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**Risk factors for suicidal behaviour in adolescents
diagnosed with attention deficit hyperactivity disorder**

PhD THESIS ABSTRACT

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1. BACKGROUND

1.1. Attention deficit hyperactivity disorder

Attention deficit hyperactivity disorder (ADHD) is one of the most common psychiatric disorders among children and adolescents (Steinau, 2013). Symptoms include age-inappropriate attention, hyperactivity, and impulsivity (Dias et al., 2013). ADHD can cause problems for children in many areas, such as social and family life and school performance (Dias et al., 2013). Research on population sample has estimated the boy-girl ratio to 3:1, while results of 5:1 and 9:1 have been found for those who were diagnosed clinically (Skogli et al., 2013). Donker and colleagues (2005) in their study in the Netherlands found that boys had 3-8 times higher rate of ADHD diagnosis compared to girls. Mowlem and colleagues (2019) found that girls' hyperactive and impulsive symptoms were underreported by their parents and not considered as severe as in boys. In addition, they also found that girls had much greater emotional problems with an ADHD diagnosis than boys. This shows that the symptoms judged by parents are clearly under-rated in girls diagnosed with ADHD (Mowlem et al., 2019). This study also shows that there are difficulties in diagnosing ADHD in girls because, if parents do not assess them appropriately, these girls will not receive professional help.

Among the consequences of ADHD, it is important to highlight the impairments in the quality of functioning that can affect school performance: children and adolescents diagnosed with ADHD are significantly more likely to perform poorly in school (Biederman et al., 1996; Loe and Feldman, 2007), repeat classes more often, or even fail (Barkley, 1990; Sharma, 2014). Furthermore, these children are four to five times more likely to attend extracurricular developmental services than children without an ADHD diagnosis (Loe and Feldman, 2007). Difficulties in social relationships may also occur in children and adolescents diagnosed with ADHD (Hoza, 2007). Difficulties caused by peers may include stigmatisation, neglect, rejection and victimisation (Gardner and Gerdes, 2015). Children diagnosed with ADHD tend to have fewer friends, lower quality friendships, and experience higher rates of peer abuse than typically developing children (Gardner and Gerdes, 2015).

1.2 Depressive disorder

Major depressive disorder (MDD) is included in the DSM-5 under the chapter on depressive disorders (APA, 2013). A diagnosis of MDD requires one or more major depressive episodes and the lifelong absence of mania or hypomania. In addition, five out of nine symptoms must be present for two weeks to qualify as a major depressive episode. One of these symptoms should be depressed mood or anhedonia (loss of interest or pleasure) (Uher et al., 2014). The

symptoms should dominate the person's mood almost all day during the two-week period (Uher et al., 2014). In terms of sex ratios, major depressive disorder is twice as prevalent in women as in men (Salk et al., 2017).

Research by McCauley and colleagues (2001) has confirmed that depression in adolescence is more strongly associated with environmental factors, whereas post-pubertal depression is best explained by the interaction between genetic and environmental factors. In addition, adolescent depression is strongly associated with recurrent depression in adulthood (McCauley et al., 2001). Several consequences of depressive disorder are known, including poor academic performance (Horn et al., 2021), alcohol abuse and dependence (Gied and Pine, 2002), and poorer quality of life (Gaynes et al., 2002).

1.3 Suicidal behaviour

Suicidal behaviour disorder is one of the eight disorders listed as "Disorders requiring further research" in the DSM-5, section 3 (APA, 2013). When considering the aetiology of suicidal behaviour, several components need to be considered, which include genetic vulnerability, various stressors, underlying psychopathology, and the social environment, as well as the complex interaction of all these (Orsolini et al., 2020). Research is ongoing to investigate the mechanisms underlying suicidal behaviour, which will provide a better understanding of the phenomenon.

Adoption studies have shown that adoptees whose biological relatives had a history of suicidal behaviour were six times more likely to commit suicide than families with no history of suicidal behaviour (Brent and Mann, 2005). Among the negative life events, several studies reported a strong relationship between school failure and suicide (Castellví et al., 2020; Kaplow et al., 2014). Among adolescents and young adults, school failure has a positive effect on suicidal behaviour (Castellví et al., 2020). Furthermore, Castellví and colleagues (2020) also found in their systematic review that dropping out of school, poor academic performance and high parental expectations were the factors which had the strongest association with suicidal behaviour.

1.4 Generalised anxiety disorder

Generalized anxiety disorder (GAD), similar to depression, is one of the most common mental health problems among adolescents and adults (Starcevic and Portman, 2013). GAD is a common psychiatric disorder, with the lifetime prevalence of GAD in the United States of America estimated at approximately 5% based on DSM-IV, and the current prevalence at 2-3%

(Weisberg, 2009). Angst and colleagues (2006) found in a general population sample that the prevalence of GAD among Swiss adolescents was 2.1%-7.7%. Ruscio (2007) found in his study using general population that the prevalence of GAD in one year was 6.6%. Several environmental factors can be listed that influence the development of GAD. These include childhood trauma or negative life events. Research supports that childhood sexual abuse has shown a significant association with later GAD development (Safren et al., 2002). Soenke and colleagues (2010) are of the opinion that the experience of childhood abuse interferes with the development of adaptive emotion regulation.

1.5 Comorbidity of attention deficit hyperactivity disorder with depressive disorder, suicidal behaviour and generalised anxiety disorder

A growing body of research supports the idea that internalizing and externalizing disorders are not only distinct but may be closely related. Children diagnosed with ADHD are often sad and unhappy (Turgay, 2001). Among children diagnosed with ADHD, at least one other child psychiatric diagnosis is present in the majority of cases, moreover mood disorders are present in 15-17% of the cases (Spencer et al., 2007), with a prevalence of depressive disorders in 16-26% (Gillberg et al., 2004). Major depressive disorder has been found to impair symptoms and dysfunctional abnormalities in children diagnosed with ADHD (Turgay, 2001). In summary, depression and ADHD have a strong association with negative effects on the person (Turgay, 2001). Longitudinal studies with children and adolescents have found that ADHD can also be considered as a risk factor for developing GAD (Tai et al., 2013). The results showed that children with ADHD had GAD symptoms at an earlier age compared to controls (Tai et al., 2013). A systematic review by Balázs and Keresztesy (2017) showed a positive association between ADHD and suicidal behaviour in both children and adolescents. Our research team, Balázs and colleagues (2014), found that 10% of children and 38.9% of adolescents who seek help for ADHD also have comorbid suicidal behaviour. Based on these findings, it is important to consider comorbid conditions in children and adolescents diagnosed with ADHD, as their impact may lead to an aggravation of ADHD symptoms. Van Eck and colleagues (2014) found that ADHD indirectly increased suicidal behaviour through depression. This suggests that depression is an important mediating factor between ADHD and suicidal behaviour. It is important to note that research has already been conducted on depression and suicide in children and found that more than half of the children who had suicidal behaviour were also diagnosed with major depression (Fuller-Thomson et al., 2022).

1.6 Perfectionism

Hamachek (1978) theorized that there are two distinct types of perfectionism, normal and neurotic perfectionism, and was the first to characterize perfectionism as a multidimensional construct. Adaptive perfectionists experience less stress in the process of striving for high standards because they pursue their quest for superiority by focusing on realistic and appropriate goals (Hamacheck, 1978). That said, adaptive perfectionism can be viewed as a useful trait that can help a person in many life situations. Frost and colleagues (1990) developed a theory of perfectionism that distinguishes six different dimensions. Out of these six dimensions, Frost believed that “organisation” and "individual expectations" were adaptive, and the other four were maladaptive. The six different dimensions are: concern of mistakes; individual expectations; parental expectations; parental criticism; doubt about actions and organisation.

Perfectionism has been associated with several pathological disorders, including depression (Campbell et al., 2018) suicidal behaviour (O'Connor et al., 2007) and ADHD (Strohmeier et al., 206). Recently, there have been a few studies that have shown a link between perfectionism and ADHD, these include the work of Strohmeier and colleagues (2016) who found that perfectionism was predominantly associated with ADHD in adulthood and with delaying the onset of tasks (Strohmeier et al., 2016). Their research shows that depression and perfectionism are strongly associated. This is probably because someone who is a perfectionist may experience the onset of depression symptoms more quickly, as they can experience even a small mistake very negatively. On the one hand, maladaptive perfectionists may develop depression from this feeling of dissatisfaction later on. Low self-esteem can also play a big role in the development of depression; however, this has been studied for a long time (Campbell et al., 2018).

In my doctoral thesis, we conducted a systematic review of qualitative research on the relationship between suicide and perfectionism, the results were published in English (Katzenmajer-Pump and Balázs, 2021). To our knowledge, the current systematic review is the first to focus on studies using qualitative research methods on suicide and perfectionism. From all studies we conclude perfectionist traits were present in all suicide attempts and completed suicides. Overall, we can come to the same conclusion as Smith and colleagues (2018) and O'Connor and colleagues (2008) that perfectionism plays a major role in suicide.

2. OBJECTIVES

2.1 To our knowledge, there has been no previous study investigating perfectionism as a potential mediating factor between ADHD and suicidal behaviour, and the aim of my PhD thesis is to investigate this relationship.

2.2 Since ADHD has a high comorbidity, a further aim of my doctoral thesis is to analyse the possible mediating effect of depressive and generalised anxiety disorder symptoms among ADHD and suicidal behaviour.

2.3 There is no validated Hungarian measure of perfectionism has been developed, one of the aims of our study was to develop a Hungarian version of the "Frost Multidimensional Perfectionism Scale" questionnaire (Frost et al., 1990).

3. HYPOTHESES

In order to further explore the relationship between suicidal behaviour and perfectionism in the first phase of my doctoral thesis, a systematic review analysing only qualitative research articles was conducted (Katzenmajer-Pump and Balázs, 2021). This review contributed significantly to the theoretical foundation of the research in my doctoral thesis, and I present this work in the theoretical introduction of this dissertation. Similar to previous summaries (Smith et al., 2018), we found a positive association between maladaptive perfectionism and suicidal behaviour.

Next, we assessed the level of perfectionism in adolescents diagnosed with ADHD and compared it to the control group, and then examined perfectionism as a mediating factor in the association between ADHD and suicidal behaviour. Our hypotheses are the followings:

H1. Maladaptive perfectionism increases the risk of suicidal behaviour in adolescents diagnosed with ADHD.

H2. Perfectionism is a mediating factor between ADHD and suicidal behaviour.

Finally, we wanted to explore mediating factors between ADHD and suicidal behaviour, which was conducted using symptoms of depression and generalized anxiety disorder. We hypothesized:

H3. Both anxiety and depressive symptoms mediate the association between ADHD and suicidal ideation and planning among adolescents.

H4. There is a direct relationship between ADHD, anxiety and depressive symptoms and suicidal ideation and planning.

4. METHOD

4.1 Research design and ethical considerations

The research was conducted between 2018 and 2020 and was carried out under a licence from the Scientific and Research Ethics Committee of the Health Sciences Council (TUKEB) (ethics licence number 50922-2/2017/EKU).

4.2. Research participants

We included in the study subjects who were aged between 13 years and 19 years in the control and clinical groups.

Inclusion criteria for the clinical group were: 1. diagnosis of ADHD by a treating physician, 2. diagnosis of ADHD confirmed by a structured diagnostic interview (see below).

Inclusion criteria for the control group were: 1) no history of psychological, psychiatric or neurological treatment, 2) no history of previous psychological, psychiatric or neurological treatment, 3) no structured interview (see below) to confirm ADHD diagnosis.

In both study groups, the exclusion criterion is intellectual disability or suspected intellectual disability.

4.3 Measures used in the research

Mini International Neuropsychiatric Interview Kid

In our research, we considered it important to use a psychiatric diagnostic interview because we were collecting information on child psychiatric pathologies and symptoms, which, when recorded in a questionnaire format, does not provide as reliable results as an interview situation. In our study, we used the Hungarian version of the *Mini International Neuropsychiatric Interview Kid (M.I.N.I. Kid)* developed by Sheehan et al. (1998) to assess the presence of different psychiatric diagnoses. The M.I.N.I. Kid assesses the presence of twenty-four psychiatric diagnoses based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) (APA, 2013).

Frost Multidimensional Perfectionism Scale

The level of perfectionism was measured using the Multidimensional Perfectionism Scale (FMPS), a self-report scale developed by Frost and colleagues (Frost, 1990). This questionnaire consists of 35 questions divided into four "maladaptive" and two "adaptive" dimensions (Frost, 1990; Frost et al., 1993). The questionnaire is administered on a 5-point Likert scale (1=strongly disagree and 5=strongly agree) (Frost et al, 1990).

Demographic data sheet

Demographic questions were prepared by our research team for this study. The demographic questions were answered by the parents. The questions include information on socioeconomic status and medical history.

5. RESULTS

5.1. Persons included in the research

Finally, 89 families agreed to be included in the clinical group, which meant that both parents and child gave written consent to participate in the research and all questionnaires were completed.

The control group consisted of 96 families, who also gave informed consent and completed the questionnaires.

In terms of gender a total of 58 women and 127 men participated in my doctoral research. The overall mean age was 14.79 with a standard deviation of 1.48. 89 adolescents (mean age: 14.58; SD: 1.77) were included in the ADHD group and 96 adolescents (mean age: 14.77; SD: 1.53) in the control group. There was no significant difference in age between the groups, but there was a significant difference in gender between the clinical and control groups: 46% of participants in the control group were girls, compared to only 8% of participants in the clinical group ($\chi^2(1) = 39.32$; $p < .0001$, $V = .46$). Table 1 presents the demographic data for the ADHD group and the control group, both combined and separately.

Table 1. Demographic variables, ADHD and control group

	Overall					ADHD group					Control group				
Variable	N	Mean	SD	Min	Max	N	Mean	SD	min	Max	N	Mean	SD	min	max
Age	184	14.68	1.65	13	18	89	14.58	1.77	13	18	96	14.77	1.53	13	18

5.2. Results of the first study

Perfectionism in the ADHD and control groups

Perfectionism and suicidal behaviour in the ADHD and control groups are presented in Table 2.

Table 2. Descriptive statistics for perfectionism and suicidal behaviour

		Overall					ADHD group					Control group				
Variable	Cronbach- alfa	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N	Mean	SD	Min	Max
Concern over mistakes (perfectionism)	.84	184	20.83	7.21	9	42	89	20.79	7.16	9	42	96	20.86	7.28	9	39
Personal standards (perfectionism)	.83	184	19.45	6.26	7	35	89	18.65	6.32	7	35	96	20.18	6.15	8	34
Parental expectations (perfectionism)	.76	184	12.07	4.36	5	25	89	12.17	4.52	5	25	96	11.97	4.23	5	20

Parental criticism (perfectionism)	.72	184	8.429	3.68	0	20	89	8.77	3.89	0	18	96	8.11	3.47	4	20
Doubt about actions (perfectionism)	.75	184	10.49	3.61	4	20	89	10.89	3.61	4	20	96	10.12	3.6	4	18
Organization (perfectionism)	.82	184	22.9	5.06	6	30	89	21.68	5.19	6	30	96	24.02	4.70	11	30
General scale (Perfectionism)	.80	184	71.26	19.46	32	137	89	71.27	19.96	35	137	96	71.25	19.09	32	121
Suicidal symptom scale	-	182	.148	.82	0	7	89	.30	1.17	0	7	96	.01	.10	0	1

Table 3 shows the aggregate perfectionism scores. Based on the responses, we found a significant difference between the two groups on only one dimension, namely "organisation". The ADHD group scored significantly lower on this dimension than the control group ($t(183) = 3.153$ $p = .002$; effect size mean $d = .47$; ADHD group: $M = 21.73$; $sd = 5.18$, control group: $M = 24.02$; $sd = 4.7$, variances were homogeneous ($F = .946$; $p = .332$).

Table 3. Total and dimensional values of perfectionism

Variable	Group	Significance test and adjusted p value
Concern over mistakes	Control	
	ADHD	$t(183) = .095$ $p_{adj} = 1.000$
Personal standards	Control	
	ADHD	$t(183) = 1.68$ $p_{adj} = .760$
Parental expectations	Control	

	ADHD	t(183)=-.259 p _{adj.} = 1.000
Parental criticism	Control	
	ADHD	t(183)=-1.181 p _{adj.} = 1.000
Doubt about actions	Control	
	ADHD	t(183)=-1.376 p _{adj.} = 1.000
Organization	Control	
	ADHD	t(183)=3.153 p _{adj.} =.016
Perfectionism (general)	Control	
	ADHD	t(183)=.036 p _{adj.} =1.000

Suicidal behaviour in the ADHD and control group

In the following, we wanted to obtain information on the extent of suicidal behaviour in the two groups, which is an important part of my doctoral work. We found a significant difference in suicidal behaviour between the two groups. Based on the M.I.N.I. KID, we found that the group diagnosed with ADHD had significantly higher suicidal behaviour, but the effect size was small ($z(182) = -2.975, p = .003, r = .22$). Table 4. presents the differences in suicidal behaviour between the two groups.

Table 4. Suicidal behaviour in the ADHD and control groups.

Variable	Group	N	Mean	SD	Significance test and adjusted p value
Suicidal behaviour	Control	96	.010	.1021	r=.22
	ADHD	89	.299	1.1625	z(181)=-2.975, p _{adj.} =.016

Perfectionism and suicidal behaviour in adolescents diagnosed with ADHD

Results showed that the "Personal expectations" dimension of perfectionism was significantly associated with suicidal behaviour in both regression models. The "Personal expectations" perfectionism dimension belongs to the group of adaptive traits. Furthermore, my results showed that a diagnosis of ADHD increased the prevalence of suicidal behaviour by 48%, while the "Personal expectations" perfectionism dimension decreased the prevalence of suicidal behaviour by 7% (OR = 1.48, $p = .012$). Table 5. illustrates the detailed results for suicidal behaviour, perfectionism, and ADHD obtained using logistic regression analysis.

Table 5. Relationship between ADHD, suicidal behaviour and perfectionism using logistic regression

Suicide dummy	OR	St.Err	z-value	p-value	[95% conf. int]		Sig.
Perfectionism (general)	.928	.023	-3.02	.003	.884	.974	***
ADHD (combined)	1.477	.23	2.50	.012	1.088	2.004	**
Constans	1.264	1.718	.17	.863	.088	18.141	
	Mean dependent var		.060	SD dependent var	.239		
	Pseudo r-squared		.203	Number of obs	182		
	Chi-square		16.888	Prob > chi2	.000		
	Akaike crit. (AIC)		72.168	Bayesian crit. (BIC)	81.780		
*** $p < .01$, ** $p < .05$, * $p < .10$							

For the second regression model, I used negative binomial regression. In this model, the dependent variable was the M.I.N.I. KID's suicide symptom scale and the two independent

variables were Perfectionism and ADHD, which result was significant ($\chi^2(3) = 21.12, p < .0001; \alpha = 6.13$). The detailed results are illustrated in Table 6.

Table 6. Association between ADHD, suicidal behaviour and perfectionism using negative binomial regression.

Negative binomial regression							
Suicide scale	IRR	St.Err	z-value	p-value	[95% conf	Interval	Sig
Perfectionism (general)	.900	.025	-3.75	0	.852	.951	***
ADHD (combined)	1.572	.284	2.50	.012	1,103	2.24	**
Constans	1.572	.284	2.50	0.012	1,103	2.24	**
	Mean dependent var		.148	SD dependent var		.818	
	Pseudo r-squared		.180	Number of obs		182	
	Chi- square		21.119	Prob > chi2		.000	
	Akaike crit. (AIC)		104.479	Bayesian crit. (BIC)		117.295	

5.3. Results of the second study

In our second study we wanted to explore the effect of generalised anxiety disorder and depressive symptoms as mediators between ADHD and suicidal behaviour.

Examining the relationship between ADHD, depression, anxiety and suicidal behaviour

First, to explore the relationship between the disorders, I created four variables by summing the questions in the M.I.N.I. KID and calculated Spearman correlations. For this first analysis, I was interested in the relationship between the four variables. The number of ADHD symptoms was significantly correlated with that of depression ($\rho = 0.3, p < .001$) and suicidal ideation and planning ($\rho = .17, p = .02$), but not with anxiety ($\rho = .12, p = .11$). Depression significantly correlated with suicidal ideation and planning ($\rho = .3, p < 0.001$), but anxiety was not ($\rho = .06, p = .42$), and anxiety was correlated only with depression ($\rho = .34, p < .001$). These results are illustrated in detail in Table 5.

Table 5. ADHD, GAD, depression, suicidal behaviour and their correlations.

	ADHD	Depression	Suicidality
Depression	.3 ($p < .001$)		
Suicidality	.17 ($p = .019$)	.3 ($p < .001$)	
Anxiety	.12 ($p = .111$)	.34 ($p < .001$)	.06 ($p = .422$)

Mapping the relationship between ADHD, anxiety, depression and suicidal behaviour with Ising's network

The controlled Ising network model was estimated with one suicidal behaviour (thinking and planning), three anxiety (anxiety, fatigue and concentration problems, restlessness and anger), four depression (sad and uninterested, appetite and concentration, sleepiness and fatigue, and worthlessness), and four ADHD (intrusive, inattentive, disorganised, hyperactive) variables. This is illustrated in Figure 1.

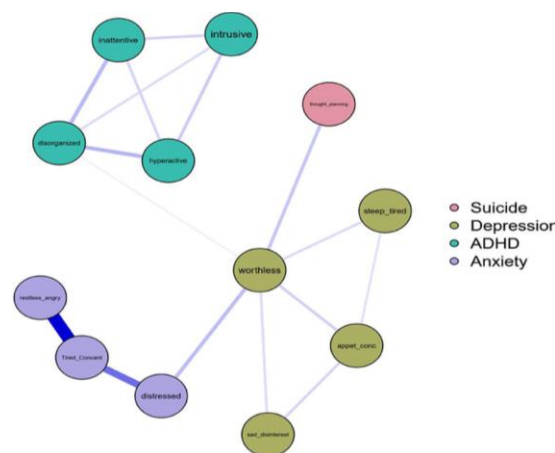


Figure 1. Regulated Ising network model showing the relationship between suicide, depression, anxiety, and ADHD.

Figure 2 examines the robustness of our findings. The figure shows that we have compared the previously obtained networks based on strength, betweenness and closeness. The figure shows that increasing the hyperparameter above .15 (removing weak correlations) changes the estimate of the first mediator edge between disorganization and worthlessness. These results suggest that the mediator effect is relatively robust, but the effect size of the association between ADHD and depression is not large. The second path between worthlessness and suicidal ideation appears robust, as the estimates do not vary significantly. The graph shows that only removing the weak edge between ADHD and depression modifies the absolute edge weight. I illustrate these relationships in Figure 2.

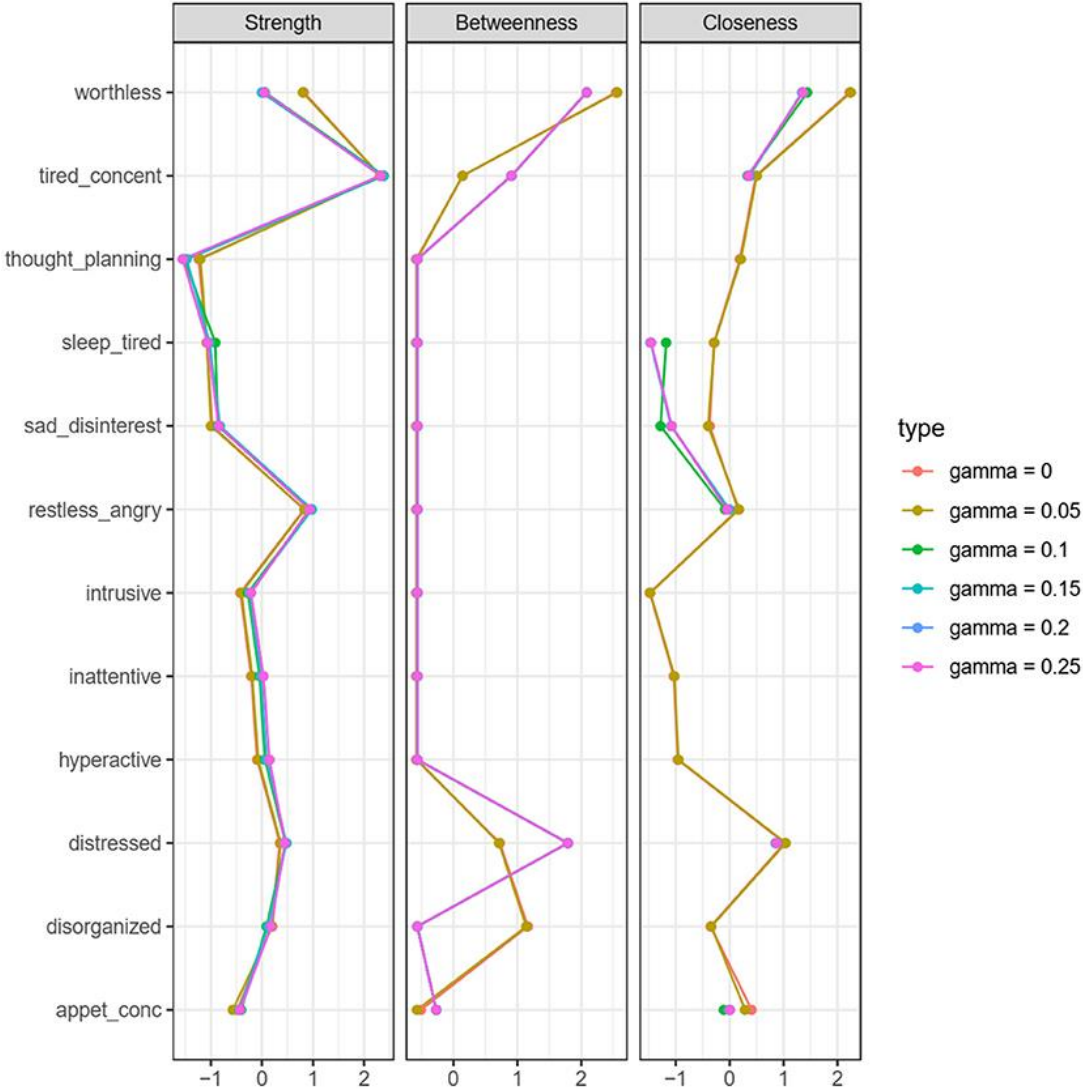


Figure 2. An illustration of the robustness of the results

Although the analysed correlation with suicidal behaviour was significant for both ADHD and depression, based on our network model, only depression was directly related to suicidal behaviour. Within depression, the logit B CI95 value between the worthlessness factor and suicidal ideation proved to be significant [.72, 1.66]. In addition, we found that both ADHD and anxiety were indirectly related to suicidal behaviour through depression.

6. DISCUSSION

6.1. Discussion of the first study

To the best of my knowledge, this study of my doctoral work is the first that focuses on perfectionism as a risk factor for possible suicidal behaviour in adolescents diagnosed with ADHD.

One of the most important results of our research is that the level of suicidal behaviour was negatively related to adaptive perfectionism. This is a very important result, since, as I mentioned in the introduction, people often focus only on the negative aspects when it comes to perfectionism, and this aspect shows that adaptive perfectionism has a positive effect not only on performance, but also on suicidal behaviour. In the last decade, a growing literature deals with the construct of perfectionism among persons diagnosed with ADHD (Bodalski et al., 2023; Christian et al., 2021; Fugate and Gentry, 2016). The perfectionism dimension, personal expectations means that the person strives not only for good performance, but for perfection without mistakes (Frost et al., 1991). In this way, for adolescents diagnosed with ADHD, if they set high expectations for themselves, it can be a helping factor not to get stuck in the stigma, for example, as a "bad student". Thus, perfectionism can not only have a positive effect on development, but it can also have a negative on suicidal behaviour (Tingey et al., 2016). In contrast, Bodalski and colleagues (2023) found in their research that people diagnosed with ADHD do not set high expectations for themselves, but if these low expectations are not met, they react very negatively. Christian and colleagues (2021) also confirm that persons diagnosed with ADHD had one of the lowest perfectionism values among the investigated disorders. These results highlight that persons diagnosed with ADHD have lower expectations regarding their performance, which, if we reflect on our results, may be a risk factor for suicidal behaviour. The only dimension in which we found a significant difference was the organisation trait. This difference shows that one of the leading symptoms of ADHD, inattention, is probably influenced by the concentration and perfectionism dimension. Therefore, it may be that persons diagnosed with ADHD, especially those with predominantly attention deficit ADHD, score lower on the organisation dimension of perfectionism than persons not diagnosed with ADHD.

Our study also showed that there is a significantly higher level of suicidal behaviour among adolescents diagnosed with ADHD than in the control group. This result is consistent with previous research, which also indicated a significantly increased suicidal behaviour among adolescents with ADHD (Balazs and Keresztény, 2017; Buitelaar, 2017).

6.2. Discussion of the second study

The second study of my doctoral work is, to our knowledge, the first to examine the relationship between anxiety, depression, ADHD and suicidal thoughts.

In line with several previous results, my third hypothesis was supported (Levy et al., 2020; Balazs et al., 2014; Fried et al., 2015), according to which symptoms of anxiety and depression mediate the relationship between ADHD and suicidal ideation and planning. When we controlled for anxiety and depression, the association between ADHD and suicidal ideation and planning disappeared, meaning that in the current study we found only an indirect association between ADHD and suicidal ideation and planning. Cho and colleagues (2008) also found that comorbid conditions fully mediated the relationship between ADHD and suicidal ideation. Our research group previously found that the mediating symptoms between ADHD and suicide are different for children and adolescents (Balázs et al., 2014). Depression symptoms are important mediating factors in adolescents, while anxiety symptoms are important mediating factors in children (Balázs et al., 2014; Balázs and Keresztény, 2017; Van Eck et al., 2015). Based on our results, it can be said that, like other research mentioned above, our study also supported the importance of comorbid symptoms among adolescents diagnosed with ADHD. In the current study, we would highlight depression's sense of worthlessness as the primary risk factor for suicidal thoughts and planning. We can also interpret worthlessness as a lack of positive feelings about oneself, which is closely related to a lack of interest and joy (Harrison et al., 2022). Blanken and colleagues (2018) believed that feelings of worthlessness were closely related to self-blame, guilt, inferiority complex, and ultimately ending one's life. As a result, the feeling of worthlessness is presumably related to suicidal behaviour. Worthlessness was first described as a leading symptom of major depressive disorder in the DSM-3 edition (Buchwald & Rudick-Davis, 1993). Worthlessness was present in 70-80% of major depressive patients in the USA (Buchwald & Rudick-Davis, 1993). Furthermore, worthlessness, as a symptom of depressive disorder, was closely related to suicide even at a young age (Ridge et al., 2016; Liu et al., 2006; Jeon et al., 2014). Recently, Harrison and colleagues (2022) studied the psychopathological implications of feelings of worthlessness. Their publication reveals that feeling of worthlessness is a symptom of depression that is present in all cultures and is a

characteristic and is a constant symptom of depression. In addition, the feeling of worthlessness also functions as a predictor of the future occurrence of depression (Harrison et al., 2022). Previous studies mostly looked for correlations between internalizing disorders and the feeling of worthlessness, the volume of literature related to externalizing disorders is much smaller. Therefore, the results obtained in our research are important because the more we know about the depressive symptoms of adolescents diagnosed with ADHD, the more effectively we can help them.

7. LIMITATIONS

Our results should be interpreted considering the following limitations. 1) These are cross-sectional studies; I could not assess a cause-and-effect relationship. 2) We used self-report scales to assess perfectionism. With self-report scales, there is always a chance that the participants will not mark the most relevant answer, or that they will just rush through the questions. 3) In the research, there was a difference in gender ratios between ADHD and the control group, however, it is important to note that this difference reflects the natural occurrence of ADHD, as ADHD is more common in boys than in girls (Gershon and Gershon 2002). 4) There are no published norms for the FMPS, but there is a lot of normative information about the scale (Frost et al., 1991; Frost et al., 1990; Frost et al., 1994) in the published articles. 5) The FMPS is a non-validated tool in Hungary, which we would like to validate in the future based on the present research. 6) Due to the Covid-19 pandemic, the study had to be completed earlier than we wanted, so instead of the planned number of participants, fewer people were included in the study.

8. THE PRACTICAL SIGNIFICANCE OF THE RESULTS OBTAINED DURING MY DOCTORAL WORK

The results obtained during my doctoral work can be divided into two parts: one serves to support the existing literature, and the other is new information compared to the literature.

8.1. Supporting the existing literature

Our current research also confirmed, as did others in a domestic sample (Balázs et al., 2014, Balázs and Keresztény, 2017), that suicidal behaviour showed a strong correlation with ADHD. In our current research, adolescents diagnosed with ADHD had a significantly higher rate of suicidal behaviour than in the control group (Katzenmajer-Pump et al., 2021; Katzenmajer-Pump et al., 2022). In an American high school, a school prevention program was developed

for adolescents diagnosed with ADHD, in which the emphasis was placed on the treatment of depression and suicidal symptoms (Meinzer et al., 2022). In the future, I consider it important to validate and possibly develop prevention programs for the treatment of adolescents diagnosed with ADHD.

Among adolescents diagnosed with ADHD, previous research on mediating factors was also investigated, and the researchers found a mediating effect between ADHD and suicidal behavior through depressive (Balázs et al., 2014) and anxiety (Levy et al., 2020) symptoms. Like others, we found the same, that when mediating factors were controlled, the relationship disappeared, so we also found an indirect relationship. This finding is important among adolescents diagnosed with ADHD, since in addition to ADHD, another comorbid disorder is also present in 66% of cases (Reale et al., 2017). On a domestic basis, the results of Balázs and colleagues' (2014) research drew the attention of clinicians to possible mediators among adolescents diagnosed with ADHD, which was confirmed by the inclusion of additional sites in the current study.

8.2. New research results during my doctoral work

One of the most important new results of my doctoral work is the information obtained on the level of perfectionism of adolescents diagnosed with ADHD. Among adolescents diagnosed with ADHD, adaptive perfectionism is negatively related to suicidal behaviour (Katzenmajer-Pump et al., 2021). So far, only a few studies have mentioned the relationship between ADHD and perfectionism (Christian et al., 2020; Strohmeier et al., 2016; Ramsay and Rostain, 2016). The research conducted during my doctoral work is the first that specifically dealt with the relationship between ADHD and perfectionism and found a negative correlation of the personal expectations adaptive perfectionism dimension with suicidal behaviour.

Another new research result of my doctoral work is that among adolescents diagnosed with ADHD and the control group was no significant difference in the dimensions of perfectionism, only in one, organisation. This confirms that adolescents diagnosed with ADHD strive for perfect performance in the same way as those without an ADHD diagnosis. The lower scores obtained in the organisation dimension support the characteristics of the symptoms of adolescents diagnosed with ADHD. We can provide significant results in clinical work, because adolescents diagnosed with ADHD have the same demand for good performance as undiagnosed adolescents, and that is why it is important that parents and children consult a specialist as soon as possible, which unfortunately often does not happen (Zwaan et al., 2012).

Finally, our research results pointed out that, among the depressive symptoms, we found the feeling of worthlessness, which appeared as a mediating factor between ADHD and suicidal behaviour. Previous research has also published depression as a mediating factor (Balázs et al., 2014), but no specific research has yet been conducted on the depressive symptom of worthlessness. In our study, I consider it important to emphasize this result, since it may be of greater importance in the clinic as well for specialists to address value as a process of treating depression, since if an adolescent diagnosed with ADHD feels valued, then based on our present research, the possibility of suicide is reduced.

9. SUMMARY

The information obtained during my doctoral work supports and confirms several previous studies regarding the suicidal behaviour of adolescents diagnosed with ADHD (Balázs et al., 2014; Balázs and Keresztény, 2017). The results also confirm that it is still important to place great emphasis on the development of suicide prevention programs among adolescents diagnosed with ADHD, since adolescents diagnosed with ADHD had significantly higher suicidal behaviour than the control group. Our research also supported the presence and importance of depression as a mediating factor (Katzenmayer-Pump et al., 2022), and among the depressive symptoms, I would highlight the feeling of worthlessness, which I found in my research as a significant mediating factor between ADHD and suicide (Katzenmayer-Pump et al., 2022). Previous research also found a similar result, according to which depression is a mediator between ADHD and suicidal behaviour (Cho et al., 2007; James et al., 2004). Studies are usually based on the DSM system, in which the presence or absence of a diagnosis is used, thus narrowing it down to symptoms is not possible, and therefore valuable information may be lost. This result draws attention to the importance of depressive symptoms and emphasizes the importance of the dimensional approach, according to which mental disorders must be treated as a continuum and all symptoms must be paid attention to. I would like to highlight our result regarding the feeling of worthlessness in depression because the literature on depression and ADHD contains a large amount of research, but this research did not address which symptom has the greatest influence in the relationship between ADHD and suicidal behaviour. In our study, I also would like to highlight adaptive perfectionism as a protective factor for suicidal behaviour among adolescents diagnosed with ADHD. My result is also important because suicidal behaviour is one of the leading causes of death among adolescents (Mayes et al., 2015), so research on protective factors will increase the effectiveness of future prevention programs. Regarding perfectionism, it is important to note our results on the differences

between the dimensions, since the adolescents diagnosed with ADHD did not reach a lower level in the dimensions of perfectionism than the healthy group, only in the aggregate. I would like to highlight this result of ours because, as I mentioned before, adolescents diagnosed with ADHD are often stigmatized as "bad students" at school because of their ADHD symptoms (Tingey et al., 2016). In contrast, Bodalski and colleagues (2023) found in their research that people diagnosed with ADHD do not set high expectations for themselves, but if these low expectations are not met, they react very negatively. Christian and colleagues (2021) also confirm that persons diagnosed with ADHD had one of the lowest perfectionism values among the investigated disorders. These results highlight that persons diagnosed with ADHD have lower expectations regarding their performance, which, if we reflect on our results, may be a risk factor for suicidal behaviour. The only dimension in which we found a significant difference was the organisation trait. This difference, as the research also supports, shows that one of the leading symptoms of ADHD, inattention, is probably influenced by the concentration and perfectionism dimension. Therefore, it may be that persons diagnosed with ADHD, especially those with predominantly attention deficit ADHD, score lower on the collectivity dimension of perfectionism than persons not diagnosed with ADHD. Our study also showed that there is a significantly higher level of suicidal behavior in adolescents diagnosed with ADHD than in the control group. This result is consistent with previous research, which also indicated significantly increased suicidal behavior among adolescents with ADHD (Balazs and Keresztény, 2017; Buitelaar, 2017).

10. OUTLOOK

The present research raises a number of additional questions, which should be addressed in future research. In my dissertation, we examined the degree of perfectionism of adolescents diagnosed with ADHD, in the future it is worthwhile to include not only perfectionism, but also the character traits related to it in the studies. One such trait is procrastination, which is clearly related to both perfectionism and ADHD. The literature on perfectionism is growing, but it is not yet widespread among externalizing disorders. I believe that just as there is no difference between the perfectionism dimensions in adolescents diagnosed with ADHD, which is an even surprising research result, compared to healthy adolescents, we might get similar results in the case of other disorders. For example, the correlation of other externalizing disorders with perfectionism could be investigated in the future, since little data is available. The better we get to know perfectionism, and in which disorders it dominates, would provide important information, since problems related to disorders can even arise from an excessive perfectionist

attitude. Since our current research is cross-sectional, from which it is not possible to draw cause-and-effect relationships, I think it is important to be able to analyse the relationships between ADHD, perfectionism, and suicidal behaviour again in the future, within the framework of a longitudinal study. This would be important because we would get an idea of whether the perfectionist character of children diagnosed with ADHD is stable and whether their relationship with suicidal behaviour changes. Finally, as we already mentioned in my dissertation, the motivation of adolescents diagnosed with ADHD for good academic performance is also an adaptive perfectionist trait, and this can be a protective factor in relation to suicidal behaviour. On the one hand, it would be worthwhile to include motivation as a control factor in the research, since it is an important element of how adolescents diagnosed with ADHD perform. In addition, academic performance could be included as a control factor in future research since motivation and perfectionism also have a significant effect on school performance.

OWN PUBLICATIONS RELATED TO THE DISSERTATION

Katzenmayer-Pump, L., & Balázs, J. (2021). Perfectionism and Suicide: A systematic review of qualitative studies. *Psychiatria Hungarica: Scientific journal of the Hungarian Psychiatric Association*, 36, 4-11.

Katzenmayer-Pump, L., Farkas, B.F., Varga, B.A., Jansma, J.M., & Balázs, J. (2021). Low level of perfectionism as a possible risk factor for suicide in adolescents with attention-deficit/hyperactivity disorder. *Frontiers in Psychiatry*, 12, 707831.

Katzenmayer-Pump, L., Komáromy, D., & Balázs, J. (2022). The importance of recognizing worthlessness for suicide prevention in adolescents with attention-deficit/hyperactivity disorder. *Frontiers in Psychiatry*, 13, 969164

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