010). Cross-sectional evaluation of cognitive functioning in children, adolescents and

young adults with ADHD. *Journal of neural transmission*, *117*(3), 403-419.

https://doi.org/10.1007/s00702-009-0345-3

Maurer, M., Mangrum, R., Hilliard-Boone, T., Amolegbe, A., Carman, K. L., Forsythe, L., ... &

Woodward, K. (2022). Understanding the Influence and Impact of Stakeholder

Engagement in Patient-centered Outcomes Research: a Qualitative Study. *Journal of General Internal Medicine*, *37*(1), 6-13. https://doi.org/10.1007/s11606-021-07104-w

McKee, T. E. (2008). Comparison of a norm-based versus criterion-based approach to

measuring ADHD symptomatology in college students. *Journal of Attention Disorders*, *11*(6), 677-688. https://doi.org/10.1177%2F1087054707308501

Mehta, T. R., Monegro, A., Nene, Y., Fayyaz, M., & Bollu, P. C. (2019). Neurobiology of

ADHD: a review. *Current Developmental Disorders Reports*, *6*(4), 235-240.

https://doi.org/10.1007/s40474-019-00182-w

Milman, N.B. (2015). Distance Education. *International Encyclopedia of the Social & Behavioural Sciences* (2nd ed.): 567-570. https://doi.org/10.1016/B978-0-08-097086-8.92001-4

Mortier, P., Demyttenaere, K., Nock, M. K., Green, J. G., Kessler, R. C., & Bruffaerts, R.

(2015). The epidemiology of ADHD in first-year university students. *Tijdschrift voor psychiatrie*, *57*(9), 635-644.

Nordmann, E., Clark, A., Spaeth, E., & MacKay, J. R. (2022). Lights, camera, active!

appreciation of active learning predicts positive attitudes towards lecture capture. *Higher Education*, *83*(3), 481-502. http://dx.doi.org/10.1007/s10734-020-00674-4

Paling, R. M. (2020). An Empirical study to determine whether ADHD disorder affects the

process of language learning. *Journal of Psychology and Neuroscience*.

Parker, D. R., & Banerjee, M. (2007). Leveling the digital playing field: Assessing the

learning technology needs of college-bound students with LD and/or ADHD. *Assessment for Effective Intervention, 33*(1), 5-14.

https://doi.org/10.1177%2F15345084070330010201

Patton, M. Q. (1990). *Qualitative evaluation and research methods*. SAGE Publications, inc.

Pollock, A., Campbell, P., Struthers, C., Synnot, A., Nunn, J., Hill, S., ... & Morley, R. (2018). Stakeholder involvement in systematic reviews: a scoping review. Systematic reviews, *7*(1), 1-26. https://doi.org/10.1186/s13643-018-0852-0

Quinn, P. O., & Madhoo, M. (2014). A review of attention-deficit/hyperactivity disorder in women and girls: uncovering this hidden diagnosis. *The primary care companion for CNS disorders*, *16*(3), 27250. https://doi.org/10.4088/PCC.13r01596

Rabiner, D. L., Anastopoulos, A. D., Costello, J., Hoyle, R. H., & Swartzwelder, H. S. (2008). Adjustment to college in students with ADHD. *Journal of Attention Disorders*, *11*(6), 689-699. https://doi.org/10.1177%2F1087054707305106

Ramtekkar, U. P., Reiersen, A. M., Todorov, A. A., & Todd, R. D. (2010). Sex and age differences in attention-deficit/hyperactivity disorder symptoms and diagnoses: implications for DSM-V and ICD-11. *Journal of the American Academy of Child & Adolescent Psychiatry*, *49*(3), 217-228. https://doi.org/10.1016/j.jaac.2009.11.011

Rasmussen, K., & Levander, S. (2009). Untreated ADHD in adults: are there sex differences in symptoms, comorbidity, and impairment?. *Journal of Attention Disorders*, *12*(4), 353-360. https://doi.org/10.1177%2F1087054708314621

Reaser, A., Prevatt, F., Petscher, Y., & Proctor, B. (2007). The learning and study strategies of college students with ADHD. *Psychology in the Schools*, *44*(6), 627-638.https://doi.org/10.1002/pits.20252

Reid, R., Trout, A. L., & Schartz, M. (2005). Self-regulation interventions for children with attention deficit/hyperactivity disorder. *Exceptional Children*, *71*(4), 361.

Richards, T. L., Deffenbacher, J. L., & Rosen, L. A. (2002). Driving anger and other driving-related behaviors in high and low ADHD symptom college students. *Journal of Attention Disorders*, *6*(1), 25-38. https://doi.org/10.1177/2F108705470200600104

Richards, T. L., Rosen, L. A., & Ramirez, C. A. (1999). Psychological functioning differences among college students with confirmed ADHD, ADHD by self-report only, and without ADHD. *Journal of College Student Development*.

Ruban, L. M., McCoach, D. B., McGuire, J. M., & Reis, S. M. (2003). The differential impact of academic self-regulatory methods on academic achievement among university students with and without learning disabilities. Journal of learning disabilities, 36(3), 270-286. https://doi.org/10.1177%2F002221940303600306

Sagvolden, T., Aase, H., Zeiner, P., & Berger, D. (1998). Altered reinforcement mechanisms in attention-deficit/hyperactivity disorder. Behavioural brain research, 94(1), 61-71. https://doi.org/10.1016/S0166-4328(97)00170-8

Sagvolden, T., Johansen, E. B., Aase, H., & Russell, V. A. (2005). A dynamic developmental theory of attention-deficit/hyperactivity disorder (ADHD) predominantly hyperactive/impulsive and combined subtypes. Behavioral and Brain Sciences, 28(3), 397-418. https://doi.org/10.1017/S0140525X05000075

Shaw-Zirt, B., Popali-Lehane, L., Chaplin, W., & Bergman, A. (2005). Adjustment, social skills, and self-esteem in college students with symptoms of ADHD. *Journal of attention disorders*, *8*(3), 109-120.https://doi.org/10.1177%2F1087054705277775

Shen, C., Luo, Q., Jia, T., Zhao, Q., Desrivières, S., Quinlan, E. B., ... & IMAGEN

consortium. (2020). Neural correlates of the dual-pathway model for ADHD in

adolescents. American Journal of Psychiatry, 177(9), 844-854.

https://doi.org/10.1176/appi.ajp.2020.19020183

Solanto, M. V., Abikoff, H., Sonuga-Barke, E., Schachar, R., Logan, G. D., Wigal, T., ... &

Turkel, E. (2001). The ecological validity of delay aversion and response inhibition as

measures of impulsivity in AD/HD: a supplement to the NIMH multimodal treatment

study of AD/HD. Journal of abnormal child psychology, 29(3), 215-228.

https://doi.org/10.1023/A:101032971481

Sonuga-Barke, E. J. (2002). Psychological heterogeneity in AD/HD—a dual pathway model

of behaviour and cognition. *Behavioural brain research*, *130*(1-2), 29-36.

https://doi.org/10.1016/S0166-4328(01)00432-6

Sonuga-Barke, E. J. (2003). The dual pathway model of AD/HD: an elaboration of neuro-

developmental characteristics. *Neuroscience & Biobehavioral Reviews*, *27*(7), 593-604.

https://doi.org/10.1016/j.neubiorev.2003.08.005

Sonuga-Barke, E. J., Taylor, E., Sembi, S., & Smith, J. (1992). Hyperactivity and delay

aversion—I. The effect of delay on choice. *Journal of Child Psychology and Psychiatry*,

33(2), 387-398. https://doi.org/10.1111/j.1469-7610.1992.tb00874.x

Study in Holland. (n.d.). *The Dutch way of teaching*.

https://www.studyinholland.nl/dutch-education/dutch-way-of-teaching

Thorell, L. B. (2007). Do delay aversion and executive function deficits make distinct

contributions to the functional impact of ADHD symptoms? A study of early academic

skill deficits. Journal of child Psychology and Psychiatry, 48(11), 1061-1070.

https://doi.org/10.1111/j.1469-7610.2007.01777.x

Turnock, P., Rosen, L. A., & Kaminski, P. L. (1998). Differences in Academic Coping

Strategies of College Students Who Self-Report High and Low Symptoms of Attention

Deficit Hyperactivity Disorder. *Journal of College Student Development*, *39*(5), 484-93.

University of Twente. (2017). *The Twente Educational Model* [Brochure].

https://www.utwente.nl/en/tom/tom-brochure-2017-definitieveversie15mei2017.pdf

Unluer, S. (2012). Being an insider researcher while conducting case study research. *Qualitative*

Report, *17*, 58.

Volkow, N. D., Wang, G. J., Newcorn, J., Fowler, J. S., Telang, F., Solanto, M. V., ... &

Pradhan, K. (2007). Brain dopamine transporter levels in treatment and drug naive adults

with ADHD. Neuroimage, 34(3), 1182-1190.

https://doi.org/10.1016/j.neuroimage.2006.10.014

Weyandt, L. L., Iwaszuk, W., Fulton, K., Ollerton, M., Beatty, N., Fouts, H., ... & Greenlaw, C.

(2003). The internal restlessness scale: performance of college students with and without

ADHD. *Journal of Learning Disabilities*, *36*(4), 382-389.

https://doi.org/10.1177/2F00222194030360040801

Weyandt, L. L., Linterman, I., & Rice, J. A. (1995). Reported prevalence of attentional

difficulties in a general sample of college students. Journal of Psychopathology and

Behavioral Assessment, 17(3), 293-304. https://doi.org/10.1007/BF02229304

Weyandt, L. L., Rice, J. A., Linterman, I., Mitzlaff, L., & Emert, E. (1998). Neuropsychological

performance of a sample of adults with ADHD, developmental reading disorder, and

controls. *Developmental neuropsychology*, *14*(4), 643-

656.https://doi.org/10.1080/87565649809540734

Wolf, L. E. (2001). College students with ADHD and other hidden disabilities: Outcomes and

interventions. *Annals of the New York Academy of Sciences, 931*(1), 385-395.

https://doi.org/10.1111/j.1749-6632.2001.tb05792.x

Wolf, G. J., Weyandt, L. L., O'Dell, S. M., & Varejao, M. (2009). College students with

ADHD: Current status and future directions. *Journal of attention disorders*, *13*(3), 234-

250. https://doi.org/10.1177%2F1087054709340650

Zhang, J., Shuai, L., Yu, H., Wang, Z., Qiu, M., Lu, L., ... & Chen, R. (2020). Acute stress,

behavioural symptoms and mood states among school-age children with attention-

deficit/hyperactive disorder during the COVID-19 outbreak. *Asian journal of psychiatry*,

51, 102077.https://doi.org/10.1016%2Fj.ajp.2020.102077

Appendix A

Diagnostic Criteria for ADHD (DSM)

Diagnostic Criteria for ADHD
1. A recurring pattern of distress that interferes with functioning in social, personal or academic/occupational areas. Specific symptomological presentation (subtype) is determined by the presence symptoms (that have been persistent for at least six months) and is classified as follows:
    a. **Inattentive subtype:**
    The symptoms are not solely a manifestation of oppositional behaviour, defiance, hostility, or failure to understand tasks or instructions. For older adolescents and adults (age 17 and older), at least five symptoms are required.
        i. Often makes careless mistakes or demonstrates poor attention to detail
        ii. Often faces challenges remaining focused on tasks; difficulty in sustaining attention for extended periods of time.
        iii. Often does not appear to listen when spoken or seems distracted when there are no other stimuli present.
        iv. Often demonstrates lack of follow through, easily side-tracked of fails to complete work or classroom assignments.
        v. Often has difficulty with organization; demonstrates poor time management.
        vi. A pattern of dislike or avoidance for activities that require sustained mental effort.
        vii. Frequently loses things or forgets items that are necessary for the completion of tasks or activities.
        viii. Is often easily distracted by the outside environment
        ix. Frequently forgets routine task or activities
    b. **Hyperactive and impulsive subtype:**
        i. Excessive fidgeting, squirming or movement, particularly when seated.
        ii. Difficulty remaining seated when being seated is expected.
        iii. Frequently runs about or climbs in inappropriate situations.
        iv. Often unable to engage in quiet activities.
        v. Feels uncomfortable being still for extended time, appears restless and may be difficult to keep up with.
        vi. Often talks excessively
        vii. Frequently interrupts others in conversation or blurts out answers to a question
        viii. Shows difficulty in waiting his or her turn
        ix. Frequently intrudes on the activities of others
    c. Six or more symptoms were present prior to age 12 years (five or more symptoms if being evaluated over the age of 17).
    d. Symptoms are present in three or more settings.
    e. Clear evidence that the symptoms are impairing in social, interpersonal and/or academic/professional settings.

    f. The symptoms cannot be better explained by another medical condition or mental disorder

When diagnosing ADHD, it is usual to specify presentation classifications as follows:

- **Combined presentation**: If criterion for both the inattention subtype (1a) and the hyperactive-impulsive subtype (1b) are met.
- **Predominantly inattentive presentation**: If only the criterion for the inattention subtype (1a) are met.
- **Predominantly hyperactive/impulsive presentation**: If only the criterion for the hyperactive-impulsive subtype (1b) are met.

Condition may also be specified as being in partial remission

- **In partial remission**: Full criteria were previously met, however fewer than the full criteria are currently present despite continued impairment in personal, social or academic/occupational functioning.

It is also common to specify symptom severity:

- **Mild**: Few or no symptoms in excess of those required to make the diagnosis are present, and/or symptoms result only in minor impairments.
- **Moderate**: Symptoms or functional impairment are currently present and can be classified as are neither "mild" nor "severe".
- **Severe**: The presence of many symptoms in excess of those required in making the diagnosis or the symptoms result in significant impairment or performance.

ADHD AND REMOTE LEARNING

Appendix B

Consent Form for the interview

Participant number:

Consent Form for *Experiences of university students with ADHD with remote learning*

YOU WILL BE GIVEN A COPY OF THIS INFORMED CONSENT FORM

Please tick the appropriate boxes	Yes	No
Taking part in the study		
I have read and understood the study information sheet provided, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	O	O
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	O	O
I understand that taking part in the study involves an audio-recorded interview that will be transcribed as text. I understand that the recording will be saved on a secure and password protected utwente platform.	O	O
Use of the information in the study		
I understand that information I provide will be used to explore common themes of experiences of students with ADHD and (remote) education at university.	O	O
I understand that personal information collected about me that can identify me, such as [e.g. my name or where I live], will not be shared beyond the study team.	O	O
I agree that my information can be quoted in research outputs	O	O
Consent to be Audio Recorded		
I agree to be audio recorded. Yes/no	O	O
Future use and reuse of the information by others		
I give permission for the audio recording and the transcription of the audio-recording to be archived by the University of Twente so it can be used for future research and learning.	O	O

Signatures

_____   _____ _____

Name of participant

                              Signature   Date

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

_____   _____ _____

Researcher name   Signature   Date

Study contact details for further information:

Sonja Dobrowolski: s.dobrowolski@student.utwente.nl

Steven Watson: s.j.watson@utwente.nl

Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee/domain Humanities & Social Sciences of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-hss@utwente.nl

ADHD AND REMOTE LEARNING

Appendix C

Practitioner topic guide for the interview

Interview number:

Place:

Date:

Time:

Duration:

Introduction

A lot of education at university has been delivered online over the last couple of years. I want to understand how this might have affected the education and university experience of people with ADHD, both positively and negatively. With this information I hope to gain understanding about how the student's education and wellbeing can be improved in the future, whether delivered online or face-to-face.

I will interview you about your experiences at university. The interview will take no more than one hour. Topics I will ask about include how your ADHD affects your education in general, how online teaching in particular has affected you and your studies, and how online education has impacted on your wider experiences as a student. For example, I might ask about social life and general physical and mental wellbeing. Please note you do not have to answer any questions you do not want to, and you do not have to explain why. You can also ask that we skip any topics you do not wish to discuss.

Your participation is voluntary, and you can decide to withdraw from the study at any given moment. You do not have to explain why you wish to withdraw.

During the interview I will use the term remote learning. Remote learning is also known as distance learning and is similar to online learning.

Do you have any further questions?

Then I will start the recording and begin with the first question.

ADHD AND REMOTE LEARNING

Topic	Key questions	Follow up
general	Can you tell me how your education in general is going at the moment? How does ADHD affect you personally? How does ADHD impact your education?	How do you study with regards to ADHD? What areas of life?
Remote learning	In what forms are you receiving your education since the switch to remote learning? How do you feel about remote learning? Do you think your experience with remote learning differs to someone without ADHD?	Lectures, exam, classes Positive, negative Why? In what way? Impact on you?
Compared to offline	Compared to offline education: What are things that changed with the switch from face-to-face education to remote education? Have you adapted in any way to remote learning? - How What aspects of remote learning are better compared to face-to-face education? Is there anything specifically beneficial for ADHD? Are there new or different aspects that you struggle with concerning your ADHD?	 Study habits Learning environment Enthusiasm for interesting topics Creative problem solving What has been the most difficult aspect about remote learning?
Aspects of remote learning	Are there specific aspects of remote learning that have a significant impact on you?	Check next topics
Classes (size) **Lectures** **Group work** (cohesion) **Self-study** Exams **Communication with teachers** **Schedule** (flexib)	What is your experience with XY? How are you affected by ADHD regarding XY? What do you like about XY? What do you dislike about XY?	performance **Benefits of working at home recorded lectures**
grades	How do grades affect you? Did the switch in teaching method influence your grades?	Good +bad Impact on you
Engagement	How is your attention affected during remote learning? How is your memory affected during remote learning? How is your motivation affected during remote learning?	Diff to offline + why Motivation to take care of

	How is planning and organisation affected during remote learning? How did you handle distractions during remote learning?	responsibilities, not fun
Wellbeing	How satisfied are you with your experience at university with remote learning? How is your wellbeing affected by ADHD and remote learning? Have you noticed any changes in your mood due to the switch? Do negative emotions affect your studies? Have you notice any changes in your self-opinion since the switch?	Diff to offline + why Why do you think it changed?
support	Have you received any kind of support from your university since switching to remote learning? How are your family and friends impacting your studies? Medication: Does taking medication help with remote learning?	Does your uni know about your ADHD? Compared to offline? Support? Compared to offline?
socialising	In what way does ADHD affect your social life during remote learning? Have felt more likely to tell people about your ADHD in an online setting? How do people react to you having ADHD? Do you think your experience at university differs from your peers who don´t have ADHD?	Do you feel they understand ADHD? In what way?
Future	How would remote education need to be delivered to you so it would be as useful as possible? What aspects of remote learning would you wish are kept when switching back to face-to-face education? Do you have any additional thoughts you would like to share with me?	What support? Think about different methods
Ending	What university are you attending? What subject are you studying? How far are you in your studies? For how long have you been studying? What is your living situation like? Were you professionally diagnosed with ADHD? When were you diagnosed with ADHD / or when did you notice that you may have ADHD? Do you know what subtype of ADHD you have? Are you being treated for ADHD in any way?	
demographic	How would you describe your ethnicity? How old are you? What are your preferred pronouns?	

ADHD AND REMOTE LEARNING

Appendix D

Theme definition and anchor examples

Theme	Theme definition	Anchor example
Social	This theme includes statements about the impact of social aspects on their university experience.	
Social interaction	The subtheme includes the participant's perceived influence of interactions with other people on their university experience.	"And especially when it's only online classes and no personal interaction with the people, everything seems very different, distant in a sense, and I don't really like engage with it that much because I feel like it's not important to me anymore and I kind of lose motivation." (Interviewee 6)
Social support	This subtheme includes statements related to the participants experience of support from friends or peers and the effect on their university experience.	"I was doing this with friends even before we went completely online. However, when we did went online, it became a lot more frequent, and I felt the need to have them help me a lot more, when we started having online classes." (Interviewee 8)
Formal support	This subtheme includes statements regarding support offered by university itself including staff, which influenced the interviewee's university experience.	"So, she was my lifeline to help me have a little bit more of a schedule. She also is the one who suggested that I tried to start going to sleep on time and getting up at like around the same time so that my day would start, at the same point every day and I would feel like there is a little bit more normality to my schedule. So that really helped." (Interviewee 8)
Stigma	This subtheme includes statements related to how the awareness of others regarding ADHD effects the student's university experience.	"Because it is a stigma, in a sense. Because I remember we have one girl, who also has it in my classes and she in the beginning she handed in some kind of document that said that 'I have ADHD. I will get longer.' She can get, like, longer time to finish a project. And just in general, she has more time

		on things. And I never wanted that because I do not want to be seen as somebody who gets an advantage because people do not, it is not something people see. They cannot see that I have ADHD. So, they will just think, 'Oh, she is just as good as us, but she will get the extra time.'" (Interviewee 6)
Learning processes	This theme includes statements about the influence of remote education on learning processes.	
Attention	This subtheme includes statements concerning how remote education affected the ability to focus on a task related to education.	"I do not really get into the work mindset that easily. So, because there is always stuff to do that is also there, I might as well clean my room or cook or meet a friend or read my book or something like that. There are too many distractions here, so my schedule is non-existent." (Interviewee 6)
Memory	This subtheme includes statements regarding changes in general daily memory, as well as memory related to retaining study material and information during lectures and classes due to remote education.	"I feel like, maybe a bit better sometimes because everything was online documented more clearly when they were, when everything went online. So, it is easier to see them online then to remember those deadlines from what the teacher said in the lectures and in offline." (Interviewee 4)
Learning outcomes	This theme includes statements about the influence of remote education on learning outcomes.	
Performance	This subtheme includes statements about changes in grades and general performance due to the switch to remote education.	"So, now I just have to get up out of bed and sit in front of my laptop. But I would not say it is better for me personally to just be able to get up and not do anything and basically still wear my pyjamas and sit in front of the laptop. Yes, that is not a good work environment, but back to schedule. XX it feels less relevant, it feels less

		important to me if it is not in person meeting, and I do not feel as responsible I guess. So, I would sometimes forget lectures, especially the less important ones. I would just like, not go there, like for three or four times. And then I actually failed the class once because I forgot to go more than three times." (Interviewee 6)
Wellbeing	This theme includes statements about the student's wellbeing in relation to their university education.	
Mental wellbeing	This subtheme includes statements regarding the students' feelings about themselves and their life, as well how they cope with issues regarding their university experience.	"I am just not as happy anymore then because I feel stuck in my studies." (Interviewee 6)
Physical wellbeing	This subtheme includes statements addressing lifestyle behaviours, experienced stress, eating behaviours, sleep patterns and general hygiene in relation to the university experience.	"My sleep schedule was non-existent. I think that is the biggest change. I used to be almost completely nocturnal." (Interviewee 8)
Improvements	This theme includes suggestions for improving future education.	"I feel like it would be more useful to give an option for people to go study in groups." (Interviewee 7)