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ARTICLE

How do adolescents with ADHD perceive and experience stress? An interview study

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ABSTRACT

Background: Attention-deficit/hyperactivity disorder (ADHD) is linked to high levels of perceived stress in adult populations. Thus, it is not surprising that stress managing techniques are being included in treatment protocols for adults with ADHD. There is, however, a paucity of studies on perceived stress in adolescents with ADHD.

Aims: This study aims to explore how adolescents with ADHD perceive and experience stress (and stressors) using a qualitative approach.

Methods: Explorative interviews were conducted with 20 adolescents (Mean age: 16.30) diagnosed with ADHD in conjunction with group treatment therapy. Data were analysed using qualitative content analysis.

Results: Stress and ADHD, as well as stress, anxiety and ill-health, were described as closely intertwined. The result is presented in four categories: stress is often present, triggers of stress, stress affects daily life, and stress can be handled and prevented. A relation was found between stress and feelings of helplessness, ill-health and anxiety. Stress was viewed as being out of proportion with reality and was driven by such factors as ADHD symptoms, school demands, unpredictable situations and relational problems. Several negative consequences of stress were reported, including postponing schoolwork and the tendency to give up. Some participants also reported performing better when stressed. Accepting help from others, practising acceptance, settling down and controlling oneself, and planning in advance were seen as helpful stress managing techniques.

Conclusions: Stress should be considered among other problems related to ADHD. Psychoeducation about stress, stress managing techniques and coaching should be included in the treatment of adolescents with ADHD.

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KEYWORDS
ADHD; perceived stress; adolescents; qualitative

Background

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterised by hyperactivity, inattentiveness and impulsiveness. ADHD is common in childhood and adolescence, with a reported prevalence of about 5% [1]. ADHD symptoms can lead to a number of negative consequences in everyday life. A systematic review and meta-analysis from 2016 showed that ADHD was linked to poor academic performance (e.g. failure to complete high school) and unemployment later in life [2]. Moreover, ADHD is associated with a high percentage of comorbid psychiatric disorders, including depression, bipolar disorder, conduct disorder and oppositional defiant disorder [2]. The disorder may negatively impact interpersonal relations. For instance, children with ADHD are reported to have less friends and being less liked by peers compared with children not diagnosed with ADHD [3].

Because ADHD symptoms are generally associated with pervasive and persistent impairment across several domains in life, it is not surprising that individuals with ADHD are exposed to a large number of stressors and, consequently, high levels of stress. As defined by the cognitive activation theory of stress (CATS) [4,5], stress is considered a vital response to novel situations, a homoeostatic imbalance or threat. Stress comprises several elements: the stress stimuli, the stress experience, a physical stress reaction with a general increase in arousal, and experience of the physical stress reaction. However, when exposed to prolonged stress, the stress response may result in an allostatic load in which a cumulative effect of the stress on the body and brain increases the risk of illness and disease, including psychiatric disorders [6]. Moreover, the individual's expectancies on both the stimuli and the results of the stress response may elicit further expectations of being able to cope with the stress (where most or all of the responses lead to a positive result), but also to feelings of helplessness with not being able to control what happens or hopelessness where most or all of

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Table 1. Clinical characteristics of the adolescents.

Females, n	12 (60%)
Age, Mean (SD)	16.30 (0.92)
Clinical diagnosis, n	ADHD, 13 ADD, 5 ADHD (NOS), 2
ASRS-A[a]	
Self-ratings, Mean (SD)	38.65 (15.37)
Parental-ratings, Mean (SD)	37.15 (11.20)
ADHD medication[b], n	16

[a]Adult ADHD Self-Report Scales for Adolescents.
[b]Methylphenidate, atomoxetine, lisdexamfetamine, or guanfacine.
ADHD: Attention-deficit/hyperactivity disorder; ADD: Attention deficit disorder; ADHD (NOS): Attention-deficit/hyperactivity disorder not otherwise specified.

the responses lead to negative results, which, in turn, may further elicit the perception of stress and negative affect [4].

Although there is an abundance of research on stress in children and adolescents with ADHD, with reports of an increased exposure to the number of stressful life events [7] and alteration in physiological systems related to stress and stress reactivity [8], there is only a paucity of studies on the perception and experience of stress in these age groups. Studies on community-based adult populations have shown that symptoms of ADHD, especially symptoms of inattention, are associated with higher self-ratings on the Perceived Stress Scale (a psychological instrument to measure the perception of stress), in which participants find their life to be more unpredictable, uncontrollable and overloaded [9–11]. A higher perceived stress has also been reported in clinical populations, with higher ratings among ADHD cases compared with controls [12,13]. To our knowledge, only one study has investigated perceived stress among children and adolescents with ADHD [14], reporting more feelings of activation and pressure in children/adolescents with ADHD compared to healthy controls [14]. Surprisingly, little is known about how young people with ADHD experience and perceive stress.

In general, adolescence is a period marked by rapid developmental changes and stressful experiences. The ability to cope with these stressful events is critical to the well-being of these individuals. Adolescence is also a period of increased vulnerability to stress, with an increase in various types of psychopathology, including depression, anxiety [15] and recurring pain [16]. School-related stress, but also problems with parents, have proven particularly stressful during this period of life, and these stressors are of importance in a variety of different cultures [17]. Given the higher rates of stress among individuals with ADHD, this group may be particular vulnerable to stress-related problems. Accordingly, fatigue syndrome [18], depression, anxiety disorders, substance abuse and sleep disorders are regarded as a common clinical feature of ADHD [19]. Stress-related problems may also be an explicit focus of treatment programmes for patients with ADHD. Within a structured skills training group programme based on dialectical behaviour therapy (DBT), adult patients with ADHD are trained in elements such as mindfulness, acceptance and behavioural analysis and are also informed about the relationship between stress and performance and trained in stress management techniques [20]. We have adapted this programme for an adolescent population and investigate the efficacy of the programme for adolescents with ADHD in an ongoing randomised control trial. Within this larger ongoing longitudinal treatment study, we seized on the opportunity to also explore how adolescents with ADHD perceive and experience stress and stressors as a separate study with a different aim.

Methods

Procedure and participants

Adolescents with a clinical diagnosis of ADHD who had completed a 14-session long structured skills training group based on DBT were invited to participate in an interview study. The adolescents were informed about the study by the group leaders and subsequently invited to participate by a researcher via telephone. The treatment was conducted in 2016–2017 and included elements such as psychoeducation, mindfulness, acceptance and behavioural analysis [20]. The eligible participants were attending the skills training groups at two child and adolescent psychiatric outpatient units in Sweden. Of 21 eligible adolescents, one declined to participate and indicated lack of time as a cause, and thus the final sample included 20 adolescents aged 15–18 years (12 girls and 8 boys; mean age: 16.30, SD: 0.92). The diagnosis of ADHD was validated by clinical psychologists using the Mini-International Neuropsychiatric Interview for children and adolescents (MINI Kid) [21] and the Adult ADHD Self-Report Scale for Adolescents (ASRS-A) [22]. The ASRS-A is an 18-item widely used diagnostic tool to measure ADHD symptoms. Total scores on the ASRS-A range from 0 to 72, with higher scores indicating more ADHD symptoms. Demographic and clinical characteristics of the group are presented in Table 1. Written informed consent was obtained from all participants prior to their participation and the study was approved by the Ethical Review Board of Uppsala University (Reg.no. 2015/257/2). The consolidated criteria for reporting qualitative studies (COREQ) were applied when planning the study, describing the data collection and data analysis, and presenting the results [23].

Interviews

The interviews were conducted 1–2 weeks after the end of the last session of the structured skills training group treatment. The interviews were performed by two graduate students (one in psychology and one in medicine), who were both trained in communication skills. The two interviewers did not participate in the treatment, had no prior relationship to the participants and were trained in the current interviewing technique by one of the authors (CÖ) who is experienced in this method of interviewing. The interviews took place at the outpatient units where the group treatment was held, except for one interview that was conducted through Skype because the participant was unable to attend in person. The interview was explorative with three predefined areas of interest: (1) how it is to live with ADHD, (2) how the adolescents experience and perceive stress and (3)

Table 2. Categories and subcategories from the analysis.

Category	Subcategory
Stress is often present	Stress is terrible and tiresome
	Stress is related to anxiety
	Sensitive to stress
	Same stress level for everything
	Not feeling stressed when others do
Triggers of stress	Ill-health
	Too many and too rapid thoughts
	Unpredictable situations
	Demands
	School
	Social relationships
Stress affects daily life	Feelings of depression and sadness
	Postponing school work
	To give up - doing nothing
	Helpless and out of control
	Performs better during stress
Stress can be handled and prevented	Help from others
	Acceptance
	Preventive strategies

experiences of the group treatment. Interview data from the second area, experienced and perceived stress, is the target subject of the present study, and is not related to the evaluation of the treatment. The interview started with the question 'How do you perceive stress?'. The narratives were explored in relation to home, school, relationships and well-being. Follow-up questions were asked when appropriate. The interviews, lasting from 20 to 60 minutes, were audio recorded and transcribed verbatim.

Analyses

Qualitative Content Analysis was conducted, which is a process of identifying, coding and categorizing the primary pattern in the data [24]. The analysis was inspired by Graneheim and Lundman [25] and the analysis was conducted using an inductive approach where the categories are derived from the data. We searched for both the manifest and the latent content of the text, where the manifest content refers to what the text says, that is, the visible and obvious components in the text, and the latent content refers to what the text is talking about, that is, the underlying meaning of the text [25]. The analysis comprised the following steps: (1) The transcripts were read by two of the authors (JI and CÖ) separately, bearing in mind the aim of the study, in order to get a sense of the content. (2) The content and understanding of the text were then discussed by the authors in relation to the aim. (3) Meaning units, related to how the adolescents perceive and experience stress, were identified from sentences or paragraphs in the text. (4) The meaning units were condensed, abstracted and labelled with a code. (5) The codes with similar meaning, based either on the precise meaning of words or on words sharing similar connotations, were grouped into mutually exclusive categories. (6) The categories were then divided into subcategories based on dissimilarities within the categories. The analysis, reflecting the manifest content, continued until all categories and subcategories were considered clearly defined and distinct from one another. Lastly (7), focusing on the latent content of the text, patterns across categories at the interpretive level [24] were reflected on, expressing the essence of the participants' experiences, and themes were identified. To increase the rigor of the analysis, the interview texts were read again and the analysis was compared and validated against the text as a whole [26]. The categorization and themes were discussed by the authors until consensus was achieved. We searched for results that did not match the opinions of the majority and incorporated these diverse cases in the data analysis.

Results

Two themes were identified, *stress and ADHD intertwined*, and *stressed and distressed*. The analysis of the manifest content rendered in four categories (1) stress is often present, (2) triggers of stress, (3) stress affects daily life and (4) stress can be handled and prevented (Table 2). The categories and subcategories are described below and representative quotes are used to describe how the findings and interpretations are related to the data (the respondents are denoted with #), whereas the themes are elaborated on in the discussion section.

Stress is often present

In this category there are descriptions of feelings connected with stress, that stress is often present in the daily life and without variability. Stress was perceived as negative, extensive, threatening and terrible. Stress was also viewed as tiresome, with reports of feeling exhausted after a day in school.

> 'Stress is the enemy, surely, it … , goddammit.' #1

Stress was related to anxiety and involved depictions of mixed feelings of anxiety and stress. The two concepts, stress and anxiety, were often used synonymously or perceived as closely related, where stress contributed to anxiety, and vice versa.

> 'Stress and anxiety are sort of the same thing, and yet they're not. You become stressed about your anxiety and you get anxious over your stress. So, they're related, but they're not the same thing.' #5

Being sensitive to stress was common and linked to being perceived as nervous. A sensory sensitivity towards external stimuli, such as noise and light, was associated with a lower tolerance for stress. There were also statements that others, such as their mothers and teachers, often perceived them as stressed.

> 'I am that very stressed-out girl. The nervous one who is stressed and talking all the time.' #1

Levels of stress were without functional variability, out of proportion with the same stress level for everything. The lack of gradual development of stress was evident and feelings of high stress levels were often present. These high levels of stress could continue over long periods and sometimes end with a period of feeling sick.

'There is not a correct level of stress. There is not a little or a lot. There is only a lot or [there is] nothing.' #5

Stress was sometimes difficult to identify, and instead feelings such as anxiety were easier to recognise. More often there were descriptions of not feeling stressed when others do. Sometimes there were remarks from others that one should be stressed in certain situations.

'It is possible that I'm stressed, but do not understand it.' #3

'When everybody has been running around and – Oh, my God, we have exams tomorrow, then I'm like, and [who cares]?' #12

Triggers of stress

The interviews contained narratives of several situations that were perceived as triggers of stress or/and linked to stress. Ill-health often exacerbated stress, with feelings of more stress during those periods in which symptoms of mental health problems were experienced, after having a bad period or after a bad night's sleep.

'When I feel bad, I become more worried and stressed about THAT, and then I go into a depression.' #17

'Those days when I'm in a bad period there will be more stress, and then even trivial things will make me stressed.' #7

Too many and too rapid thoughts were linked to stress. Speeding or racing thoughts and having multiple thoughts simultaneously were experienced as very stressful. These racing thoughts made it hard to concentrate on the task at hand, why some tasks became more time-consuming.

'The exam questions … I'm thinking so much quicker than I talk or write. So, I have to wait … think back in order to keep up with the writing and then I have forgotten all that I was thinking about.' #5

'You have so many thoughts in your head that, in the end, it just becomes stressful.' #1

Unpredictable situations were common precursors of stress, and especially meeting new people and not having control over what was going to happened was considered stressful. A need to plan ahead and to prepare before handling new situations was emphasised. Sometimes, changes from the normal routine resulted in truancy, for example from school activities.

'I have not had lunch in the canteen in three years and have not participated in sports in several years because I don't know what will happen and there are too many people and too many impressions.' #18

Living up to one's own and others demands was difficult. Thoughts of not being able to complete tasks in time, missing important events or arriving to late resulted in more stress, as well as a bad conscience and feelings of being a failure. Some compared themselves with others, e.g. siblings, feeling inferior. Sometimes the demands felt overwhelming.

'If there is something that is extremely important and it looks like I won't be able to finish it, then I go around and think about it all the time. Then I'm stressed.' #5

Situations in school was the primary precursor for stress. Many of the experiences in school could be linked to stress, including assignments and other tasks, often with deadlines. In addition, group work was particularly demanding. There were also stressful thoughts of how grades and school performance will affect future life and well-being.

Establishing and maintaining social relationships were also seen as demanding. Recurrent feelings of stress concerning both how to establish and maintain relationships were evident. Relationships were deemed important and having few or no close friends, and the fear of losing existing friends, were sources of stress.

'Don't keep up with answering [text messages] when I'm stressed.' #11

'There are not so many people I socialise with … it is like my best friend since I was a child; then I can be myself and he accepts it.' #12

Stress affects daily life

There were several ways in which stress affected daily life. Stress had a negative effect on well-being and was regarded as one important factor contributing to ill-health, especially symptoms of anxiety and sadness, but also tiredness and restlessness. It is a difficult situation to be always stressed and stress is one of the biggest problems the adolescents encounter.

'It [stress] affects [me] in a bad way.' #9

'It is more like you become worried over the stress.' #10

Stress led to a delay in schoolwork, putting off tasks to a later time and not being able to prioritise tasks effectively. These behaviours are categorised as postponing, which by itself contributed to more stress. In addition, it was hard to study effectively when stressed.

'Yes, I have more stress than those without ADHD. Because they used to finish their bloody things on time and are able to study those things that are not considered fun. So, then they have less stress because they DO things and manage things.' #5

Feeling overwhelmed by stress made the adolescents to give up – doing nothing, thus they become incapable of handling everyday demands, and sometimes these feelings even lead to the inability to act. Instead of finishing assignments or going to activities, they made up excuses and stayed home instead, which had a negative impact on school work and relationships.

'When I become so stressed that I can't do anything, then I lie down and stop caring and I feel like I'm a failure.' #7

Another consequence of stress was feeling helpless, not knowing how to handle the stress. Moreover, contrary to giving up their efforts and doing nothing, they felt unstable and would explode, sometimes destroying things (or relationships) when overly stressed. A common consequence of stress was feelings of irritability and anger, which by itself constituted a strain on relationships.

'Then I'll become super stressed and destroy everything around me, relationships or mirrors - just everything.' #4

In the last subcategory, performs better during stress, there were statements that a low or moderate stress level could improve performance and that some types of stress could be positive but at the same time very demanding.

Stress can be handled and prevented

There were different ways to handle or prevent stress. However, it was evident that the strategies were not always helpful. Stress management was seen as challenging, on the one hand, because of the adolescents' lack of knowledge on how to deal with the stress and, on the other hand, because it was difficult to do what was needed to reduce the stress in their life. Help from others was mainly received from the neighbourhood. It could be parents (preferentially mothers), siblings or teachers who were able to lower the demands, adjust their expectations and pay close attention to when the adolescent is under stress.

'My teacher has to "break the circle" because I can't do it myself.' #11

'My mum and I used to do a small plan … and then the stress disappeared.' #5

Practicing acceptance was one way to handle stress and the associated difficulties, and idioms such as 'make it up as it goes along' and 'just take it one day at a time' was used by the adolescents to explain how they deal with stress.

'You have to take one step at a time and not rush through it all.' #4

'I have accepted that I can't keep time.' #12

There were also remarks about preventive strategies. To calm down and try to avoid stress were strategies mentioned. Another approach recalled was to be better be prepared by taking proper time to plan ahead and thinking before doing.

' … . sit and think of how I can organise something.' #11

'I use to decide to do things with structure at home.' #4

Discussion

This qualitative study aims to explore how adolescents with ADHD perceive and experience stress. The result encompasses four categories: stress is often present, triggers of stress, stress affects daily life, and stress can be handled and prevented. From the analysis across categories, two themes were identified: stress and ADHD intertwined, and stressed and distressed. Perceived stress was closely linked to ADHD symptoms, ill-health and anxiety, and stress were driven by multiple factors (school demands, unpredictable situations, relational problems and too many and too rapid thoughts). Several negative consequences of stress were identified, including postponing schoolwork, giving up and doing nothing, and feeling helpless or out of control. Helpful stress managing techniques included accepting help from others, practising acceptance, calming down and planning ahead. In addition, a need for more knowledge on how to manage stress-related problems were apparent.

Stress and ADHD intertwined

There was a close link between the manifestations of stress and the manifestations of ADHD. The association between ADHD and higher levels of perceived stress has also previously been demonstrated in adult studies [9–13], but also on children [14]. Some of the categories from the content analysis seemed to be directly referring to ADHD symptoms (e.g. having too many and too rapid thoughts and being unable to complete tasks) and it was sometimes hard to distinguish between symptoms of stress and symptoms of ADHD. A sensitivity to stress, as well as having problems to mobilize an appropriate stress response, was identified. Instead, there was a lack of gradual development of stress and the stress response was regarded as out of proportion. In line with this reasoning stress intolerance has been proposed as a criterion for adult ADHD [27] and previous research has indicated a hypoactive hypothalamus–pituitary–adrenal axis in children with ADHD with lower levels of the hormone cortisol, a primary mediator of the ability to respond to stressors [14]. Lower levels of cortisol could thus reflect a reduced ability to respond to environmental stressors. An important cause for stress, recurring in several of the current interviews, was school and school-related activities. The adolescents described feeling stress at school and over schoolwork, sometimes combined with stress related to procrastinating schoolwork and giving up. This observation is consistent with previous research on stress in adolescents in Sweden and other countries, suggesting that schoolwork is the most common reason for perceived demands [17,28]. Adolescents with ADHD obtain lower grades and are less likely to complete school, which makes the connection between school and stress an important factor. Particularly noteworthy was the finding that peer relationships, especially a fear of losing friends, was a factor contributing to perceived stress, which does not seem to be as stressful in community-based samples [17]. However, this result is consistent with reports of more peer-related conflict for children and adolescents with ADHD as compared with peers without ADHD [3].

Stress management and coping was particular challenging, with statements of lacking knowledge on how to handle stress and resources to execute what was needed to reduce stress. However, some important experiences emerged from the interviews. For instance, getting help from others (parents, siblings, teachers) was considered an important factor to manage the stress. Interventions that help participants with ADHD to develop skills, strategies and behaviours to cope with their conditions (including mental health disorders) are regarded as being beneficial for college students with ADHD [29]. Some aspects of coaching may be constructive for growth and development in adolescents with ADHD. In addition, preventive strategies, such as trying to

regain composure, plan ahead and prepare themselves in advance were emphasised. These strategies seem to be of particular importance given the executive dysfunction associated with the disorder, but may also pose great challenges.

Stressed and distressed

An association between stress and anxiety was found, which agrees with the high comorbidity reported between ADHD and anxiety disorders [19]. In the interviews, there were descriptions on how anxiety led to stress, but also that stress led to anxiety and sadness as well as to feelings of helplessness. One possible interpretation of this finding is that stress is an underestimated driver for the anxiety comorbidities seen in ADHD. Statements of giving up and doing nothing, losing control and feeling helpless reflect a negative expectancy of the stress response, that is, not being able to control what happens, as stated in the CATS [4]. These feelings of helplessness and having no control over several factors in life have also been proposed to underpin anxiety, but also depression [5], which was specifically discussed by the participants as a consequence of stress.

Given the high prevalence of emotional symptoms in ADHD, an emotion dysregulation presentation of ADHD has also been suggested, represented by a low temper control, emotional lability, emotional over-reactivity, as well as hyperactivity/restlessness [30]. Emotional dysregulation may further diminish the individuals ability to handle typical life stresses, and negatively impact social and interpersonal relationships [3]. Destroying things and acting out towards things and relationships was also described as a problem in the interviews, and acceptance of their problems and not blaming themselves for their condition were seen as an important intervention. Acceptance is also one of the therapeutic interventions practised in the structured skills training group in which the adolescents participated. Indeed, in the mindfulness sessions the adolescents are trained to observe the present moment and take a non-judgmental stance [20]. In addition, managing interpersonal relations, emotion dysregulation and emotional symptoms are areas that are specifically target in DBT [31]. Since emotional problems, such as depression and anxiety, are more common in females with ADHD [32] it would have been compelling to analyse whether there were any differences in perceptions of stress between the sexes, but such an analysis was not in the scope of this study.

Limitations

This study has some methodological aspects that have to be addressed. To enable transferability, we sought to ensure transparency by extending a clear description of the context, participants, data collection and analysis. The number of informants ($n = 20$) is rather large for a qualitative study. The adolescents' willingness to participate in the interviews may in some way be related to their perception of the importance of the research topic. Nevertheless, a larger sample of informants could have led to additional information on ADHD and stress. In addition, data saturation was not used in the recruitment procedure of participants. Participant checking and obtaining participants comments or corrections were not used. One reason was the relatively long period of time elapsed from the interviews to the transcriptions and analysing of the data. All interviews were conducted by two interviewers who were not known by the participants or involved in their care. The interviewers closely followed the question sequence of the interview guide and thus all participants responded to the same questions in the same mode of assessment conditions. Such consistency helps to ensure that the participants had the opportunity to share their experiences under same conditions. The interviews were performed after the 14th and final group session. It may therefore be assumed that the treatment had some impact on the adolescents' answers and that the treatment could have affected their feelings of stress. For instance, the treatment may have resulted in the participants discovering more about themselves and how to deal with stressful situations. It can also be a strength where an increased knowledge about themselves have enabled a more detailed description of their experiences of stress. In contrast to the often reported sex ratio in ADHD, with more boys being diagnosed [33], the majority of the participants in this study were girls. However, this gender distribution, with more females compared to males, is not uncommon in treatment studies conducted on participants with ADHD [34,35]. Measures were adopted to strengthen the trustworthiness of the analysis: analyses were performed by two researchers having different professions and experiences. In addition to their research positions all authors have extensive experience in the field of child and adolescent psychiatry. Moreover, diverse cases were incorporated in the data analysis.

Conclusion

Stress and ADHD seem to be closely intertwined, and stress should be considered among other problems related to ADHD. This study showed that stress was linked to feelings of helplessness and lack of control, and consequently, symptoms of anxiety and ill-health. School proved to be a major source of stress, highlighting the need to consider whether the school environment could be adjusted to suit the needs of these adolescents, especially given that stress enhanced the manifestations of their symptoms with increased postponing of schoolwork and emotional dysregulation. Two other sources of stress were unpredictability and peer relationships. Potential domains of interventions brought to our attention were the need to generate more knowledge on stress management and self-efficacy, coaching, acceptance and preventive strategies. These interventions should be included in treatment programs for adolescents with ADHD.

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References

[1] Polanczyk G, de Lima MS, Horta BL, et al. The worldwide prevalence of ADHD: a systematic review and metaregression analysis. Am J Psychiatry. 2007;164(6):942–948.
[2] Erskine HE, Norman RE, Ferrari AJ, et al. Long-term outcomes of attention-deficit/hyperactivity disorder and conduct disorder: a systematic review and meta-analysis. J Am Acad Child Adolesc Psychiatry. 2016;55(10):841–850.
[3] Nijmeijer JS, Minderaa RB, Buitelaar JK, et al. Attention-deficit/hyperactivity disorder and social dysfunctioning. Clin Psychol Rev. 2008;28(4):692–708.
[4] Ursin H, Eriksen HR. The cognitive activation theory of stress [Historical Article Research Support, Non-U.S. Gov't Review]. Psychoneuroendocrinology. 2004; 29(5):567–592.
[5] Ursin H, Eriksen HR. Cognitive activation theory of stress (CATS). Neurosci Biobehav Rev. 2010;34(6):877–881.
[6] McEwen BS. Neurobiological and systemic effects of chronic stress. Chronic Stress (Thousand Oaks). 2017;1:1–11.
[7] Humphreys KL, Watts EL, Dennis EL, et al. Stressful Life Events, ADHD Symptoms, and Brain Structure in Early Adolescence. J Abnorm Child Psychol. 2019;47:421–432.
[8] Angeli E, Korpa T, Johnson EO, et al. Salivary cortisol and alpha-amylase diurnal profiles and stress reactivity in children with Attention Deficit Hyperactivity Disorder. Psychoneuroendocrinology. 2018;90:174–181.
[9] Bernardi S, Faraone SV, Cortese S, et al. The lifetime impact of attention deficit hyperactivity disorder: results from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) [Research Support, N.I.H., Extramural]. Psychol Med. 2012;42(4):875–887.
[10] Combs MA, Canu WH, Broman-Fulks JJ, et al. Perceived stress and ADHD symptoms in adults. J Atten Disord. 2015;19(5):425–434.
[11] Salla J, Galera C, Guichard E, et al. ADHD symptomatology and perceived stress among French college students. J Atten Disord. 2019;23:1711–1718.
[12] Hirvikoski T, Lindholm T, Nordenstrom A, et al. High self-perceived stress and many stressors, but normal diurnal cortisol rhythm, in adults with ADHD (attention-deficit/hyperactivity disorder). Horm Behav. 2009;55(3):418–424.
[13] Lackschewitz H, Huther G, Kroner-Herwig B. Physiological and psychological stress responses in adults with attention-deficit/hyperactivity disorder (ADHD). Psychoneuroendocrinology. 2008; 33(5):612–624.
[14] Isaksson J, Nilsson KW, Lindblad F. The Pressure-Activation-Stress scale in relation to ADHD and cortisol. Eur Child Adolesc Psychiatry. 2015;24(2):153–161.
[15] Lupien SJ, McEwen BS, Gunnar MR, et al. Effects of stress throughout the lifespan on the brain, behaviour and cognition. Nat Rev Neurosci. 2009;10(6):434–445.
[16] Wiklund M, Malmgren-Olsson EB, Ohman A, et al. Subjective health complaints in older adolescents are related to perceived stress, anxiety and gender - a cross-sectional school study in Northern Sweden [Research Support, Non-U.S. Gov't]. BMC Public Health. 2012;12(1):993.
[17] Persike M, Seiffge-Krenke I. Stress with parents and peers: how adolescents from 18 nations cope with relationship stress. Anxiety Stress Coping. 2016;29(1):38–59.
[18] Rogers DC, Dittner AJ, Rimes KA, et al. Fatigue in an adult attention deficit hyperactivity disorder population: A trans-diagnostic approach. Br J Clin Psychol. 2017;56(1):33–52.
[19] Franke B, Michelini G, Asherson P, et al. Live fast, die young? A review on the developmental trajectories of ADHD across the lifespan. Eur Neuropsychopharmacol. 2018;28(10):1059–1088.
[20] Hesslinger B, Tebartz van Elst L, Nyberg E, et al. Psychotherapy of attention deficit hyperactivity disorder in adults–a pilot study using a structured skills training program. Eur Arch Psychiatry Clin Neurosci. 2002;252(4):177–184.
[21] Sheehan DV, Sheehan KH, Shytle RD, et al. Reliability and validity of the Mini International Neuropsychiatric Interview for Children and Adolescents (MINI-KID). J Clin Psychiatry. 2010;71(03): 313–326.
[22] Sonnby K, Skordas K, Olofsdotter S, et al. Validation of the World Health Organization Adult ADHD Self-Report Scale for adolescents. Nord J Psychiatry. 2015;69(3):216–223.
[23] Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care. 2007;19(6):349–357.
[24] Schreier M. Qualitative Content Analysis in Practice. London: SAGE Publications. 2012.
[25] Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. Nurse Educ Today. 2004;24(2):105–112.
[26] Graneheim UH, Lindgren BM, Lundman B. Methodological challenges in qualitative content analysis: a discussion paper. Nurse Educ Today. 2017;56:29–34.
[27] Wender PH, Wolf LE, Wasserstein J. Adults with ADHD. An overview [Review]. Ann N Y Acad Sci. 2006;931(1):1–16.
[28] Schraml K, Perski A, Grossi G, et al. Stress symptoms among adolescents: the role of subjective psychosocial conditions, lifestyle, and self-esteem. J Adolesc. 2011;34(5):987–996.

[29] Prevatt F. Coaching for college students with ADHD. Curr Psychiatry Rep. 2016;18(12):110.
[30] Reimherr FW, Marchant BK, Gift TE, et al. Types of adult attention-deficit hyperactivity disorder (ADHD): baseline characteristics, initial response, and long-term response to treatment with methylphenidate. ADHD Atten Def Hyp Disord. 2015;7(2):115–128.
[31] MacPherson HA, Cheavens JS, Fristad MA. Dialectical behavior therapy for adolescents: theory, treatment adaptations, and empirical outcomes. Clin Child Fam Psychol Rev. 2013;16(1):59–80.
[32] Rucklidge JJ. Gender differences in attention-deficit/hyperactivity disorder. Psychiatr Clin North Am. 2010;33(2):357–373.
[33] American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (5th ed.). Arlington (VA): American Psychiatric Publishing; 2013.
[34] Morgensterns E, Alfredsson J, Hirvikoski T. Structured skills training for adults with ADHD in an outpatient psychiatric context: an open feasibility trial. ADHD Atten Def Hyp Disord. 2016;8(2):101–111.
[35] Hirvikoski T, Waaler E, Alfredsson J, et al. Reduced ADHD symptoms in adults with ADHD after structured skills training group: Results from a randomized controlled trial. Behav Res Ther. 2011;49(3):175–185.