

# ADHD Symptoms and Health-Related Quality of Life of Adolescents and Young Adults

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**Abstract:** *Background:* Adolescence and young adulthood present particularly challenging periods for individuals affected by attention-deficit hyperactivity disorder (ADHD) symptoms. However, unlike childhood ADHD, ADHD among adolescents and young adults has been studied less frequently. A concept that can be used to characterize the experiences of individuals with ADHD symptoms is health-related quality of life (HRQoL), which encompasses well-being in various dimensions. *Aims:* The present study used a school-based sample in the German-speaking part of Switzerland to investigate the association between ADHD symptoms and HRQoL of adolescents and young adults. *Method:* A total of 907 individuals aged 14–24 years ( $M = 17.69$ ;  $SD = 1.66$ ; 58.9% female) were surveyed regarding ADHD symptoms and HRQoL. *Results:* Multiple hierarchical regression analyses disclosed that ADHD symptoms were negatively related to all subdimensions of HRQoL. Moreover, adolescents with clinically significant or subclinical ADHD symptoms showed lower values in all examined dimensions – physical, emotional, self-esteem, family, friends/peers, and school/education – than adolescents with unremarkable ADHD symptoms. An exception was the well-being concerning friends/peers. *Limitations:* The present study used a cross-sectional design and a selective sample of school classes. ADHD symptoms were assessed using self-reports without any diagnostic judgment. *Conclusion:* The results illustrate the comprehensive effects of ADHD symptoms on well-being during adolescence and young adulthood. They highlight the importance of focusing more on ADHD during these stages of age, also considering individuals with symptoms in the subclinical range.

**Keywords:** attention-deficit hyperactivity disorder, ADHD, health-related quality of life, adolescence, young adulthood

In recent years, there has been a shift in the spectrum of illnesses among children and adolescents from somatic and acute to mental and chronic disorders (e.g., Reinhardt & Petermann, 2010). One disorder that has increasingly come into focus in this context is attention-deficit hyperactivity disorder (ADHD), which is one of the most common mental disorders in childhood and adolescence (e.g., Banaschewski et al., 2017). Over the past few years, many studies have shown that ADHD symptoms are related to characteristic difficulties in school and other areas of life (e.g., Danckaerts et al., 2010; Frazier et al., 2007).

ADHD can be conceptualized as a spectrum. Even children and adolescents with ADHD symptoms in the subclinical range exhibit impairments (e.g., Balázs & Keresztény, 2014). Although categorical definitions are mainly used for psychiatric disorders based on current classification systems such as the Diagnostic and Statistical Manual of Men-

tal Disorders (DSM-5; American Psychiatric Association, 2013), studies are increasingly integrating dimensional approaches, also regarding ADHD<sup>1</sup> (e.g., Okasha, 2009; Schmiedeler & Schneider, 2014). For example, various studies demonstrate that children with subthreshold ADHD (who show at least a minimum number of ADHD symptoms but do not meet the full-symptom criteria of the classification systems) have higher levels of functional impairments than children without ADHD and are also more frequently affected by comorbid psychiatric disorders (see the review of Balázs & Keresztény, 2014). These findings provide evidence that dimensional approaches to ADHD reflect the subjective reality of affected individuals more adequately than categorical ones.

Compared to childhood, ADHD in adolescence and young adulthood has been studied far less frequently. However, it is likely that these developmental phases, with their

<sup>1</sup> The categorical classification approach uses a critical threshold to define ADHD and indicates the minimum number of symptoms that must be present to make a diagnosis. This approach assumes that individuals with ADHD can be demarcated from the normal behavioral range by a specific cut-off. An alternative conceptualization favors a dimensional view. Here, ADHD is described as a trait on a continuum of increasing symptom severity, with individuals with ADHD at one extreme end of this dimension, differing from normal only by degree (Schmiedeler & Schneider, 2014).

multiple demands, are particularly challenging periods for affected individuals. Various developmental tasks (e.g., detachment from parents, development of autonomy and self-reliance, relationship experiences) and a decrease in formal structures (Hurrelmann, 2007; Seiffge-Krenke, 2015) may pose great challenges for adolescents and young adults with ADHD symptoms.

A concept that can be used to characterize the experiences of individuals with ADHD symptoms is health-related quality of life (HRQoL). In recent years, this concept has gained considerable importance in research and practice as an additional measure alongside symptomatology. It provides a means to measure health more comprehensively as it includes physiological, psychological, social, and functional aspects of health. Researchers have studied this concept mainly regarding disease prevention and health promotion (e.g., Baumgarten et al., 2019). However, the concept has been little studied regarding adolescents and especially young adults with ADHD. Most of the existing studies on the association between ADHD and HRQoL rely on parents' assessments of children with ADHD (Danckaerts et al., 2010; Lee et al., 2016). In order to provide effective treatment and prevention strategies, it is important to know how the symptoms affect the daily life and well-being of adolescents and young adults with ADHD symptoms. Therefore, this study aimed to examine the association between ADHD symptoms and HRQoL of adolescents and young adults according to a dimensional approach to ADHD.

## ADHD Symptoms in Adolescence and Young Adulthood

The characteristic childhood ADHD symptom pattern changes over the years. In general, symptoms tend to decrease during adolescence (Döpfner et al., 2015). Moreover, motor restlessness (i.e., hyperactivity), which is common in childhood, often results in inner restlessness in adolescence and young adulthood. It can manifest as the frequent rocking of the feet, finger drumming, or playing around with pens. Inattention problems usually persist and manifest as disorganization, forgetfulness, unreliability, and difficulties with planning, task completion, and time management (e.g., Tischler et al., 2010). Prominent neuropsychological theories of ADHD (for a review, see Willcutt, 2015) suggest that its symptoms arise from a primary deficit in executive functions and self-regulation, defined as neurocognitive processes that maintain an appropriate problem-solving set to attain a later goal. Particularly, anticipatory planning ability, behavioral inhibition (i.e., suppression of action-irrelevant stimuli), working memory, and sustained attention are often impaired. In adolescence and young adulthood, the negative effects of symptoms on performance may be accentuated when high demands are

placed on attentional performance and self-regulatory skills in the school context.

In addition to performance problems, difficulties in social interaction in both home and school settings often arise (Edwards et al., 2001; Murray-Close et al., 2010). It is known that ADHD symptoms are associated with lower frustration tolerance and interpersonal skills. Based on these findings, it is not surprising that comorbid problems, such as low self-esteem, low achievement motivation, social skills deficits, and social withdrawal are very common among adolescents and young adults affected by ADHD symptoms (Abecassis et al., 2017; Powell et al., 2020; Rademacher et al., 2002). It seems obvious that the symptoms and associated difficulties are also closely linked to the subjective well-being of individuals.

## ADHD Symptoms and Health-Related Quality of Life

Based on the definition of health proposed by the World Health Organization (WHO, 2020), the subjective well-being of children and adolescents can be examined under the concept of HRQoL. This multidimensional construct can be defined as the subjective perception and assessment of the most important aspects of one's own life situation, such as one's state of health, functioning, social integration, and participation in age-appropriate life activities (Mattejat & Remschmidt, 2006). This concept also helps in determining the burden associated with a specific disorder.

Regarding childhood, several studies are looking at the relationship between ADHD and HRQoL. However, with regard to adolescence and young adulthood, a research gap is apparent. In the few studies examining the quality of life of adolescents and young adults with ADHD symptoms, ADHD has been conceptualized in different ways. Most studies are based on categorical approaches and concrete diagnoses. In summary, the studies show that lower scores were found in all or at least some dimensions of well-being compared to the respective control group. For example, Topolski et al. (2004) found lower overall quality of life scores among 68 boys aged 11–18 years with a clinical diagnosis of ADHD compared to a group of 107 adolescents with no chronic conditions. Likewise, they found lower scores in the subdomains of *sense of self* (with aspects such as self-efficacy and psychological and physical well-being) and *relationships* (with family and friends). Data from the German Health Interview and Examination Survey for Children and Adolescents (KiGGS; Hölling et al., 2008) show that the quality of life of adolescents with ADHD aged 14–17 years is significantly lower in the domains of well-being concerning family and school/education, as well as in the overall score when compared with children and adolescents with no ADHD diagnosis.

Schmidt et al. (2012) did not explicitly address the concept of HRQoL. However, they addressed the psychosocial situation of adolescents with ADHD symptoms in a similar way. Using data from 327 adolescents aged 14–25 years, they categorized groups, namely “ADHD” and “no ADHD”, based on a screening instrument and a cut-off value. The authors demonstrated that adolescents affected by ADHD symptoms reported more depressive symptoms than adolescents with no ADHD symptoms. Moreover, those with ADHD symptoms had reduced physical and psychological well-being and global life satisfaction.

## Research Questions

Previous considerations suggest that ADHD symptoms can be associated with a wide range of difficulties. Only a few studies have examined individuals with ADHD symptoms during adolescence and young adulthood. Moreover, affected individuals in the subclinical range are often not included in studies and/or analyses as most studies use categorical approaches to determine ADHD (e.g., in KiGGS; Hölling et al., 2008). Therefore, the present study addressed the association between ADHD symptoms as well as symptom severity and HRQoL. Thus, the aim was to comprehensively examine the impact of the symptoms on the daily life and well-being of adolescents and young adults, using a dimensional approach to ADHD.

Based on evidence on characteristic difficulties associated with ADHD symptoms (e.g., Banaschewski et al., 2017; Murray-Close et al., 2010; Rademacher et al., 2002) and the relationship between ADHD and quality of life (Hölling et al., 2008; Schmidt et al., 2012; Topolski et al., 2004), we expected that more severe ADHD symptoms are associated with lower quality of life and that the strongest effects can be found in psychological/emotional and relationship domains.

## Method

### Project and Sample

The present study is embedded in the project Enhanced Inclusive Learning (EIL; Schellenberg et al., 2020) of two higher education institutions in Switzerland. This project aimed to examine the situation of adolescents and young adults with impairments and behavioral problems at the upper secondary level II. Predominantly, it focused on

accommodations in the form of disability compensation (“Nachteilsausgleich”). Therefore, the study included classes in which at least one adolescent or young adult claimed disability compensation. All upper secondary schools in the German-speaking part of Switzerland were contacted. Schools volunteered to participate.

Symptoms of ADHD and HRQoL were examined in more detail as part of the ADHD sub-study. Between September 2018 and January 2019, adolescents and young adults from 66 classes from the German-speaking part of Switzerland were surveyed at one point in time using questionnaires. All procedures complied with the ethical guidelines of the local ethics committee of a higher education institution. All respondents were informed about the aims and contents of the survey, and a written declaration of consent for anonymous data use was obtained from all respondents.

The total sample consisted of 907 adolescents and young adults aged between 14 and 24 years ( $M = 17.69$ ;  $SD = 1.66$ ; 58.9% female). Individuals over the age of 24 were excluded from the sample after data collection because the focus of the project was on adolescence and young adulthood. Students from Baccalaureate schools ( $n = 344$ ) were in their 9th–13th grades and were preparing for tertiary-level education programs. Students from vocational education and training (VET) schools ( $n = 563$ ) had different years of training. Some were engaged in a three- or four-year apprenticeship leading to a Federal VET Diploma (FVD), while others were in a two-year apprenticeship leading to a Federal VET Certificate (FVC).<sup>2</sup>

## Measures

Sociodemographic data on gender, age, and school type (Baccalaureate schools vs. VET schools) were collected.

In order to assess ADHD symptoms, the self-report questionnaire of the German Diagnostic System for Mental Disorders according to ICD-10 and DSM-5 for Children and Adolescents (DISYPS-III; Döpfner & Görtz-Dorten, 2017) was used. The scale consists of 20 items that measure inattention (items 1–9), hyperactivity (items 10–16), and impulsivity (items 17–20). For example: “I am often easily distracted by the environment or by my own thoughts”. The items are rated on a 4-point scale (from 1= *not at all true* to 4= *especially true*). The internal consistency of the scale ( $\alpha = .88$ ) was good.

In order to measure well-being in the sense of HRQoL, the KINDL-R questionnaire (Ravens-Sieberger

<sup>2</sup> In Switzerland, after compulsory schooling (until 9th grade), youth have to decide between a general education (Baccalaureate or specialized schools) or vocational education and training (VET) at the upper secondary level II. Students with matriculation certificates from Baccalaureate schools are entitled to enroll at universities whereas graduates of the specialized schools and VET-graduates with a vocational baccalaureate certificate are eligible for admission to universities of applied sciences.

& Bullinger, 2003) was used. The KINDL-R inquires about six subdimensions of HRQoL considering the prior week. All 24 items were answered on a 5-point Likert scale (from 1 = *never* to 5 = *always*). Internal consistencies of the total scale and the different subscales were mostly acceptable to good. However, few subscales also showed critical values (physical well-being [e.g., felt sick, item recoded]:  $\alpha = .70$ ; emotional well-being [e.g., felt fearful or insecure, item recoded]:  $\alpha = .63$ ; self-esteem [e.g., was happy with myself]:  $\alpha = .72$ ; well-being regarding family [e.g., felt comfortable at home]:  $\alpha = .84$ ; well-being regarding friends/peers [e.g., got along with friends]:  $\alpha = .59$ ; and well-being relating to school/education [e.g., was afraid of getting bad grades, item recoded]:  $\alpha = .48$ ). The scale showed comparable internal consistency in the KiGGS study (Bullinger et al., 2008). As it is an established scale that is considered valid and reliable, the subscales were used largely unchanged in this study. Only for the subscale well-being related to school/education, internal consistency was improved by excluding one item from the analysis (Item 2 “I was interested in the lessons”; new  $\alpha = .56$ ).

## Statistical Analyses

IBM SPSS Statistics 26 was used to perform the statistical analyses. Scales were calculated in each case only if a maximum of 10% of the associated items were missing. One or more scales could not be calculated for 74 individuals. Thus, data from 833 individuals were included in the analyses. Excluded adolescents and young adults did not differ from the included ones in terms of gender,  $\chi^2(1) = 2.62, p > .05$ , age,  $t(905) = -0.78, p > .05$ , ADHD symptoms,  $t(65.50) = -0.84, p > .05$ , and HRQoL,  $t(839) = 0.60, p > .05$ .

Prior to the essential analyses, product-moment correlations were calculated to examine the extent to which the relevant variables were related (Table 1). Subsequently, multiple hierarchical regression analyses were conducted to examine the impact of ADHD symptoms on HRQoL. In a first step, the control variables gender and age were included in all regression analyses. Regarding ADHD symptoms, two approaches were used. In order to determine the general impact of ADHD symptoms on HRQoL, the mean of the ADHD scale was entered in step 2 in a set of regression analyses (Approach 1, Table 2, in the upper half of the table). Intending to examine the influence of the individual

symptom severity on HRQoL, two group variables were entered at Step 2 in another set of regression models (Approach 2, Table 2, in the lower half of the table). For Approach 2, a group classification was made based on percentile ranks and stanine norms according to Döpfner and Görtz-Dorten (2017).<sup>3</sup> For this purpose, percentile ranks were formed separately for gender from the raw scores of the ADHD scale for those aged 14–17 years and 18–24 years. The percentile ranks were then converted into stanine scores. Individuals falling into stanine scores 1–6 (percentile rank 0–77) were classified in the “unremarkable ADHD symptoms” group. Individuals with a stanine score of 7 (percentile rank 78–89) were classified in the “subclinical ADHD symptoms” group. Lastly, those in stanine scores 8 and 9 (percentile rank 90–100) were classified in the “clinically significant ADHD symptoms” group. It was tested whether the three ADHD groups differ from each other in the potential control variables. Regarding the regression analyses with Approach 2, in Step 2, the two dummy variables “subclinical ADHD symptoms” and “clinically significant ADHD symptoms” were entered. The variable “unremarkable ADHD symptoms” was used as a reference category. Thus, it was examined whether belonging to the group “clinically significant ADHD symptoms” or “subclinical ADHD symptoms” as opposed to the group “unremarkable ADHD symptoms” had an impact on HRQoL.

## Results

### Correlations

Descriptive statistics and correlations between the variables are shown in Table 1. Gender was correlated with ADHD symptoms ( $r = .10, p < .01$ ), with the KINDL-R total score ( $r = .22, p < .001$ ), and with all subdimensions of HRQoL (from  $r = .07$  to  $.30$ , all  $p < .05$ ). Age was correlated with school type ( $r = .26, p < .001$ ), ADHD symptoms ( $r = .08, p < .05$ ), the KINDL-R total score ( $r = -.08, p < .05$ ), emotional well-being ( $r = -.08, p < .05$ ), and well-being related to school/education ( $r = -.13, p < .001$ ). There was no significant relation between school type and other variables, except age. ADHD symptoms correlated with the total score of HRQoL ( $r = .42, p < .001$ ) and with all subdimensions (from  $r = -.17$  to  $-.35$ , all  $p < .001$ ). The

<sup>3</sup> The DISYPS-III manual provides standard values for boys and girls aged 14:0–17:11 years. However, as the present sample included individuals over the age of 18, separate stanine norms were formed in favor of a more conservative assessment of symptoms (i.e., fewer individuals classified as clinically significant). Even if this categorization remains associated with a certain arbitrariness, it seemed legitimate to make this classification due to the relatively large sample size. The authors of the DISYPS-III manual (Döpfner & Görtz-Dorten, 2017) consider this a dimensional approach (examination based on stanine norms). It contrasts with testing a minimum number of required symptoms to establish a diagnosis (categorical approach). It must be considered that the classification is based on a comparison of the individuals' symptomatology with the symptomatology of other individuals in the sample of the same gender.



**Table 1.** Descriptive statistics and correlations

KINDL-R	<i>M</i>	<i>SD</i>	2	3	4	5	6	7	8	9	10	11
1. Gender	0.41	0.49	.04	-.01	.10**	.22***	.30***	.10**	.23***	.08*	.07*	.13***
2. Age	17.69	1.66		.26***	.08*	-.08*	-.05	-.08*	-.03	-.05	-.04	-.13***
3. School type	0.62	0.49			-.03	-.03	-.06	-.02	-.03	-.04	.04	-.03
4. ADHD symptoms	0.67	0.42				-.42***	-.32***	-.35***	-.20***	-.28***	-.17***	-.30***
5. KINDL-R total score	3.69	0.49					.71***	.79***	.73***	.65***	.61***	.62***
6. Physical WB	3.25	0.80						.43***	.43***	.33***	.27***	.37***
7. Emotional WB	3.90	0.69							.49***	.43***	.47***	.45***
8. Self-esteem	3.39	0.77								.32***	.36***	.36***
9. Family WB	4.26	0.77									.25***	.28***
10. Friends/peers WB	3.86	0.64										.23***
11. School/education WB	3.47	0.79										

Note. WB = well-being. Gender was coded as follows: 0 = female, 1 = male. School type was coded as follows: 0 = Baccalaureate school, 1 = VET school.  
 \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

subdimensions of HRQoL correlated with each other between  $r = .23$  and  $.49$  (all  $p < .001$ ).

Regarding Approach 2, it was tested whether the three ADHD groups differ from each other in potential control variables. They did not differ in terms of gender,  $\chi^2(2) = 0.10$ ,  $p > .05$ , age,  $F(2) = 0.88$ ,  $p > .05$ , and school type,  $\chi^2(2) = 1.69$ ,  $p > .05$ .

## Impact of ADHD Symptoms on Health-Related Quality of Life

In the first step of the multiple regression analyses, gender and age were entered. Gender exhibited a significant effect in all analyses (e.g., KINDL-R total score:  $\beta = .27$  for Approach 1 with continuous ADHD symptoms as independent variable and  $.23$  for Approach 2 with ADHD related groups as independent variables, both  $p < .001$ ; Table 2) except for the well-being concerning friends/peers and Approach 2 ( $\beta = .06$ ,  $p > .05$ ). Thus, being male was related to a higher HRQoL. Age had a negative effect on HRQoL. However, the negative effect was significant only with respect to the KINDL-R total score (e.g., Approach 1:  $\beta = -.06$ ,  $p < .05$ ) and well-being concerning school/education (Approach 1:  $\beta = -.10$ ,  $p < .01$ ).

With regard to the impact of ADHD symptoms on HRQoL and Approach 1, it can be stated that the symptoms showed a negative impact on the total score ( $\beta = -.44$ ,  $p < .001$ ) and all subdimensions of HRQoL (from  $\beta = -.18$  to  $-.37$ , all  $p < .001$ ). The strongest effect was found for emotional well-being ( $\beta = -.37$ ,  $p < .001$ ), followed by physical well-being ( $\beta = -.36$ ,  $p < .001$ ). The weakest effect was

found regarding well-being with friends/peers ( $\beta = -.18$ ,  $p < .001$ ). Effect sizes were medium for the total score ( $f^2 = 0.26$ ), for physical ( $f^2 = 0.17$ ) and emotional well-being ( $f^2 = 0.16$ ), and small to medium for the other subscale (from  $f^2 = 0.03$  to  $0.11$ ), according to Cohen (1988). Overall, in Approach 1, the predictors could explain 25% of the variance in the total score of HRQoL ( $F(3, 829) = 92.82$ ,  $p < .001$ ; for the equations of all KINDL-R subdimensions, see the notes under Table 2).

In Approach 2, the variable “clinical significant ADHD” showed a significant negative impact on the total score ( $\beta = -.30$ ,  $p < .001$ ) and all subdimensions of HRQoL (from  $\beta = -.13$  to  $-.26$ , all  $p < .001$ ) compared to the reference category “unremarkable ADHD symptoms.” The variable “subclinical ADHD” also showed a significant negative impact on the total score compared to the reference category “unremarkable ADHD symptoms” ( $\beta = -.17$ ,  $p < .001$ ) and on all subdimensions of HRQoL (from  $\beta = -.09$  to  $-.15$ , all  $p < .01$ ), except for well-being with friends/peers ( $\beta = -.07$ ,  $p > .05$ ). Overall, the predictors were able to explain 16% of the variance in the total score of HRQoL in Approach 2 ( $F(4, 828) = 41.32$ ,  $p < .001$ ).<sup>4</sup>

## Discussion

The results show that ADHD symptoms are negatively associated with HRQoL in adolescence and young adulthood. Adolescents and young adults with clinically significant ADHD symptoms had substantially lower well-being

<sup>4</sup> Additionally, we ran another set of regression analyses to see a direct comparison between clinically significant and subclinical ADHD symptoms within approach 2. Hence, the variable “clinically significant ADHD symptoms” was in used as a reference category in this set. Results showed that the variable “subclinical ADHD” had a significant positive impact on the total score ( $\beta = .15$ ,  $p < .001$ ) and some subdimensions of HRQoL (physical, emotional, family from  $\beta = .12$  to  $.13$ , all  $p < .05$ ) compared to the reference category “clinically significant ADHD symptoms”.

**Table 2.** Results of the multiple regression analyses predicting (subdimensions of) Health-Related Quality of Life

KINDL-R	KINDL-R total score				Physical				Emotional				Self-esteem			
	B	b (SE)	$\beta$	$\Delta R^2$	B	b (SE)	$\beta$	$\Delta R^2$	B	b (SE)	$\beta$	$\Delta R^2$	B	b (SE)	$\beta$	$\Delta R^2$
Approach 1																
Step 1				.06***				.10***				.02**				.06***
Intercept	4.27	.16			3.80	.26			4.57	.24			3.73	.27		
Gender	.27	.03	.27***		.55	.05	.34***		.20	.04	.15***		.42	.05	.27***	
Age	-.02	.01	-.06*		-.02	.01	-.04		-.02	.01	-.05		-.01	.02	-.03	
Step 2				.19***				.13***				.14***				.06***
ADHD symptoms	-.53	.04	-.44***		-.71	.06	-.36***		-.62	.05	-.37***		-.45	.06	-.24***	
R <sup>2</sup> adj.				.25***				.22***				.15***				.12***
Approach 2																
Step 1				.06***				.10***				.02**				.06***
Intercept	4.10	.17			3.58	.27			4.38	.24			3.59	.27		
Gender	.23	.03	.23***		.49	.05	.30***		.15	.05	.11**		.39	.05	.25***	
Age	-.02	.01	-.08*		-.02	.02	-.05		-.03	.01	-.06		-.02	.02	-.03	
Step 2				.11***				.06***				.08***				.03***
Subclinical ADHD	-.27	.05	-.17***		-.31	.08	-.12***		-.31	.07	-.14***		-.21	.08	-.09**	
Clinically significant ADHD	-.50	.05	-.30***		-.63	.09	-.24***		-.58	.08	-.26***		-.37	.09	-.15***	
R <sup>2</sup> adj.				.16***				.16***				.09***				.08***
KINDL-R			Family				Friends/peers					School/education				
Approach 1																
Step 1				.01*				.00				.03***				
Intercept	4.90	.27			4.13	.24			4.62	.28						
Gender	.17	.05	.11**		.10	.04	.08*		.27	.05	.17***					
Age	-.02	.02	-.04		-.01	.01	-.02		-.05	.02	-.10**					
Step 2				.10***				.03***				.09***				
ADHD symptoms	-.59	.06	-.31***		-.27	.05	-.18***		-.57	.06	-.30***					
R <sup>2</sup> adj.				.10***				.03***				.12***				
Approach 2																
Step 1				.01*				.00				.03***				
Intercept	4.72	.28			4.05	.24			4.45	.28						
Gender	.12	.05	.08*		.08	.04	.06		.22	.05	.14***					
Age	-.02	.02	-.05		-.01	.01	-.03		-.05	.02	-.11***					
Step 2				.06***				.02***				.06***				
Subclinical ADHD	-.30	.08	-.12***		-.13	.07	-.07		-.36	.08	-.15***					
Clinically significant ADHD	-.58	.09	-.23***		-.29	.07	-.13***		-.56	.09	-.21***					
R <sup>2</sup> adj.				.06***				.02***				.09***				

Note.  $N = 833$ . Gender was coded as follows: 0 = female, 1 = male. Reference category for variables subclinical and clinically significant ADHD symptoms are individuals with unremarkable ADHD symptoms (subclinical ADHD: 0 = unremarkable or clinically significant ADHD, 1 = subclinical ADHD; clinically significant ADHD: 0 = unremarkable or subclinical ADHD, 1 = clinically significant ADHD). Final equations for Approach 1: Total score:  $F(3, 829) = 92.82, p < .001$ ; Physical:  $F(3, 829) = 80.77, p < .001$ ; Emotional:  $F(3, 829) = 49.43, p < .001$ ; Self-esteem:  $F(3, 829) = 38.43, p < .001$ ; Family:  $F(3, 829) = 32.81, p < .001$ ; Friends/peers:  $F(3, 829) = 10.02, p < .001$ ; School/education:  $F(3, 829) = 37.92, p < .001$ . Final equation for Approach 2: Total score:  $F(4, 828) = 41.32, p < .001$ ; Physical:  $F(4, 828) = 39.30, p < .001$ ; Emotional:  $F(4, 828) = 21.20, p < .001$ ; Self-esteem:  $F(4, 828) = 20.47, p < .001$ ; Family:  $F(4, 828) = 15.21, p < .001$ ; Friends/peers:  $F(4, 828) = 5.27, p < .001$ ; School/education:  $F(4, 828) = 20.62, p < .001$ . \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

compared to adolescents and young adults with unremarkable ADHD symptoms. This result is consistent with the findings of other studies (e.g., Hölling et al., 2008; Topolski et al., 2004). The present study goes beyond this and shows that the well-being of adolescents and young adults suffering from symptomatology in the subclinical range is already impaired.

Regarding the subdimensions of HRQoL, significant effects of ADHD symptoms were found in all subdimensions. Adolescents and young adults with clinically significant or subclinical ADHD symptoms showed lower values in all examined dimensions than individuals with unremarkable ADHD symptoms. An exception was the well-being concerning friends/peers, where adolescents and

young adults with subclinical symptoms did not differ from those with unremarkable ADHD symptoms. The effect sizes regarding the subscales ranged from small to medium. Overall, the strongest effects were found in emotional and physical well-being.

The finding that ADHD symptoms are associated with impaired emotional well-being is consistent with studies showing that ADHD symptoms may be a risk factor for affective disorders, such as depression and anxiety in adolescence (e.g., Meinzer et al., 2014). The specific reasons for this association may lie in etiological similarities (common genetic factors; Kain et al., 2008). On the other hand, there may be an increase in the risk of comorbid emotional problems in adolescence because of problems with school demands and in social interactions with peers (Powell et al., 2020; Schmidt et al., 2012). Thus, negative feedback regarding performance and social interactions can accumulate over the years. This is likely to result in depressive symptomatology during adolescence, a phase of life in which the vulnerability for the development of affective disorders generally increases (Kouider & Petermann, 2015). It should be noted that there is a large overlap between ADHD and stress, anxiety, and depression symptoms as age increases (Alexander & Harrison, 2013; Das et al., 2012). Therefore, the reported inattention and hyperactivity/impulsivity symptoms in the present study may also be a direct expression of problems in the affective domain.

Symptoms of ADHD were also negatively related to physical well-being. In contrast, in some studies on children affected by ADHD symptoms (e.g., Klassen et al., 2004), no or only small differences in physical well-being were found. It can be assumed that there is a better physical awareness and a change and re-evaluation of the physical self-concept in adolescence (cf. Nitzko & Seiffge-Krenke, 2009). This may lead to the fact that individuals with clinically significant and subclinical ADHD symptoms reported more complaints, such as fatigue and exhaustion than individuals with unremarkable symptoms in the present study. Thus, ADHD symptoms are associated with impairments in both the psycho-emotional and physical components of HRQoL. This illustrates the comprehensive effects of ADHD symptoms on personal experiences in adolescence and young adulthood.

Surprisingly, the weakest effect of the symptoms was found in relation to well-being regarding friends/peers. Moreover, no difference was found between adolescents and young adults with subclinical and unremarkable symptoms. Peer problems are consistently found among children with ADHD symptoms (e.g., Hoza, 2007). It is possible that the negative effects on peer problems are attenuated during adolescence and young adulthood. This could be related to the fact that adolescents and young adults show fewer

hyperactive-impulsive symptoms than children with ADHD symptoms. These symptoms are the main determinants of negative peer relationships (Cordier et al., 2010). Other studies reveal that although peers largely reject adolescents with ADHD symptoms, these adolescents still have individual positive friendships that help mitigate the rejection's negative effects (e.g., Glass et al., 2012).

Concerning gender, being male was associated with higher scores in all dimensions of well-being. This finding could be statistically confirmed in all subscales of HRQoL, except for well-being regarding friends/peers. This finding is consistent with other studies proving that adolescent girls' mental health is worse than that of boys (e.g., Inchley et al., 2020). Age was negatively associated with HRQoL. The effect reached significance for the KINDL-R total score and well-being concerning school/education. Barkmann et al. (2016) also found a decline in HRQoL among children and adolescents aged 11–17 years overtime in the large-scale German KiGGS study.

Overall, the results show that ADHD symptoms are associated with reduced well-being in various dimensions during adolescence. This finding underscores the need for appropriate support for affected individuals and even therapy, if necessary. For adolescents with severe ADHD symptoms and severely impaired well-being, multimodal treatment is indicated, including therapeutic settings, psychoeducation, self-management, and coaching elements (e.g., Rademacher et al., 2002). However, it is well known that adolescents' motivation for therapy is often insufficient or diminishes over the years (e.g., Bachmann et al., 2017). As the present study also demonstrates that adolescents and young adults have impaired well-being when symptoms are still in the subclinical range, the question arises as to whether it would not make sense to use preventive measures in the school setting to mitigate the symptomatology's negative effects and enhance the affected individuals' well-being. Psychological disorders are generally highly prevalent during adolescence, and symptom overlaps are relatively common (Castellanos-Ryan et al., 2016). However, only a proportion of those affected receives adequate help (cf. Hintzpeter et al., 2014). Furthermore, the proportion of students with social, emotional, and behavioral problems in general schools is increasing with school inclusion. New evidence-based school interventions are consistent with a dimensional perspective of disorders and suggest a tiered approach with a combination of universal, selective, and indicated prevention interventions, depending on symptom severity for pedagogical practice in schools (e.g., Castello, 2017; Hanisch et al., 2019). However, prevention research on mental health disorders is still in its infancy. Therefore, an intensification of studies is necessary.

## Limitations

The present study used a selective sample. Nonetheless, it can be assumed that the sample is approximately representative of adolescents and young adults aged between 14 and 24 years in Switzerland.<sup>5</sup> On average, only one person received disability compensation in the school classes, which targeted dyslexia in the majority of cases (61.7%). The results did not change significantly when the adolescents and young adults with disability compensation were excluded from the analyses.

The assessments of ADHD symptoms in the present study were based exclusively on self-reports. Validation by third-party assessments and diagnostic judgments were not included. Therefore, it can be understood as an approximation of a clinical diagnosis.

Comorbidities were not considered in the analyses, even though ADHD symptoms are often associated with comorbid disorders (Banaschewski et al., 2017). These comorbid disorders may have an impact on the HRQoL and should be considered in future studies.

The KINDL-R questionnaire was designed to be used for adolescents aged 14–17 years. In the present study, however, it was also used in young adults over the age of 18 years. This seemed valid given the lack of instruments regarding HRQoL specifically for young adults.

Cross-sectional data does not allow for conclusions about causal effects. However, in the context of longitudinal studies (e.g., Döpfner et al., 2015), it can be assumed that ADHD symptoms result in reduced HRQoL. Nevertheless, reduced quality of life may also – at least partially, lead to symptoms of inattention and hyperactivity (e.g., Alexander & Harrison, 2013). In the future, it would be desirable to have more longitudinal studies addressing the relationship between ADHD symptoms and HRQoL.

## Conclusions

The results show that ADHD symptoms, even in the sub-clinical range, negatively affect HRQoL in adolescence and young adulthood. These findings illustrate the comprehensive effects of ADHD symptoms on well-being during adolescence and young adulthood and highlight the importance of focusing more on ADHD at these particular ages. Although diagnostic thresholds are often pragmatically necessary in clinical practice, additional dimensional approaches can lead to a better understanding of ADHD and its impact on daily functioning and well-being.

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<sup>5</sup> The frequency distributions of the adolescents in the present sample roughly correspond to the distributions of a representative cohort at upper secondary schools in Switzerland regarding the type of education (i.e., approximately two-thirds in vocational education and training vs. nearly one-third in general education programs; <https://www.bfs.admin.ch/bfs/en/home/statistics/education-science/pupils-students/upper-secondary.html>).



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## History

Received June 20, 2021

Revision received November 29, 2021

Accepted December 20, 2021

Published online February 21, 2022

## Acknowledgments

The authors would like to thank Pia Georgi-Tscherry and Matthias Pfiffner for their work in the project and Katja Mackowiak for the excellent supervision.

## Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, or publication of this article.

## Publication Ethics

All procedures complied with the ethical guidelines of the local ethics committee of a higher education institution.

## Funding

The project was financially supported by the Swiss Federal Office for the Equality of People with Disabilities. Open access publication enabled by Interkantonale Hochschule für Heilpädagogik.

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