ORIGINAL ARTICLE

Annals of Agricultural and Environmental Medicine
www.aaem.pl

Does general health literacy predict adolescent mental health profiles based on the dual continua model?

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A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical revision of the article, F – Final approval of the article

Mazur J, Kozakiewicz A, Kleszczewska DW, Dec-Pietrowska D, Izdebski Z. Does general health literacy predict adolescent mental health profiles based on the dual continua model? Ann Agric Environ Med. doi: 10.26444/aaem/208538

Abstract

Introduction and Objective. The aim of the study was to define mental health profiles according to the Dual Continua Mental Health (DCMH) model and to analyse their associations with socio-demographic characteristics and health literacy (HL).

Materials and Method. An online survey was conducted in 2024 among students aged 13–17 in schools in a mid-western region of Poland (n=9,026). Standardised instruments were used to assess well-being, prevalence of psychosomatic complaints, as well as HL. Multinomial logistic regression was applied.

Results. The findings showed that 57.1% of students reported frequent psychosomatic complaints, whereas 24.5% met the criteria for low well-being. Six mental health profiles were identified, ranging from the most unfavourable (low well-being and frequent complaints – 21.4%) to optimal (high well-being and none or infrequent complaints – 29.1%). HL was associated with profile membership to a significant extent – a low level of HL tripled the risk of adherence to the group with the poorest mental health status (OR=3.06; 95% CI: 2.43–3.85). Living in rural areas protected against being classified into the least favourable group (OR = 0.82; 95% CI: 0.69–0.97).

Conclusions. The DCMH model offers a framework for multidimensional analysis of mental health profiles among adolescents, and its application may incorporate various research tools. Professionals (psychologists, educators, teachers) should not only respond to signs of crisis, but also actively strengthen young people's resources – particularly by fostering health literacy, building psychological resilience, and promoting positive functioning within the school environment.

Key words

well-being, adolescents, health literacy, psychosomatic symptoms, mental health profiles, dual continua model

INTRODUCTION

The developmental tasks of adolescence, combined with the rapid pace of biological changes, make young people particularly vulnerable to mental disorders. The evidence shows that half of mental health disorders have their onset during or before adolescence. Child and Adolescent Health and Well-being Strategy (2025–2030), developed recently by the WHO and UNICEF, demonstrates that mental health affects 1 in 4 children under 18 years of age, and that adolescents today have poorer mental health than previous generations. This calls for urgent actions across the 53 member states including Poland [1]. Moreover, Polish youth rank unfavourably in international comparisons regarding their mental well-being, as reported by the international research network Health Behaviour in School-aged Children (HBSC). Polish teenagers perform very poorly compared to their peers from the other 44 countries surveyed across all indicators related to mental health [2].

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Received: 23.06.2025; accepted: 23.07.2025; first published: 11.08.2025

Traditional screening studies typically focus on the presence of mental health disorder symptoms, analysed along a single continuum. As an alternative, the Dual Continua Mental Health (DCMH) model may be adopted, presenting symptoms of psychopathology on one axis and subjective well-being on the other (rooted in positive psychology). A 2024 review of DCMH applications summarised findings from 85 selected studies, 47 of which focused exclusively on adolescents. In 85% of the studies analysed, psychometric justification for the model's bi-dimensionality was provided [3]. Inferences drawn from the DCMH model and the practical implications of the analyses conducted depend on the tools used, the cut-off points applied to define normative ranges, and the number of identified groups. The simplest classification distinguishes four groups, often referred to as: mentally unhealthy, asymptomatic yet discontent, symptomatic yet content, and mentally healthy.

An extension of this classification builds on the work of Corey Keyes, who defined the opposing poles of mental health as languishing and flourishing. *Flourishing* represents an optimal state characterised by positive emotions and high levels of psychological and social functioning. *Languishing*, by contrast, is a state of stagnation and emptiness, marked by a lack of engagement with life. However, intermediate states

may also occur, in which symptoms of neither languishing nor flourishing are clearly present [4]. Accordingly, the DCMH model may include more than the four classic groups.

To promote mental health and prevent disorders among children and adolescents, efforts should focus not only on minimising the impact of risk factors but also on developing resources that support the maintenance of mental health. Increasing the health literacy of adolescents could be one such resource, among others. Following the best known definition of HL set by Sorensen et al. health literacy is the ability to 'assess, understand, appraise and apply health information to make judgments and make decisions in everyday life concerning health care, disease prevention and health promotion' [5]. In the academic literature, attention is also drawn to specialized competencies related to selected aspects of health, such as well-being literacy and mental health literacy.

Educational institutions, especially schools, are assigned a key role in the development and enhancement of these skills. School-based programmes are seen as playing a significant role, given that school – after the family – is the second most influential environment for students' mental well-being. Such programmes should aim to develop health literacy, including the previously mentioned mental health literacy and well-being literacy. The direction of the ongoing educational reform in Poland, including the introduction of a new school subject, health education, may support this objective. This underscores the importance of analysing the relationship between students' general and specific health competences and their mental health, particularly in the context of their classification within DCMH groups [6].

Researchers collaborating within the international HBSC network have long acknowledged the relevance of the DCMH model. In cross-national analyses, the scale of psychosomatic complaints (or parts of it) was used to represent the psychopathology axis, while measures such as the Cantril ladder or self-rated health were used to represent the well-being axis [7, 8].

The study of Polish adolescents presented below, conducted outside the mainstream HBSC survey, enabled a rarely used application of the WHO-5 scale for assessing well-being within the DCMH framework, and allowed for the analysis of the relationship between mental health profiles and levels of students' health literacy.

OBJECTIVE

The aim of the study is to define mental health profiles among adolescents, based on the frequency of self-reported subjective, non-specific complaints and the level of overall well-being, in line with the DCMH model. The study focuses on the prevalence of individual DCMH groups within the overall sample, as well as in subpopulations distinguished by socio-demographic characteristics. It also examines whether the level of general health literacy shapes the likelihood of a student being classified into a given mental health profile.

MATERIALS AND METHOD

Sample and procedure. The cross-sectional survey was conducted online in the spring of 2024 in schools across the Lubuskie Province in Western Poland, using the Webankieta platform. Schools were invited to participate through the local board of education (Lubuskie Kuratorium Oświaty), which resulted in the participation of 30% of students in the region. The data presented below concern 9,026 from a total of 9,411 surveyed students who fully completed the questions required to define DCMH profiles. This group comprised 45.4% boys and 54.6% girls, and included 40.4%, 37.4%, and 22.2% of students from three designated grade levels. In the sample accepted for analyses, 21.5% of respondents lived in two large cities (Zielona Góra, Gorzów Wielkopolski), 42.7% in smaller towns, and the remaining 35.8% in rural areas.

Data were collected from students in the following groups: K7 – Year VII of primary school (mean age: 13.76 ± 0.38 years), K9 – Year I of upper secondary school (15.20 ± 0.57 years), and K11 – Year III of the same schools (17.67 ± 0.53 years).

The study procedure and the scope of data collection were reviewed by the Research Ethics Committee at the University of Zielona Góra (Decision No. RCM-CM-KBUZ.031.39.2023, dated 17 November 2023). The research procedure is described in greater detail in the report [9].

Tools. The Dual Continua Mental Health model was defined using the WHO-5 and HBSC Symptoms Checklist (HBSC-SCL); instruments also included in the HBSC 2021/22 protocol.

The WHO-5 scale consists of 5 items rated on a 6-point Likert scale ranging from 0 ('at no time') to 5 ('all the time') with a 2-week timeframe [10]. The scale was standardised to a range of 0–100 points and divided into 3 intervals with 2 cut-off points of 28/29 and 50/51, respectively. Among the 9,026 students in the study group, the WHO-5 demonstrated a uni-dimensional structure, with a Cronbach's alpha of 0.843.

The HBSC-SCL scale measures the frequency of 8 symptoms experienced over the past 6 months: headache, stomach-ache, backache, feeling low, irritability/bad temper, feeling nervous, difficulties in falling asleep, and feeling dizzy. Five response categories were provided: about every day; more than once a week; about every week; about every month; rarely or never [11]. Results are most commonly interpreted in terms of *recurrent health complaints* (RHC), defined as the proportion of individuals who reported experiencing 2 or more of the 8 symptoms, either daily or more than once a week.

Health literacy was measured using the HLSAC-5 scale, a shortened version of the 10-item tool implemented in the HBSC study [12]. The scale covers 5 components: theoretical knowledge, practical knowledge, critical thinking, self-awareness, and citizenship. Adolescents were asked to assess how true various statements about their health competences were, using a 4-point scale (1 = not at all true, 2 = not completely true, 3 = somewhat true, 4 = absolutely true). The crude summary index with a range of 5–20 points was divided into 3 ranges, with the following cut-off points: 12/13 and 17/18, respectively. The HLSAC-5 showed a uni-dimensional structure in this group, with a Cronbach's alpha of 0.817.

Family affluence was measured using a modified version of the Family Affluence Scale, consisting of 6 items also known as FAS III. Among the 9,026 students in the sample, 34.2% were classified as having low affluence, 49.4% as medium, and 16.4% – high.

Statistical analysis. The Dual Continua Mental Health model was defined using the WHO-5 and HBSC-SCL indices, based on the commonly accepted cut-off points described above. The association between DCMH group membership and socio-demographic characteristics and health literacy was examined using the chi-square test. In the multivariate analysis, multinomial logistic regression was applied, with membership in one of the 6 DCMH groups as the dependent variable. The group of students with optimal mental health served as the reference category. The association with health literacy was presented as odds ratios (OR) with 95% confidence intervals (CI), adjusted for gender, grade, FAS and place of residence. Statistical analysis was performed using SPSS version 29.0. Statistical significance was set at $p < 0.05$.

RESULTS

DCMH model and its socio-demographic correlates. In the study group, 57.1% of students reported experiencing at least 2 of the 8 psychosomatic complaints more than once a week or nearly every day. Additionally, 24.5% met the criterion for low well-being, which is considered grounds for further diagnostic assessment for depression. The mental health status of girls was poorer than that of boys, according to both indicators (Tab. 1). Place of residence differed the mental health assessment of the students surveyed. However, the inference relating to both indicators depended on gender. Depressive symptoms increased only in boys in large cities, compared to other localities (p=0.004), and psychosomatic complaints only in girls from small towns (p=0.005). The 2 indicators were the lowest in rural areas, both for boys and girls.

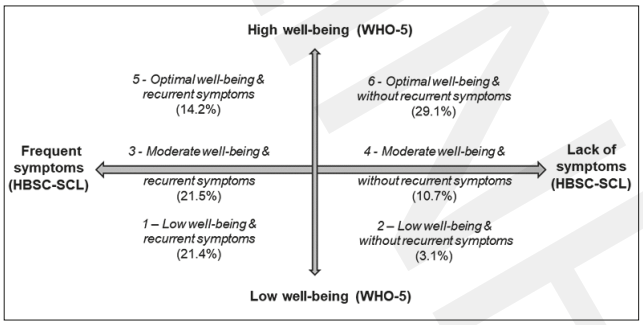

Figure 1. Prevalence of individual mental health profiles according to the DCMH

Six groups of adolescents were distinguished and numbered from the least favourable (1) to the most favourable (6). Among the 9,026 students, one in 5 (21.4%) had more serious mental health problems, reporting both depressive symptoms and frequent psychosomatic complaints. It was very rare for low well-being to occur without such complaints (Group 2). Nearly one-third of respondents were classified into 2 groups representing moderate well-being, which co-occurred twice as often with psychosomatic complaints (Group 3 – 21.5%) than without them (Group 4 – 10.7%). At the top of Figure 1 are two groups of adolescents with very high levels of well-being according to the WHO-5. Group 6, comprising nearly one-third of the population (29.1%), included adolescents with high well-being who reported no psychosomatic complaints. Group 5 included 14.2% of respondents who, despite optimal well-being, reported recurring symptoms.

Table 1. Components of the Dual Continua Mental Health (DCMH) model, according to gender

Two continua cut-off points	Total N=9026	Boys N=4096	Girls N=4930	P
Number of recurrent health complaints according to the HBSC-SCL				
0–1	3,976 (42.9)	2,373 (57.9)	1,503 (30.5)	Chi-sq=687.9
2–8	5,150 (57.1)	1,723 (42.1)	3,427 (69.5)	p<0.001
Well-being according to the WHO-5 categories (standardized score)				
Low (0–28)	2,210 (24.5)	634 (15.5)	1,576 (32.0)	Chi-sq=731.8
Moderate (29–50)	2,912 (32.3)	1,071 (26.1)	1,841 (37.3)	p<0.001
Optimal (50–100)	3,904 (43.2)	2,391 (58.4)	1,513 (30.7)	

The proportion of adolescents classified into Group 6 was significantly higher among boys than girls, and also among the youngest students compared to the 2 upper secondary school cohorts. Group 5 and Group 6 occurred significantly more often among students from the most affluent families. However, affluence levels did not differentiate membership in Group 3, which included individuals with moderate well-being burdened by recurrent symptoms (Tab.2).

Health literacy as a predictor of DCMH subgroup membership. As shown in Table 2, there is a statistically significant association between the level of health literacy among school-aged adolescents and membership in the 6 groups defined by the DCMH model. The proportion of students in the healthiest group (Group 6) increased consistently across higher HL levels.

In the final step of the analysis, a multinomial logistic regression model was estimated to assess the strength of this association after adjusting for gender, age, and family affluence (Tab.3).

When examining the effects of low HL, all results were statistically significant, with ORs ranging from 1.69 (Group 5) – 3.57 (Group 4). At equivalent levels of well-being, lower health literacy was more strongly associated with membership in groups not reporting RHC than with those burdened by recurring symptoms. A moderate level of HL was significantly associated only with an increased risk of belonging to Group 3 and Group 4. Both the ORs related to low and moderate HL levels were highest for Group 4.

Furthermore, living in a rural area was shown to protect against being in the least favourable first group (OR=0.82; 95% CI: 0.69–0.97). After adjusting the analyses for other factors, the association between place of residence and 'middle' DCMH group membership, was not confirmed.

DISCUSSION

The study reveals a complex and multidimensional picture of adolescent mental health. The DCMH model made it possible to capture not only the presence of psychosomatic symptoms or low well-being but also their co-occurrence, offering a more comprehensive view of the mental well-being of the studied population.

Girls were more likely than boys to report both a higher number of psychosomatic symptoms and lower levels of well-being. This finding is consistent with previous research indicating that girls tend to report more psychosomatic complaints [13, 14] and are more likely to experience

Table 2. Mental health profiles according to the dual continua model in individual student subgroups

	DUAL CONTINUA MODEL SUBGROUPS* (%)					
	RHC (+) & low WB N=1928	RHC (-) & low WB N=282	RHC (+) & moderate WB N=1945	RHC (-) & moderate WB N=967	RHC (+) & optimal WB N=1277	RHC (-) & optimal WB N=2677
Total	**21.4**	**3.1**	**21.5**	**10.7**	**14.2**	**29.1**
			Gender			
Boys	12.6	2.9	14.4	11.7	15.1	43.3
Girls	28.6	3.3	27.5	9.9	13.4	17.3
Chi-sq=980.5; d.f.=5; p<0.001						
			Grade			
K7	17.4	2.9	18.7	9.8	16.3	34.9
K9	23.7	2.9	23.4	10.6	13.0	26.4
K11	24.7	3.9	23.7	12.5	12.1	23.1
Chi-sq=181,4; d.f.=10; p<0.001						
			Family affluence			
Low	24.1	4.2	21.0	11.3	12.5	26.9
Average	20.7	2.7	21.7	11.1	14.0	29.8
High	18.0	2.3	22.2	8.4	17.1	32.0
Chi-sq=71.4; d.f.=10; p<0.001						
			Place of residence			
Large cities	22.7	3.2	21.3	11.0	13.6	28.2
Small towns	21.6	3.0	22.6	10.6	14.0	28.2
Rural areas	20.2	3.2	20.4	10.6	14.7	30.9
Chi-sq=14.9; d.f.=10; p=0.137						
			Health literacy			
Low	27.6	4.0	22.2	10.8	14.0	21.4
Average	19.5	2.9	21.6	11.5	13.8	30.7
High	19.6	2.4	19.2	6.1	15.7	37.0
Chi-sq=156.9; d.f.=10; p<0.001						

*RHC – recurrent health complaints according to HBSC-SCL; WB – well-being according to WHO-5

Table 3. Health literacy level** and membership in the Dual Continua Mental Health model profiles – results of multinomial logistic regression adjusted for gender, grade, FAS, and place of residence (N=8695)

Dual continua model subgroups**	Low HL			Average HL		
	OR	CI	p	OR	CI	p
RHC (+) & low WB	3.06	2.43–3.85	<0.001	1.14	0.93–1.39	0.217
RHC (-) & low WB	3.39	2.08–5.54	<0.001	1.48	0.94–2.34	0.089
RHC (+) & moderate WB	2.51	1.99–3.16	<0.001	1.32	1.08–1.62	0.007
RHC (-) & moderate WB	3.57	2.59–4.92	<0.001	2.24	1.67–3.00	<0.001
RHC (+) & optimal WB	1.69	1.32–2.16	<0.001	1.05	0.85–1.30	0.660

* HL – health literacy according to HLSAC-5; High HL – reference category for independent variable; ** RHC – recurrent health complaints according to HBSC-SCL; WB – well-being according to WHO-5; RHC (-) & optimal WB reference category for dependent variable

depression and anxiety [15] than boys. Although some meta-analyses suggest that girls and boys do not differ significantly in terms of life satisfaction [16], the consistent predominance of psychosomatic symptoms among girls indicates a more nuanced gender difference in mental health. This phenomenon may be partly explained by gender differences stemming from neurobiological mechanisms [17], but also by socially constructed notions of masculinity and femininity [18].

In addition to gender, the current study also examined age and family affluence. The prevalence of mental health problems increased with age, while 13-year-olds were more likely to fall into the most favourable profile. Research indicates that older adolescents (especially girls) generally experience poorer mental well-being compared with their younger peers [16]. Families in better financial standing are more likely to possess resources (both in terms of time and emotional capacity) that enable more effective support for their children and the development of communicative relationships, which can help reduce emotional difficulties during adolescence.

The figure illustrating the Dual Continua Mental Health model demonstrates that the absence of psychosomatic symptoms does not always indicate good well-being, and conversely, some individuals may report good well-being despite experiencing such symptoms. This highlights the notion that mental health should not be understood solely as the absence of psychopathological symptoms, but also to include the presence of positive aspects of functioning, such as well-being [3].

In the study it was found that one in 5 students (21.4%) experienced mental health difficulties, reporting both low well-being and frequent psychosomatic complaints. This profile (corresponding to Group 1 in the DCMH model) should be regarded as particularly concerning, especially in the context of the potential risk of developing mental disorders requiring specialist intervention. Similar conclusions emerge

from the analysis of Swedish HBSC data (2017/18), where the dual-factor model was applied [7].

Another key focus of this study – also reflected in its title – is health literacy (HL), understood as a resource that supports informed health-related decision-making. The results confirm a positive correlation between HL and membership in DCMH groups. The inclusion of HL among the correlates of the adolescent mental health profile is a distinctive element of the current study that goes beyond demographic and social factors. Research confirms that low health literacy (HL) is associated, both directly and indirectly, with a range of adverse health outcomes, including lower self-rated general health, unhealthy dietary habits, higher body weight, and greater involvement in problematic behaviours [17], as well as increased risk of contracting sexually transmitted infections (STIs) [18] or depression [19]. Moreover, a study involving over 22,000 students revealed significant negative associations between health literacy and psychosomatic symptoms, indicating that low HL may serve as an independent risk factor for deteriorated physical and mental health [20]. This suggests that health literacy may serve as a kind of 'protective shield', supporting adolescents in coping with both reduced well-being and psychosomatic complaints more successfully. Much of the existing analysis linking health literacy (HL) to mental health focuses specifically on mental health literacy. The instrument applied in the current study, originating from the HBSC protocol, is classified as general HL, and the interpretation of its association with health outcomes may be shaped by the distinct components of HL assessed by the HLSAC, which differentiate it from other generic health literacy measures. Young people who possess higher levels of mental health literacy and reside within supportive communities are more likely to seek professional help or support from family members or significant others in the event of mental health problems [21]. However, it is worth noting that recent meta-analytic evidence indicates no significant association between MHL and mental well-being among young people [22]. Similarly, some other studies found no statistical correlation between depression literacy and general health status [23]. These findings suggest that while MHL may facilitate recognition and help-seeking, its effect on subjective well-being is nuanced and likely mediated by other factors. In contrast, the relationship between general health literacy (HL) and mental health has been discussed in a review of studies on depression risk. Of 11 studies included in that review, 2 focused specifically on adolescents. Both studies – one longitudinal and one cross-sectional – found that, even after adjusting for demographic, social, and academic factors, adolescents with high general HL were 2–3 times less likely to be at risk of depression, compared to their peers with low HL [24].

The study demonstrated that a low health literacy (HL) more than tripled the odds of belonging to 2 groups characterized by low levels of well-being. Particular attention should be paid to Group 4, namely, students with a moderate level of mental well-being who reported no psychosomatic complaints. This group displayed the highest ORs for both low and moderate levels of health literacy. This may suggest that an apparently neutral mental health profile may co-occur with significant deficits in the ability to understand, evaluate, and use health-related information. Consequently, a low level of HL in this group may represent a vulnerability factor, increasing the risk of deteriorating well-being in situations that require active health management.

Limitations of the study. The study is not without its limitations. The measurement of variables was based solely on self-reports by the students, which may have introduced biases resulting from response tendencies, difficulties with introspection, or a desire to present oneself in a more favourable light. Another limitation relates to the cross-sectional nature of the study, which prevents any conclusions about the directionality of the relationships between variables. In addition, the number of factors analysed that may be associated with adherence to the DCMH mental health profiles, either as potential causes or effects, is relatively small in this study. Despite these limitations, the study offers valuable insights into the mental health of school-aged adolescents and constitutes an important foundation for further research and analysis.

Practical implications and future directions. The results encourage reflection on the role of health literacy and socio-demographic factors as potential points of intervention in preventive efforts. Professionals (psychologists, educators, and teachers) should not only respond to signs of crisis, but also actively enhance young people's resources, particularly by fostering health literacy, strengthening well-being, building psychological resilience, and promoting positive functioning within the family, school, and community. Intervention practices would need to be implemented and evaluated taking into account the varying mental health needs of adolescents. In further research, it is worth paying more attention to the factors that cause some individuals to lead happy and meaningful lives despite emerging symptoms, while in other cases, the absence of symptoms does not guarantee a sense of joy or fulfillment [22]. Moreover, future research should also employ longitudinal designs and qualitative approaches to better capture the dynamic interplay between general health literacy and mental well-being among adolescents

CONCLUSIONS

The DCMH model offers a framework for multi-dimensional analysis of mental health profiles among adolescents, and its application may incorporate various research tools. The results of the study highlight that health literacy (HL) significantly shapes these profiles: a low HL level more than tripled the likelihood of belonging to the group with the poorest mental health status (low well-being and frequent psychosomatic complaints). This indicates that general HL may function as a protective factor, supporting adolescents in coping with mental health challenges and promoting positive functioning.

The study also demonstrates the importance of a holistic approach to mental health, one that considers not only the presence of psychosomatic complaints, but also the levels of well-being. Particularly concerning is the proportion of students displaying both depressive symptoms and psychosomatic complaints; nearly one in 5 adolescents falls into this most vulnerable group. Addressing the specific needs of each DCMH group can significantly improve the constantly deteriorating mental condition of the younger generation.

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