Initiation of the *Health Promoting Learning Environment Scale*: Contributing to students' mental health

May Olaug Horverak
NORCE Research, Norway
Gerd Martina Langeland
Lillesand Upper Secondary School, Norway
Migle Helmersen
University of Agder, Norway
Øyvind Hellang, Emre Sari
NORCE Research, Norway
Unni Karin Moksnes
Norwegian University of Science and Technology, Norway
Mariette Aanensen
University of Agder, Norway
Anne-Kristin Imenes
KORUS Sør, Norway
Kjærsti Thorsteinsen
NORCE Research, Norway
Tommy Haugen
University of Agder, Norway

The increase of mental health issues among children and young people has led to several initiatives in school contexts to promote students' health. There is a need for assessment tools to evaluate the effectiveness of interventions aimed at creating a health promoting learning environment. The study presented here is based on Antonovsky's salutogenic theory and initiates the development and validation of a scale to measure students` perception of health promoting factors in the learning environment. The scale was piloted in fourteen different schools ranging from primary school to adult learning. Exploratory and confirmative factor analyses were performed, confirming a three-factor solution of a nine-item *Health Promoting Learning Environment Scale* (HPLES), including the three subdimensions relational quality in the learning environment, task mastery in school, and self-determined motivation for school. Further validation and reliability-testing is needed. However, the three-dimensional scale suggested provides a useful tool and significant contribution in the field of health promotion in schools.

Introduction

Youth health is increasingly prioritised by public health workers, policymakers, and researchers worldwide. Recent studies indicate that the teenage years are crucial for individuals' future health (Berglund et al., 2006; Dwyer & Wyn, 2001; Eckersley, 2005). It is generally assumed that many adult habits are established during adolescence, making health promotion initiatives and early prevention of negative health behaviours more effective than attempting to modify entrenched behaviours later in life (Alexander, 1994; Hurrelmann et al., 1995). In this regard, promoting adolescents` personal and social

coping resources is important, where the concept of generalised resistance resources is gaining prominence in public health discussions (UNICEF, 2015). However, the definition of coping continues to evolve, and its relationship to youth health remains under examination (Colizzi et al., 2020).

Schools are an important context for health promotion initiatives as children and adolescents spend a large proportion of their lives there (Jourdan et al., 2021). If positive changes are made early, there is a great opportunity to improve children and adolescents' chances in life. In addition to influencing academic competence, future employment and income prospects, students may be equipped to develop life skills that will benefit their health in general (WHO & UNESCO, 2021). Experience of a positive environment, safety, and wellbeing during childhood are fundamental democratic rights for children and adolescents. A healthy and safe environment for all children is also the key to efficient prevention work, according to the international prevention standards by the UN and WHO (United Nations, 2020). The UN Committee Convention on the Rights of the Child emphasises the following main principles: Every child's right to life, health, education, and development, along with care and protection (The Whoqol Group, 1998). Health promotion efforts targeting children and adolescents are essential responsibilities for schools, often implemented within the general school environment and through school health services.

In the Norwegian school curricula, "public health and life mastery" has been introduced as a cross-curricular topic, dealing with developing competence that promotes good mental and physical health, coping with adversity and success, and making responsible choices (The Norwegian Directorate of Education, 2017). However, no clear guidelines for implementation and evaluation have been provided. Another example of a national initiative to promote health in education is found in Singapore, where a Holistic Health Framework has been developed, emphasising the importance of wellbeing in school, including physical, mental and social health, and developing the competence for healthy living (Tan, 2025). These are examples of universal approaches to creating health promoting learning environments. Even though the focus is somewhat different, mastering life versus wellbeing, both deal with central aspects of health promotion, such as coping and competence development concerning health (Helmersen & Stiberg-Jamt, 2019).

Universal interventions with broad, inclusive strategies for all students are more effective in health promoting and preventive strategies among adolescents than targeted interventions aimed mainly at high-risk groups, such as students from challenging home environments (Richter et al., 2022), but both strategies are needed. A universal approach requires schools to have adequate human resources to meet the diverse needs of children and adolescents throughout the school day, fostering an environment where all students can thrive, develop, and learn. Additionally, developing assessment tools to monitor and evaluate implementation of different health promoting and preventive strategies is crucial, and this is the concern of our study.

Contextual and theoretical background

There has been an increase in self-reported mental health problems among the young population in Norway over years (Krokstad et al., 2022; Reneflot et al., 2018). Surveys from fifth grade to upper secondary school have shown over time that children and adolescents struggle with loneliness, bullying, and pressure, and an increasing number fear going to school (Bakken, 2022, 2024; Bentsen et al., 2019; Enstad & Bakken, 2022; Parlikar et al., 2023; Wendelborg, 2024). There have been different initiatives to change the negative development, among others a national program for public health run by all the counties in Norway (The Norwegian Directorate of Health, n. d.), which is the background of the current study.

Some of the initiatives in the national public health program were aimed at creating a more health promoting school (Hellang & Helmersen, 2022; Helmersen & Stiberg-Jamt, 2019; Langeland & Horverak, 2021). These build on a salutogenic way of thinking (Antonovsky, 1987) and the recognition that health is not merely absence of illness but includes having control over and ability to influence health promoting factors in one's life (WHO, 2009). Within the salutogenic perspective (Antonovsky, 1987), and health promotion, there is a focus on identifying and activating resources for mastery, both within oneself and in one's surroundings. This makes a situation comprehensible, manageable, and meaningful, which are conditions for experiencing a sense of coherence (SOC), supporting coping in stressful situations.

Antonovsky (1987) described the resources of a person, group or community, that support individuals to cope with stressors and contribute to a strong SOC, as generalised resistance resources. These may among others include material resources, knowledge and intelligence, ego identity, coping strategies, social support, commitment to one's cultural roots, cultural stability, ritualistic activities, religion and philosophy and preventive health orientation (Idan et al., 2022). On an individual level, some of the resources are emotional closeness and relationships, personal characteristics, and resources such as motivation and social support. On a community level, the school setting is described as a resource, as it influences the individual level. This is related to self-determination theory and the importance of autonomy, competence, and relatedness to achieve intrinsic motivation (Ryan & Deci, 2017). Research has shown that high levels of SOC were related to high levels of autonomy and competence, as defined within self-determination theory (Idan et al., 2022). Relatedness in self-determination theory could also be associated with the resources on individual level concerning emotional closeness and relationships. However, the concept of meaningfulness, which is an important condition for experiencing a strong SOC (Antonovsky, 1987), has no clear equivalent in self-determination theory.

Health promotion also relates to resilience theory, a strength-based perspective emphasising protective factors in the individual and environment (Zimmerman, 2013), quite parallel to the theory of generalised resistance resources. Relations and a positive environment are pointed to as crucial factors to stimulate resilience in school settings, meaning the ability to recover from and cope with adversities (Zafiropoulou & Psilou,

2024). Resilience also mediates the link between self-efficacy, meaning expectancy to master something (Bandura, 1997), and mental health outcomes, helping students manage stress and maintain wellbeing (Li & Quan, 2025). Higher levels of self-efficacy and resilience are consistently associated with better psychological wellbeing, even under high stress (Yudiati et al., 2025). A positive school climate, characterised by inclusion, belonging, and mental health awareness, enhances resilience and wellbeing (Riekie et al., 2017).

In the Norwegian national public health program, finding an adequate instrument to evaluate the impact of the health promoting initiatives on the learning environment (Hellang & Helmersen, 2022; Helmersen & Stiberg-Jamt, 2019; Langeland & Horverak, 2021) proved to be a challenge. Scales translated and adjusted from other contexts are not always appropriate in a Norwegian educational context. Antonovsky's (1987) Orientation to Life Questionnaire (Moksnes & Haugan, 2014) was considered. However, SOC is a personal resource, and does not cover generalised resistance resources in the learning environment that support the development of SOC. Some of the other scales considered were Psychological Needs Satisfaction Scale (Center for Self-Determination Theory, 2026; Ryan & Deci, 2017), General Self-Efficacy Scale (Bandura, 1997; Schwarzer & Jerusalem, 1995), and The Learning Climate Questionnaire (Hoff, 2016). These scales were applied in some studies (Horverak et al. 2025a; 2025b), but the youths and teachers found some items confusing or inappropriate, causing some resistance in the data collection process. Furthermore, these scales only measure limited concepts at individual level (e.g., need satisfaction, self-efficacy, autonomy support), while there is a need for a more general measurement of health promotion in the learning environment. In general, studies investigating health promotion and positive indicators of children and youths' mental health are lacking in a Norwegian context (FHI, 2018), as most studies report on mental health issues, for example anxiety and depression.

Our study presents the initiation and preliminary validation of a new scale to measure health promotion in the learning environment, focused on generalised resistance resources in school as proposed in the model in Figure 1. This model is an adjustment and specification of a newly developed framework for health promotion in the learning environment (Horverak et al., 2024a, 2024b), which is based on Antonovsky's (1987) salutogenic theory, Ryan and Deci's (2017) self-determination theory, as well as a framework for health promotion in the working environment (Bakken, 2012).

In an educational setting, the scale developed, and the interpretation of the scores, may be used to evaluate to what degree the learning environment is health promoting in the sense that it supports robustness through facilitating generalised resistance resources in school (Antonovsky, 1987). Another aspect of testing and evaluation in education, whether it concerns academic testing or testing related to the learning environment, is that it holds educators accountable (AERA et al., 2014). In this case, the interpretation of the scores of the scale could be used to hold educators accountable for creating a supportive and health promoting learning environment.

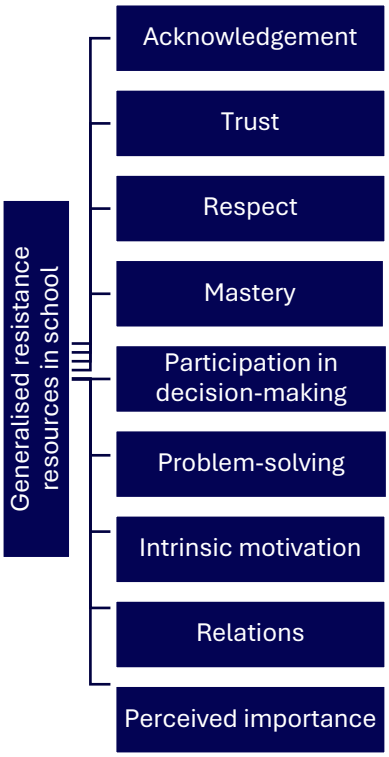


Figure 1: Model of generalised resistance resources in school (adjusted from framework for health promotion in the learning environment published in Horverak et al. 2024a; 2024b).

Research question

The overall purpose of the current study is to initiate the development and validation of an instrument that measures students' experience of health promotion in the learning environment. The research question is: How can health promotion in the learning environment be measured? The first aim was to investigate the factor structure of a scale developed to measure to what extent students experience a health promoting learning environment facilitating generalised resistance resources.

Secondly, the aim was to investigate construct validity of the scale by demonstrating that the construct behaves as expected within its nomological network (Cronbach & Meehl, 1955). The Self-Perception Profile for Adolescents-scale (SPPA) was chosen due to theoretical relations with SOC and generalised resistance resources. Comprehensibility, manageability and meaningfulness may influence and be influenced by social self-perception, academic self-perception, and global self-worth, the three subdomains included from SPPA (Wichstrøm, 1995).

Method

The procedure of scale development and validation included the following steps: (1) Item development; (2) Piloting of scale; (3) Psychometric testing and optimising scale length; and (4) Evaluating construct validity. The steps described align closely with DeVellis and Thorpe's (2022) recommendations for scale development.

Item development and piloting of scale

Measuring a phenomenon that cannot be directly observed, such as health promotion in the learning environment, is challenging. To create a scale that measures what is intended, items were developed based on discussions in an expert group consisting of five professionals. This included three researchers, with backgrounds from research on health promotion, education and transformation in the public sector, a psychologist with specialisation in child and youth psychiatry, and one teacher who had worked with health promoting initiatives in school. Two items were developed for each of the nine subcategories in the model of generalised resistance resources in school. It was decided to have relatively few items, due to a consideration that it might be difficult to recruit schools to participate with a more comprehensive questionnaire.

The scale development was initiated through projects in the Norwegian national public health program (Hellang & Helmersen, 2022; Helmersen & Stiberg-Jamt, 2019; Langeland & Horverak, 2021), and these ranged from primary school to adult learning. This is also the target population for the developed scale. Therefore, the language in the scale is kept simple, so that children from 10 years of age, and adults with limited Norwegian language skills, may understand the wording of the items. Negatively worded items were not included, as this would be a possible source of confusion and increased cognitive load (Zeng et al., 2024; Zhang et al., 2016) for the students.

A five-point Likert-scale was chosen, ranging from 'Strongly disagree' to 'Strongly agree', on the basis that this was considered a good compromise between sufficient sensitivity and respondent fatigue. In addition, including a midpoint value allows respondents to express uncertainty or real neutrality, if warranted. The items were discussed in relation to Antonovsky's (1987) salutogenic theory and SOC, as well as Ryan and Deci's (2017) self-determination theory, to consider whether the scale measured what it was intended to measure. This process strengthened the content validity of the scale (DeVellis & Thorpe, 2022).

A focus group of 10 youths between 15 and 18 years, including seven boys and three girls, were interviewed concerning how they perceived the suggested items in the scale, as well as relevant related scales. The youths were participating in a health promoting initiative in the public health program, conducted by a voluntary organisation, and targeted towards youths who experienced different types of challenges (Poulsen et al., 2025). They responded positively to the new scale and had only minor comments to it. Small adjustments were made in the wording of some items based on feedback from the youths. The scale was adjusted so it was suitable for different school contexts from primary

school to adult learning (Table 1, translated from the original Norwegian items). The scale is intended to measure health promotion in the learning environment (Health Promoting Learning Environment Scale - HPLES), and it is developed and piloted in Norwegian. Before the items in the scale, there is an introduction in the questionnaire distributed to students, asking them to consider how they experience school.

Table 1: Items suggested – *Health Promoting Learning Environment Scale* (HPLES)

No.	Item	Theme
HPLES1	I feel seen and heard by others	Acknowledgement
HPLES2	I listen to others	
HPLES3	I experience being trusted by others	Trust
HPLES4	I trust others	
HPLES5	I feel respected by others	Respect
HPLES6	I show others respect	
HPLES7	I master exercises I get	Mastery
HPLES8	I do not give up even though exercises are difficult	
HPLES9	I get to decide things in school	Participation in decision-making
HPLES10	I get to influence how exercises are solved	
HPLES11	I understand how to solve challenges	Problem-solving
HPLES12	I dare ask others for help if there are challenges I cannot solve on my own	
HPLES13	I like tasks I get in school	Intrinsic motivation
HPLES14	I like what I am doing in school	
HPLES15	I have good friends in school	Relations
HPLES16	I do activities with friends in school	
HPLES17	I think that exercises and activities I do in school are important	Perceived importance
HPLES18	I feel it is important to do my tasks	

Piloting of scale

The 18-items scale was piloted through a project including five adult learning centres, one upper secondary school, two lower secondary schools and six primary schools. An open link to a digital survey was distributed via school leaders to the students. No personal data was collected, and there was no digital trace to the respondents. A reduced nine-items version of the scale, together with the Norwegian version of the SPPA-scale (Wichstrøm, 1995), was distributed in a second pilot round in the lower and upper secondary schools to test for dimensionality and construct validity. The reduced scale included three factors, with three items in each factor, selected based on a best model fit (for the Norwegian and English version of the reduced scale, see Appendix 1a and Appendix 1b).

Participants

Pilot round 1

As the participants were recruited through schools who were part of a project, this constitutes a convenience sample, and the representativeness of the sample is unclear. The dataset in Pilot round 1 included 1336 observations in total, whereof 11% were missing,

resulting in 1191 respondents, including children aged from 10 years to adults up to 55. The missing data are generally related to respondents who had clicked on the link that was distributed but not answered any of the questions. The link was distributed to different educational contexts, including a "hard-to-reach" population (Shaghaghi et al., 2011) from the adult learning centres, with limited Norwegian skills. This may have influenced the amount of missing data.

The gender distribution of the sample was 55.3% females, 42.5% males and 2.2 % others. Of the school types represented, 14% of the respondents are from fifth to seventh grade in primary school, 42% from lower secondary school, 19% from upper secondary school and 24% from adult learning. The sample was randomly split in half for psychometric testing. The random split yielded the following samples: *Sample 1* comprised 494 individuals, 57.1 % females and *Sample 2* comprised 557 participants, 53.6 % females.

Pilot round 2

The dataset in the second pilot round (*Sample 3*) included 851 participants aged 13-19 years from lower secondary school (82.6%) and upper secondary school (17.4%). The gender distribution of the sample was 49.7% females, 48.5% males and 1.8% others. As the three subdomains social self-perception, academic self-perception, and global self-worth, of the Norwegian version of SPPA (Wichstrøm, 1995), were included in the questionnaire, only students from secondary school were included in the second pilot round.

Statistical analyses

Initial factor-structure testing (*sample 1*) and cross-validation of the most appropriate model (*sample 2*) were carried out. Exploratory factor analysis (EFA) was conducted in *sample 1* to explore the underlying factor structure and to reduce the item pool. The EFA employed oblique Geomin factor rotation. A factor was considered unique if at least three items loaded onto it. Items were retained if they met the a priori criterion of a factor loading of 0.400 or higher and did not have substantial cross-loadings (> 0.300) onto other factors. Through a stepwise procedure, removing items one by one, based on non-significant or low factor loadings, and cross-loadings, a new model consisting of nine items was tested, three from each of the factors identified in the initial analysis.

Independent cluster model confirmatory factor analysis (ICM-CFA) was employed (*sample 2*) to assess the best-fitting hypothesised model of the scale, as informed by the EFA in *sample 1*. The instrument was also evaluated by modelling it both as first-order dimensions and as a single second-order dimension. The aim of the latter was to investigate whether a common second-order factor encompassing the three first-order dimensions could be identified. Complex models inherently increase the number of parameter estimates when using only first-order latent variables, which can lead to non-identifiable solutions, particularly if the balance between sample size and the number of parameters to be estimated is suboptimal (Geiser, 2013). In the case of testing a global "Health promoting learning environment" as a second-order dimension, it appears feasible to enable future

examinations of more intricate structural models, with health promoting learning environment serving as an antecedent, mediator, or outcome variable (Byrne, 2012).

Composite reliability was calculated using McDonald's (1970) formula:

$$\omega = (\Sigma|\lambda i|)^2/([\Sigma|\lambda i|^2] + \Sigma\delta ii)$$

where standardised parameter estimates from the ICM-CFA models were used, with λi representing the factor loadings and δii the error variances. McDonald's omega coefficient, contrary to coefficient alpha, does not rely on the tau-equivalence assumption (McNeish, 2018). Researchers have suggested various criteria for determining discriminant validity based on the strength of correlations between latent variables (Cheung & Wang, 2017; Kline, 2015). In our study, correlations exceeding 0.700 were considered indicative of issues with discriminant validity (Cheung & Wang, 2017). For *sample 3*, the ICM-CFA models from *sample 2* were assessed for further fit-evaluations.

Mplus (Muthén & Muthén, 2017) version 8.4 was utilised to estimate the models using the full information maximum likelihood robust estimator (MLR). This method provides standard errors and a chi-square test statistic that are resilient to non-normality. The MLR also addressed item-level missing data (Enders, 2010). Given that the chi-square test of exact fit is sensitive to sample size and minor model misspecifications (Marsh et al., 2005), model fit was assessed using several goodness-of-fit indices and criteria: Tucker Lewis index (TLI) > 0.900, comparative fit index (CFI) > 0.900, root mean square error of approximation (RMSEA) < 0.080, and standardised root mean square residual (SRMR) < 0.080 (Marsh, 2007).

Evaluating construct validity

As an initial test of the nomological network (Cronbach & Meehl, 1955) of the newly developed scale, the construct validity of the scale was also investigated, by correlating the scale (*sample 3*) to three dimensions from the SPPA (Harter, 1988, 1999); social self-perception, academic self-perception, and global self-worth. It was hypothesised that the dimensions from the self-perception scale SPPA would yield moderate to strong positive correlations (> 0.40) with the dimensions of the developed scale. Descriptive statistics of items are found in Appendix 2.

Ethical considerations

Written information was given that it was voluntary to participate, and that all data collected was anonymous. Guardians were informed about the project and data collection by the schools. As no personal or sensitive data were collected, and it was impossible to identify respondents, the project was not reported to the Norwegian Agency for Shared Services in Education and Research.

Findings

Exploratory analysis (sample 1)

The initial EFA including all 18 items yielded non-acceptable fit indices on all possible numbers of factors (1-4). The three- and four-factor models indicated close to acceptable model fit, but the four-factor model had one factor with no items with factor loadings > 0.400. In the three-factor model, all factors had at least three items with sufficient factor loadings and no substantial cross-loadings. Based on the stepwise procedure described in the Method section, the scale was reduced from 18 items to nine items to optimise the scale length and model fit, including three items in each factor. The factors were named Figure 2) *Relational quality in the learning environment* (HPLES 1, 3 and 5 from Table 1), which includes items from acknowledgement, trust and respect, *Task mastery in school* (HPLES 7, 8, 11 from Table 1), which includes items from mastery and problem-solving and *Self-determined motivation for school* (HPLES 13, 14 and 17 from Table 1), which includes items from motivation and perceived importance. The three items for each of the three factors resulting in the best-fitting model of the scale were selected as the reduced version of the scale.

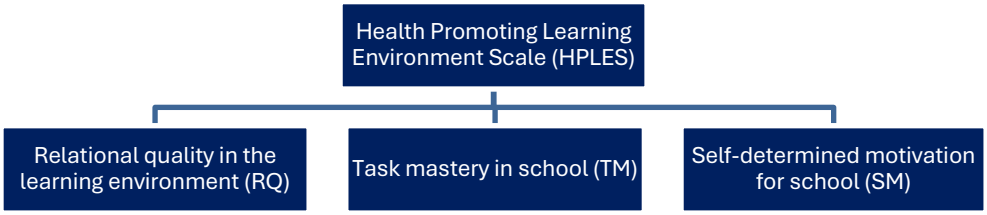


Figure 2: Factor structure for Health Promoting Learning Environment Scale (HPLES)

The final EFA (nine items, three for each factor) yielded good model-fit for the three-factor model, non-significant chi-square (p = 0.202) and satisfactory fit-indices (Table 2). Table 2 demonstrates that the three-factor solution provided a superior model fit compared to the one- and two-factor solutions.

Table 2: Goodness of fit statistics and information criteria for the models estimated on the full and reduced scale

Model	χ^2	df	CFI	TLI	RMSEA	RMSEA 90% CI	SRMR	AIC	BIC	ABIC
EFA (S. 1) 18 items										
One factor solu.	1004.33*	135	0.750	0.717	0.114	[0.108, 0.121]	0.083	20277	20504	20332
Two factor solu.	544.939*	118	0.877	0.841	0.086	[0.078, 0.093]	0.048	19557	19856	19631
Three factor solu.	421.946*	102	0.908	0.862	0.080	[0.072, 0.088]	0.038	19355	19721	19444
Four factor solu.	298.951*	87	0.939	0.893	0.070	[0.062, 0.079]	0.027	19179	19608	19284
9 items										
One factor solu.	350.184*	27	0.767	0.690	0.156	[0.141, 0.170]	0.085	10505	10618	10533
Two factor solu.	114.555*	19	0.931	0.870	0.101	[0.084, 0.119]	0.044	10134	10281	10170
Three factor solu.	15.762	12	0.997	0.992	0.025	[0.000, 0.055]	0.011	10000	10176	10043
ICM-CFA (S. 2)										
Three factor solu.	47.871	24	0.984	0.975	0.042	[0.024, 0.060]	0.028	11334	11464	11368

ICM-CFA (S. 3)										
Three factor solu.	59.018*	24	0.986	0.979	0.041	[0.028, 0.055]	0.027	16848	16990	16895
Notes. df = Degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; CI = confidence interval; SRMR = standardised root mean square residual; AIC = Akaike information criterion; BIC = Bayesian information criterion; ABIC = Sample size adjusted BIC. *All χ^2 values are significant ($p < .001$).										

As illustrated in Table 3, the three-factor solution closely aligned with the hypothesised factor structure, exhibiting negligible cross-loadings between factors.

Table 3: Factor loadings for item-reduced EFA (9 items)

Items	One factor	Two factors		Three factors		
	F1	F1	F2	F1	F2	F3
HPLES1	0.652*	0.750*	0.020	**0.763***	0.000	0.018
HPLES3	0.596*	0.878*	-0.154*	**0.838***	0.012	-0.131*
HPLES5	0.679*	0.806*	0.004	**0.832***	-0.016	0.010
HPLES7	0.634*	0.447*	0.225*	0.006	**0.856***	-0.127
HPLES8	0.700*	0.290*	0.441*	-0.008	**0.667***	0.147
HPLES11	0.701*	0.464*	0.287*	0.142	**0.662***	0.009
HPLES13	0.744*	-0.145*	0.970*	-0.009	0.185*	**0.755***
HPLES14	0.781*	0.016	0.854*	0.220*	-0.010	**0.779***
HPLES17	0.706*	0.014	0.748*	0.132*	0.100	**0.621***

Notes. N = 494. Geomin rotated loadings. * = $p < .01$. Indicators of factors in bold.
HPLES = Health Promoting Learning Environment Scale

Confirmatory analysis (sample 2 and 3)

As can be seen in Table 2, the three-factor ICM-CFA model yielded good model fit, confirming the superior model identified in sample 1. All items loaded significantly and sufficiently on the intended factors (Table 4). The latent factor-correlations in sample 2 were all below 0.700 (Table 4; TM with RQ = 0.586; TM with SM = 0.680; RQ with SM = 0.502), indicating acceptable discriminant validity. In sample 3, however, the dimension TM correlated 0.727 with SM, indicating a latent factor-correlation above the pre-set threshold of 0.700.

The results for the second-order measurement model indicated that the scale can also be used to capture overall health promoting learning environment. It is important to note that the second-order model is statistically equivalent to the first-order model, with identical fit indices (Geiser, 2013). However, since there were no inadmissible parameter estimates for the second-order model (i.e., no Heywood cases with negative variance estimates), the modelling of the second-order factor could be considered reliable (Chen et al., 2001). The standardised factor loadings on the second-order health promoting learning environment-dimension were 0.658 for RQ, 0. 891 for TM, and 0.763 for SM (Appendix 3) for the 9-item scale (Norwegian version in Appendix 1a, English version in Appendix 1b). Composite reliability values for the three latent factors were considered acceptable (ωRQ = 0.825; ωTM = 0.810; ωSM = 0.847).

Table 4: Standardised factor loadings and item uniquenesses from ICM-CFA Scale (Sample 2 and 3).

	ICM-CFA (Sample 2)				ICM-CFA (Sample 3)			
	RQ	TM	SM	δ	RQ	TM	SM	δ
HPLES1	**0.734***			0.462*	**0.820***			0.328*
HPLES3	**0.815***			0.336*	**0.843***			0.289*
HPLES5	**0.795***			0.369*	**0.844***			0.287*
HPLES7		**0.754***		0.432*		**0.778***		0.395*
HPLES8		**0.766***		0.413*		**0.773***		0.403*
HPLES11		**0.778***		0.395*		**0.829***		0.313*
HPLES13			**0.803***	0.355*			**0.783***	0.387*
HPLES14			**0.857***	0.266*			**0.818***	0.331*
HPLES17			**0.756***	0.429*			**0.717***	0.485*

Note. RQ = Relational quality in the learning environment, TM = Task management in school, SM = Self-determined motivation for school, SSP, δ = item uniquenesses (residual variances). *p < .05. Latent factor-correlations: RQ with TM = 0.586 (sample 2) and 0.586 (sample 3); RQ with SM = 0.502 (sample 2) and 0.533 (sample 3); TM with SM = 0.680 (sample 2) and 0.727 (sample 3).

Construct validity

The initial ICM-CFA of the SPPA (Wichstrøm, 1995) yielded non-acceptable fit-indices (χ2 [df = 87, N = 836] = 899.312, p < .001; TLI = .763; CFI = .803; RMSEA = .106 [.099–.112]; and SRMR = .086). An investigation of factor-loadings identified a pattern that showed the negatively worded items (two for each dimension) had low-to-moderate factor loadings (0.343 - 0.503), distinctively different from the positively worded items. One possible explanation is that the negative wording may have caused an agreeing-response effect or acquiescence (i.e. the tendency to agree regardless of the content; Bentler et al., 1971; Billiet & Davidoy, 2008). Thus, a reduced model with three positively worded items for each dimension was tested. The reduced model indicated acceptable model fit (χ2 [df = 24, N = 836] = 89.021, p < .001; TLI = .963; CFI = .975; RMSEA = .0570 [.0450–.0700]; and SRMR = .0330) and had high factor loadings across all items (0.591 - 0.928) and this model was thus retained in the subsequent correlation-analysis (Table 5).

Table 5: Latent variable correlations (sample 3).

	RQ	TM	SM	SSP	ASP	GSW
RQ	-	0.599**	0.550**	0.674**	0.482**	0.518**
TM		-	0.729**	0.475**	0.820**	0.477**
SM			-	0.384**	0.507**	0.434**
SSP				-	0.575**	0.650**
ASP					-	0.601**

Note. Standardised correlation estimates and [95% CI]. ** Statistically significant (p < 0.001). Relational quality in the learning environment, TM = Task management in school, SM = Self-determined motivation for school, SSP = Social self-perception, ASP = Academic self-perception, GSW = Global self-perception.

Fit-indices for the correlational model including the dimensions from the scale and the dimensions from SPPA indicated acceptable values ($\chi 2$ [df = 120, N = 851] = 354.041, p < .001; TLI = .953; CFI = .963; RMSEA = .0480 [.0420–.0540]; and SRMR = .0380). Table 5 shows the latent variable correlations between the dimensions from the scale and the dimensions from SPPA. As predicted, GSW, SSP and ASP were moderately-to-strongly positively correlated with the three dimensions *relational quality in the learning environment, task mastery in school* and *self-determined motivation for school* from the newly developed scale. The strongest correlation was between academic self-perception and task mastery in school (r = 0.820) (Table 5).

Discussion

In this study, an instrument for measuring health promotion in the learning environment has been developed and initially validated. A nine-item scale was developed, closely aligned with the model of generalised resistance resources in school (Figure 1). The psychometric tests, including exploratory and confirmative analyses, confirm in the present data, the presence of three subdimensions (*relational quality in the learning environment, task mastery in school, self-determined motivation for school*) with sufficient discriminant validity, in addition to a second order dimension of health promoting learning environment. The two elements 'participation in decision-making' and 'relations' were not included in the final version of the scale based on the results of the factor analyses. Still, these concepts are theoretically related to other elements included in the model for generalised resistance resources in school. Participation in decision-making is about having autonomy, which is a condition for intrinsic motivation (Ryan & Deci, 2017), and relations concern relatedness, another condition for motivation. This confirms the overlapping nature of the theoretical constructs involved in the proposed model (Figure 1). A related study to the current study (Horverak et al., 2024b), presenting the development of a scale for measuring health promotion practices in school, also supports theoretical connections between the items acknowledgement, trust, respect and relations, as well as connections between items concerning mastery, participation and motivation.

The factors in the Health Promoting Learning Environment Scale (HPLES) concern generalised resistance resources both on an individual level, and on a community level. *Relational quality in the learning environment*, such as acknowledgement, trust and respect, concerns students' perception of quality of relationships and social support, which are resources on an individual level (Idan et al., 2022). Relations in the learning environment are also considered crucial for developing resilience (Zafiropoulou & Psilou, 2024). *Task mastery in school* concerns experiences of having competence and autonomy, which are related to SOC (Idan et al., 2022), and also to self-efficacy (Bandura, 1997). From a salutogenic perspective, the school setting is considered a resource on community level (Idan et al., 2022), as experiences of competence and autonomy may be facilitated, which again are conditions for experiencing intrinsic motivation (Ryan & Deci, 2017). *Self-determined motivation for school*, through intrinsic motivation and perceiving that something is of importance, concerns experiencing meaningfulness, which is a condition for SOC (Antonovsky, 1987). Motivation is also described as a generalised resistance resource on

an individual level (Idan et al., 2022). Together, the three subdimensions in the developed scale cover important aspects of health promotion in the learning environment (Horverak et al., 2024a).

Initial evidence of construct validity was obtained, through moderate-to-strong associations with the instrument assessing self-perceptions. Regarding the discriminant validity of the scale, one latent-factor correlation was above 0.700 in sample 3, which may suggest less than optimal discriminant validity (Cheung & Wang, 2017). Sample 3 in the present study consisted of only lower- and upper-secondary school students, as opposed to the more mixed-aged samples 1 and 2. Although not readily explainable, the somewhat higher latent-factor correlation observed in sample 3 could be a complex interplay of the participants' developing variations in cognitive abilities, a greater propensity for certain response biases, and a less fully differentiated self-perception compared to older individuals.

Rather than measuring end results concerning individual health, this scale measures students` experience of health promotion in the learning environment. The scale only includes positive items concerning conditions supporting a positive development, as there are sufficient measurements of negative aspects such as bullying and loneliness (Bakken 2022, 2024; Wendelborg, 2024). There is a need for studies investigating positive indicators or individual or contextual coping resources in children and adolescents in a Norwegian context (FHI, 2018). Therefore, there was a need for psychometrically sound measures to evaluate factors involved in health promotion. The developed scale measures salutogenic health promoting resources, which are important to handle stress and develop SOC (Idan et al., 2022).

Strengths and limitations

The analyses yielded support for a second order model with three subdimensions of the nine-item version of the Health Promoting Learning Environment Scale (HPLES). According to the results, the internal validity of the instrument is good. The samples in the study are quite large, but some of the subgroups within sample 1 and 2 are relatively small. Thus, the fact that the present study consists of convenience samples should be considered when interpreting the results. Further testing of validity is needed in the context of primary school and adult learning.

Indication of construct validity is also obtained when considering correlations to the positively worded items in the SPPA-scale. It should be noted though, that the SPPA-instrument from Wichström (1995) needed post-hoc adjustments (removing negatively worded items) to provide acceptable model-fit. Thus, the evidence of construct validity found in the present study should be interpreted with caution. Further evaluations of the nomological net of health promotion are needed, as well as further psychometric testing across samples and a test-retest procedure to assess the consistency and sensitivity of the instrument over time. Of particular importance, measurement invariance across groups and across time should be investigated in future research.

Validating a scale does not concern only the property of the instrument, but it is also related to considering the appropriateness of using an instrument for specific contexts (Kane, 2021; Sireci, 2009). In the school context, scores from the scale may give employees information about what students perceive as challenging in the learning environment - whether it is how they perceive themselves in relation to others' responses (*relational quality in the learning environment*), whether they feel tasks are unmanageable (*task mastery in school*), or whether they do not see any meaning or motivation in what they do at school (*self-determined motivation for school*). The interpretations of the scale scores may guide the school staff to work towards facilitating a health promoting learning environment that strengthens students' robustness to cope with stress (Antonovsky, 1987). There may also be other relevant aspects concerning health promotion in schools, however, the scale presented here is limited to focusing on health promoting generalised resistance resources (Idan et al., 2022) in the learning environment.

Conclusion

This study has initiated the development and validation of a scale for measuring health promotion in the learning environment, and the analyses support a valid and reliable nine-item three-factor measure. This is an important step towards establishing a scale to measure positive conditions in a school context. Applying this scale may guide researchers, as well as school leaders and school owners, to identify what is important to improve in the learning environment to promote health and facilitate robustness and resilience for the students. Even though further validation is needed, the Health Promoting Learning Environment Scale (HPLES) provides a significant contribution in the field of assessment of health promotion in the educational context. The scale provides a tool for both researchers, evaluating health promoting initiatives, and practitioners, working to develop a health promoting practice.

Acknowledgements

This work was supported by the Regional Research Funds, Agder, Norway, under Grant 341173.

References

AERA, APA & NCME (2014). *Standards for educational and psychological testing.* American Educational Research Association. https://www.aera.net/publications/books/standards-for-educational-psychological-testing-2014-edition

Alexander, D. (1994). Adolescents and young adults: overview. *Preventive Medicine*, 23(5), 653-654. https://doi.org/10.1006/pmed.1994.1108

Antonovsky, A. (1987). *Unravelling the mystery of health.* San Francisco: Jossey-Bass Publishers. https://archive.org/details/unravelingmyster00aaro/mode/2up [also https://openlibrary.org/books/OL2733173M/Unraveling_the_mystery_of_health]

Bakken, A. (2024). *Ungdata 2024. Nasjonale resultater [Youth data 2024. National results]*. NOVA Rapport 6/24. Oslo: NOVA, OsloMet. https://hdl.handle.net/11250/3145138

Bakken, A. (2022). *Ungdata 2022. Nasjonale resultater. [Youth data 2022. National results]. NOVA Rapport 5/22*. NOVA, OsloMet. https://hdl.handle.net/11250/3011548

Bakken, B. (2012). *Helsefremmende arbeidsplasser [Health-promoting workplaces]*. Idebanken.org. https://www.idebanken.org/innsikt/artikler/helsefremmende-arbeidsplasser [not found 12 Aug 2026]

Bandura, A. (1997). *Self-efficacy: The exercise of control*. Freeman.

Bentler, P. M., Jackson, D. N. & Messick, S. (1971). Identification of content and style: a two-dimensional interpretation of acquiescence. *Psychological Bulletin*, 76(3), 186-204. https://doi.org/10.1037/h0031474

Bentsen, A., Kristiansen, R., Vardheim, I & de Presno, T. G. (2019). *Ung i Agder 2019 [Youth in Agder 2019]*. Korus Sør, Ungdata, Aust-Agder Fylkeskommune & Vest-Agder Fylkeskommune. [not found 12 Aug 2026] https://www.korus-sor.no/wp-content/uploads/2019/11/Rapport-Ung-i-Agder-2019.pdf

Berglund, A.-L., Claesson, D. & Kröldrup, R. (2006). Quality of life: Young people's interpretation of the concept. *Nordic Journal of Nursing Research* [*Vård i Norden]*, 26(3), 4-8. https://journals.sagepub.com/doi/10.1177/010740830602600302

Billiet J. B. & Davidov E. (2008). Testing the stability of an acquiescence style factor behind two interrelated substantive variables in a panel design. *Sociological Methods & Research*, 36(4), 542-562. https://doi.org/10.1177/0049124107313901

Byrne, B. M. (2012). *Structural equation modelling with Mplus: Basic concepts, applications, and programming*. Routledge. https://doi.org/10.4324/9780203807644

Center for Self-Determination Theory (2026). *Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS)*. CSTD. https://selfdeterminationtheory.org/basic-psychological-need-satisfaction-and-frustration-scale/

Chen, F., Bollen, K. A., Paxton, P., Curran, P. J. & Kirby, J. B. (2001). Improper solutions in structural equation models: Causes, consequences, and strategies. *Sociological Methods & Research*, 29(4), 468-508. https://doi.org/10.1177/0049124101029004003

Cheung, G. W. & Wang, C. (2017). Current approaches for assessing convergent and discriminant validity with SEM: Issues and solutions. *Academy of Management Proceedings*, 2017(1), article 12706. https://doi.org/10.5465/AMBPP.2017.12706abstract

Cronbach, L. J. & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Bulletin*, 52(4), 281-302. https://doi.org/10.1037/h0040957

Colizzi, M., Lasalvia, A. & Ruggeri, M. (2020). Prevention and early intervention in youth mental health: Is it time for a multidisciplinary and trans-diagnostic model for care? *International Journal of Mental Health Systems*, 14, article 23. https://doi.org/10.1186/s13033-020-00356-9

DeVellis, R. F. & Thorpe, C. T. (2022). *Scale development: Theory and applications* (5th ed.). Sage.

Dwyer, P. & Wyn, J. (2001). *Youth, education and risk: Facing the future*. Routledge. https://doi.org/10.4324/9780203018712

Eckersley, R. (2005). The quality of life. In P. Saunders & J. Walter (Eds.*), Ideas and influence: Social science and public policy in Australia* (pp. 198-218). UNSW Press. https://www.researchgate.net/profile/Richard-Eckersley/publication/363172745

Enders, C. K. (2010). *Applied missing data analysis*. Guilford Press. [2nd ed.] https://www.guilford.com/books/Applied-Missing-Data-Analysis/Craig-Enders/9781462549863

Enstad, F. & Bakken, A. (2022). *Ungdata junior 2022. Nasjonale resultater.* NOVA Rapport 6/22 *[Youth data junior 2022. National results.* NOVA Report 6/22*]*. Oslo: NOVA, OsloMet. https://agderfk.no/vare-tjenester/folkehelse-levekar-og-likestilling/bedre-levekar-pa-agder/

FHI (2018). *Barn og unges psykiske helse: Forebyggende og helsefremmende folkehelsetiltak. En kunnskapsoversikt [Children and adolescents' mental health: Preventive and health promoting public health measures. A knowledge overview.]*. https://www.fhi.no/publ/2018/barn-og-unges-psykiske-helse-forebyggende-og-helsefremmende-folkehelsetilta

Geiser, C. (2013). *Data analysis with Mplus.* The Guilford Press. https://www.guilford.com/books/Data-Analysis-with-Mplus/Christian-Geiser/9781462502455?srsltid=AfmBOooZL2YEU2u5zRn4d5GenD8uDWV4RzHF6jopdRd1kq2R2-VIivYB

Harter, S. (1988). *Manual for the self-perception profile for adolescents.* University of Denver. https://www.scribd.com/document/1046268250/Harter

Harter, S. (1999). *The construction of the self: A developmental perspective.* Guilford Press. https://eric.ed.gov/?id=ED429699

Hellang, Ø. & Helmersen, M. (2022). *"På felles vei" - Helsefremmende barnehager og skoler - Del II av evaluering og følgeforskning av HBS Agder i Folkehelseprogrammet. Rapport 7-2022 avdeling Helse og samfunn ["On a common path" - Health-promoting kindergartens and schools - Part II of evaluation and follow-up research of HBS Agder in the Public Health Program. Report 7-2022 Department of Health and Society.]*. NORCE Norwegian Research Centre. https://hdl.handle.net/11250/2991490

Helmersen, M. & Stiberg-Jamt, R. (2019). *HBS Agder: Førevaluering av tiltak for helsefremmende barnehager og skoler.* NORCE Samfunnsforskning og Oxford Research [*HBS Agder: Pre-evaluation of measures for health-promoting kindergartens and schools*. NORCE Social Research and Oxford Research]. https://hdl.handle.net/11250/2991441

Hoff, F. (2016*). Selvbestemmelsesteorien inn i norsk grunnskole: I hvilken grad er et autonomistøttende læringsmiljø, tilbakemeldinger fra lærere, og autonomi, kompetanse og tilhørighet relatert til forskjeller i opplevd kompetanse og skoleprestasjon? [Self-determination theory into Norwegian primary school: To what extent are an autonomy-supportive learning environment, feedback from teachers, and autonomy, competence, and belonging related to differences in perceived competence and school performance?]* Masters thesis, University of Oslo, Norway. https://hdl.handle.net/10852/52156

Horverak, M. O., Hellang, Ø., Kühn, N. S., Helmersen, M., Langeland, G. M. & Haugen, T. (2025b). Developing an instrument to measure health promotion in a youth environment: A pilot study from a Norwegian context. *The Asian Conference on Psychology & the Behavioral Sciences 2025 Official Conference Proceedings* (pp. 41-53) https://doi.org/10.22492/issn.2187-4743.2025.4

Horverak, M. O., Langeland, G. M., Aanensen, M., Hellang, Ø., Eide, S. E., Haugen, T. & Helmersen, M. (2024a). Et helsefremmende skolemiljø for økt skolenærvær. *Forebygging.no [A health-promoting school environment for increased school attendance. Forebygging.no]*. https://doi.org/10.21340/m9pw-ct37

Horverak, M. O., Langeland, G. M., Kühn, N. S., Hellang, Ø. & Helmersen, M. (2024b). Health promotion principles and practices in School. *International Journal of e-Healthcare Information Systems*, 10(1), 282-289. https://infonomics-society.org/ije-his/published-papers/volume-10-2024/health-promotion-principles-and-practices-in-school/

Horverak, M. O., Langeland, G. M., Sari, E. & Haugen, T. (2025a). Health promotion through facilitating mastery, participation and motivation in secondary school. *Education and New Developments 2025*. Volume 2, pp. 229-233. inScience Press. https://end-educationconference.org/wp-content/uploads/2025/08/202502OP048.pdf

Hurrelmann, K., Leppin, A. & Nordlohne, E. (1995). Promoting health in schools: The German example. *Health Promotion International*, 10(2), 121-131. https://doi.org/10.1093/heapro/10.2.121

Idan, O., Eriksson M. & Al-Yagon, M. (2022). Generalized resistance resources in the salutogenic model of health. In M. B. Mittelmark, G. F. Bauer, L. Vaandrager, Pelikan, J. M., Sagy, S., Eriksson, M., Lindström, B. & Magistretti, C. M. (Eds.), *The handbook of salutogenesis* [Internet] (2nd ed). Chapter 12. Cham (CH): Springer. https://www.ncbi.nlm.nih.gov/books/NBK584114/

Jourdan, D., Gray, N. J., Barry, M. M., Caffe, S., Cornu, C., Diagne, F., El Hage, F., Farmer, M. Y., Slade, S., Marmot, M. & Sawyer, S. M. (2021). Supporting every school to become a foundation for healthy lives. *The Lancet; Child & Adolescent Health*, 5(4), 295-303. https://doi.org/10.1016/S2352-4642(20)30316-3

Kane, M. T. (2021). Articulating a validity argument. In G. Fulcher & L. Harding (Eds.), *The Routledge handbook of language testing* (2nd ed., pp. 32-47). Routledge. https://www.taylorfrancis.com/chapters/edit/10.4324/9781003220756-4/articulating-validity-argument-michael-kane

Kline, R. B. (2011). *Principles and practice of structural equation modelling*. The Guilford Press.

Krokstad, S., Weiss, D. A., Krokstad, M. A., Rangul, V., Kvaløy, K., Ingul, J. M., Bjerkeset, O., Twenge, J. & Sund, E. R. (2022). Divergent decennial trends in mental health according to age reveal poorer mental health for young people: Repeated cross-sectional population-based surveys from the HUNT Study, Norway. *BMJ Open*, 12(5), article e057654. https://doi.org/10.1136/bmjopen-2021-057654

Langeland, G. M. & Horverak, M.O. (2021). *Hvordan legge til rette for mestring, medvirkning og motivasjon i ungdomsskole og videregående skole [How to facilitate mastery, participation and motivation in middle school and upper secondary school]*. Cappelen Damm Akademisk. https://www.ark.no/produkt/boker/fagboker/hvordan-legge-til-rette-for-mestring-medvirkning-og-motivasjon-9788202706722

Li, W. & Quan, S. (2025). Mediating effects of resilience on regulatory emotional self-efficacy and adverse mental health outcomes among college students in China. *Scientific Reports*, 15, article 25168. https://doi.org/10.1038/s41598-025-09260-z

Marsh, H. W., Hau, K.-T. & Grayson, D. (2005). Goodness of fit in structural equation models. In J. M. E. A. Maydeu-Olivares (Ed.), *Contemporary psychometrics. A Festschrift for Roderick P. McDonald* (pp. 275-340). Erlbaum.

Marsh, H. W. (2007). Application of confirmatory factor analysis and structural equation modelling in sport/exercise psychology. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of sport psychology* (3rd ed., pp. 774-798). Wiley. https://onlinelibrary.wiley.com/doi/abs/10.1002/9781118270011.ch35

McDonald, R. P. (1970). The theoretical foundations of principal factor analysis, canonical factor analysis, and alpha factor analysis. *British Journal of Mathematical and Statistical Psychology*, 23(1), 1-21. https://doi.org/10.1111/j.2044-8317.1970.tb00432.x

McNeish, D. (2018). Thanks coefficient alpha, we'll take it from here. *Psychological Methods*, 23(3), 412-433. https://doi.org/10.1037/met0000144

Moksnes, U. K. & Haugan, G. (2014). Validation of the Orientation to Life Questionnaire in Norwegian adolescents, construct validity across samples. *Social Indicators Research*, 119(2), 1105-1120. https://doi.org/10.1007/s11205-013-0536-z

Muthén, L. K. & Muthén, B. O. (1998-2017). *Mplus user's guide.* 8th ed. Los Angeles, CA: Muthén & Muthén. https://www.statmodel.com/download/usersguide/MplusUserGuideVer_8.pdf

Riekie, H., Aldridge, J. M. & Afari, E. (2017). The role of the school climate in high school students' mental health and identity formation: A South Australian study. *British Educational Research Journal*, 43(1), 95-123. https://doi.org/10.1002/berj.3254

Schwarzer, R. & Jerusalem, M. (1995). *General Self-Efficacy Scale (GSE)* [Database record]. APA PsycTests. https://doi.org/10.1037/t00393-000

Parlikar, N., Kvaløy, K., Strand, L. B., Espnes, G. A. & Moksnes, U. K. (2023). Loneliness in the Norwegian adolescent population: Prevalence trends and relations to mental and self-rated health. *BMC Psychiatry*, 23, article 895. https://doi.org/10.1186/s12888-023-05404-5

Poulsen, G. A. K., Hellang, Ø, Kühn, N. S. B. & Horverak, M. O. (2025). *CVidere: SAMMen for sysselsetting. Rapport 6-2025*. NORCE Helse og samfunn [*CVidere: SAMMen for employment. Report 6-2025*. NORCE Health and society]. https://hdl.handle.net/11250/3186657

Reneflot, A., Aarø, L. E., Aase, H., Reichborn-Kjennerud, T., Tambs, K. & Øverland, S. (2018). *Psykisk helse i Norge [Mental health in Norway]*. Folkehelseinstituttet. https://www.fhi.no/globalassets/dokumenterfiler/rapporter/2018/psykisk_helse_i_norge2018.pdf

Richter, A., Sjunnestrand, M., Romare Strandh, M. & Hasson, H. (2022). Implementing school-based mental health services: A scoping review of the literature summarizing the factors that affect implementation. *International Journal of Environmental Research and Public Health*, 19(6), article 3489. https://doi.org/10.3390/ijerph19063489

Ryan, R. M. & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. The Guilford Press. https://www.guilford.com/excerpts/ryan.pdf?t=1

Shaghaghi, A., Bhopal, R. S. & Sheikh, A. (2011). Approaches to recruiting 'hard-to-reach' populations into research: A review of the literature. *Health Promotion Perspectives*, 1(2), 86-94. https://pmc.ncbi.nlm.nih.gov/articles/PMC3963617/

Sireci, S. G. (2009). Packing and unpacking sources of validity evidence: History repeats itself again. In R. W. Lissitz (Ed.), *The concept of validity: Revisions, new directions, and applications.* (pp. 19-37). IAP Information Age Publishing. https://bookstore.emerald.com/the-concept-of-validity-hb-9781607522287.html

Tan, C. (2025). A review of educational reforms aiming to advance students' personal wellbeing in Singapore schools. *Issues in Educational Research*, 35(4), 1706-1726. http://www.iier.org.au/iier35/tan.pdf

The Norwegian Directorate of Health (n. d.). *Program for folkehelsearbeid i kommunene [Program for public health efforts in the municipalities]*. https://www.helsedirektoratet.no/tema/folkehelsearbeid-i-kommunen/program-for-folkehelsearbeid-i-kommunene

The Norwegian Directorate of Education (2017). *Core curriculum – values and principles for primary and secondary education*. https://www.udir.no/lk20/overordnet-del/?lang=eng

The Whoqol Group (1998). The World Health Organization quality of life assessment (WHOQOL): Development and general psychometric properties. *Social Science & Medicine*, 46(12), 1569-1585. https://doi.org/10.1016/S0277-9536(98)00009-4

United Nations (2020). *UNODC/WHO International Standards on drug use prevention.* https://www.unodc.org/unodc/en/prevention/prevention-standards.html

UNICEF (2015). *The global strategy for women's, children's and adolescent`s health (2016-2030).* https://www.unicef.org/zambia/media/5886/file/Global-Strategy-for-Womens-Childrens-and-Adolescents-Health-2016%E2%80%932030.pdf

Wendelborg, C. (2024). *Mobbing på skolen – Analyse av Elevundersøkelsen skoleåret 2023/24. [Bullying in school – An analysis of the Student survey the school year 2023/24].* NTNU Samfunnsforskning AS. https://kudos.dfo.no/documents/79779/files/37718.pdf

WHO (World Health Organization) (2009). The Ottawa Charter for Health Promotion: First International Conference on Health Promotion, Ottawa, 17-21 November 1986. In Milestones in health promotion: Statements from global conferences. WHO. https://iris.who.int/server/api/core/bitstreams/182f2f42-3b44-49d6-8329-b68f2d01a9e8/content [2.3 MB]

WHO & UNESCO (2021). *Making every school a health-promoting school: Global standards and indicators for health-promoting schools and systems*. ISBN 978-92-4-002505-9 https://unesdoc.unesco.org/ark:/48223/pf0000377941

Wichstrøm, L. (1995). Harter's self-perception profile for adolescents: Reliability, validity, and evaluation of the question format. *Journal of Personality Assessment*, 65(1), 100-116. https://doi.org/10.1207/s15327752jpa6501_8

Yudiati, E. A., Sugiharto, D. Y. P., Purwanto, E. & Sunawan. (2025). Analysis of self-efficacy and resilience as determinants of psychological well-being in situations of psychological stress in students. *Multidisciplinary Reviews*, 8(9), article 2025274. https://doi.org/10.31893/multirev.2025274

Zafiropoulou, M. & Psilou, A. (2024). Building mental resilience in children: The role of teachers and the whole-school setting. In L. Ioannidou & A. Argyriadi (Eds.), *Building mental resilience in children: Positive psychology, emotional intelligence, and play* (pp. 211-242). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-8312-4.ch008

Zeng, B., Jeon, M. & Wen, H. (2024). How does item wording affect participants' responses in Likert scale? Evidence from IRT analysis. *Frontiers in Psychology*, 15, article 1304870. https://doi.org/10.3389/fpsyg.2024.1304870

Zhang, X., Noor, R. & Savalei, V. (2016). Examining the effect of reverse worded items on the factor structure of the need for cognition scale. *PloS One*, 11(6), article e0157795. https://doi.org/10.1371/journal.pone.0157795

Zimmerman, M. A. (2013) Resilience theory: A strengths-based approach to research and practice for adolescent health. *Health Education & Behavior*, 40(4), 381-383. https://doi.org/10.1177/1090198113493782

Appendix 1a: Skala for helsefremmende læringsmiljø (HPLES)

Skala fra "Svært uenig"=1 til "Svært enig"=5.

Kode før justering	Kode etter justering	Påstand	Tema
HPLES1	HPLES1	Jeg føler meg sett og hørt av andre	Anerkjennelse
HPLES3	HPLES2	Jeg opplever å få tillit fra andre	Tillit
HPLES5	HPLES3	Jeg føler meg respektert av andre	Respekt
HPLES7	HPLES4	Jeg mestrer oppgaver jeg får	Mestring
HPLES8	HPLES5	Jeg gir ikke opp selv om oppgaver er vanskelige	
HPLES11	HPLES6	Jeg forstår hvordan jeg kan løse utfordringer	Problemløsning
HPLES13	HPLES7	Jeg liker oppgaver jeg har i skolehverdagen	Indre motivasjon
HPLES14	HPLES8	Jeg trives med det jeg holder på med i skolehverdagen	
HPLES17	HPLES9	Jeg mener at oppgaver og aktiviteter jeg holder på med i skolehverdagen er viktige	Oppfattet viktighet

Notes. Nye koder: HPLES1-3 = Relasjonskvalitet i læringsmiljøet, HPLES4-6 = Oppgavemestring i skolen, HPLES7-9 = Selvbestemt skolemotivasjon.

Appendix 1b: Health Promoting Learning Environment Scale (HPLES) (translated)

Scale from "Totally disagree" =1 to "Totally agree" =5.

Old item	New item	Item text	Theme
HPLES1	HPLES1	I feel seen and heard by others	Acknowledgement
HPLES3	HPLES2	I experience being trusted by others	Trust
HPLES5	HPLES3	I feel respected by others	Respect
HPLES7	HPLES4	I master exercises I get	Mastery
HPLES8	HPLES5	I do not give up even though exercises are difficult	
HPLES11	HPLES6	I understand how to solve challenges	Problem-solving
HPLES13	HPLES7	I like tasks I get in school	Motivation
HPLES14	HPLES8	I like what I am doing in school	
HPLES17	HPLES9	I think that exercises and activities I do in school are important	Perceived importance

Note. New items: HPLES1-3 =Relational quality in the learning environment (RQ), HPLES4-6 = Task mastery in school (TM), HPLES7-9 = Self-determined motivation for school (SM)

Appendix 2: Descriptive statistics of items

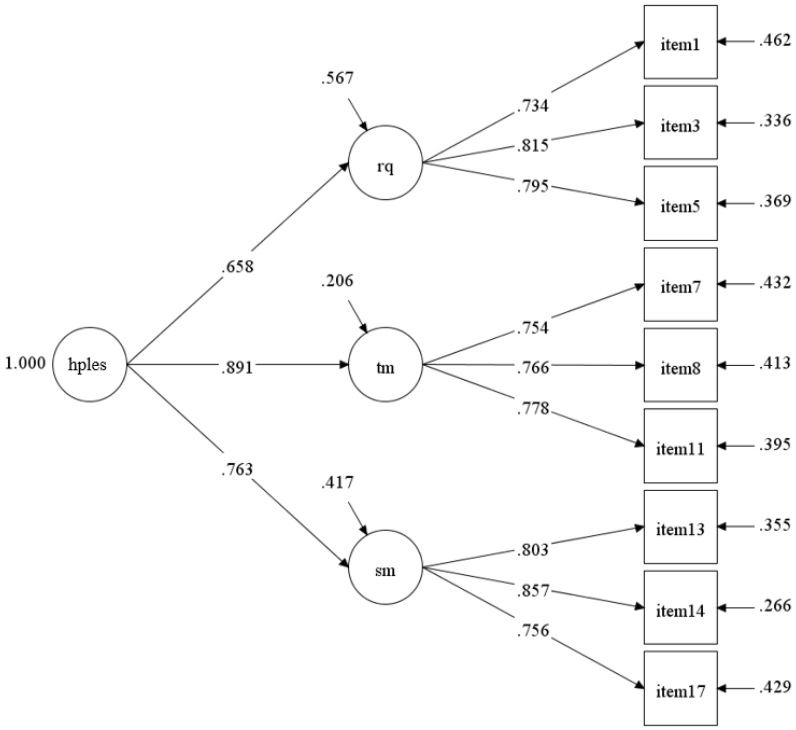
Sample 1	*M*	*Variance*	Skewness	Kurtosis	Range	*n*
HPLES1	**3.939**	**0.887**	**-1.231**	**1.834**	**1-5**	**494**
HPLES2	4.267	0.633	-1.648	4.465	1-5	494
HPLES3	**3.905**	**0.827**	**-1.087**	**1.644**	**1-5**	**494**

HPLES4	3.690	1.019	-0.756	0.195	1-5	494
HPLES5	**3.899**	**0.832**	**-0.984**	**1.217**	**1-5**	**494**
HPLES6	4.298	0.638	-1.801	5.089	1-5	494
HPLES7	**3.698**	**0.737**	**-0.570**	**0.636**	**1-5**	**494**
HPLES8	**3.666**	**1.040**	**-0.648**	**0.152**	**1-5**	**494**
HPLES9	3.443	1.057	-0.519	-0.175	1-5	494
HPLES10	3.464	0.953	-0.511	0.046	1-5	494
HPLES11	**3.694**	**0.779**	**-0.742**	**0.839**	**1-5**	**494**
HPLES12	3.889	1.042	-0.998	0.796	1-5	494
HPLES13	**3.310**	**1.226**	**-0.382**	**-0.487**	**1-5**	**494**
HPLES14	**3.609**	**1.048**	**-0.772**	**0.313**	**1-5**	**494**
HPLES15	4.320	0.792	-1.721	3.473	1-5	494
HPLES16	4.034	0.948	-1.266	1.713	1.5	494
HPLES17	**3.733**	**1.034**	**-0.742**	**0.244**	**1-5**	**494**
HPLES18	3.856	0.989	-0.795	0.374	1-5	494
Sample 2	*M*	*Variance*	Skewness	Kurtosis	Range	*n*
HPLES1	3.935	0.787	-1.079	1.553	1-5	556
HPLES3	3.935	0.708	-0.928	1.285	1-5	556
HPLES5	3.887	0.736	-0.873	1.159	1-5	557
HPLES7	3.674	0.809	-0.485	0.154	1-5	556
HPLES8	3.604	0.995	-0.572	-0.025	1-5	556
HPLES11	3.683	0.716	-0.647	0.592	1-5	556
HPLES13	3.234	1.179	-0.372	-0.458	1-5	556
HPLES14	3.558	1.006	-0.624	0.086	1-5	556
HPLES17	3.664	1.058	-0.642	0.064	1-5	556
Sample 3	*M*	*Variance*	Skewness	Kurtosis	Range	*n*
HPLES1	3.997	0.742	-1.075	1.680	1-5	851
HPLES3	3.927	0.759	-1.043	1.583	1-5	850
HPLES5	3.876	0.833	-1.007	1.290	1-5	850
HPLES7	3.608	0.808	-0.647	0.627	1-5	850
HPLES8	3.475	1.002	-0.502	0.035	1-5	850
HPLES11	3.602	0.758	-0.560	0.480	1-5	849
HPLES13	2.976	1.035	-0.094	-0.565	1-5	850
HPLES14	3.471	0.974	-0.565	0.095	1-5	850
HPLES17	3.548	0.982	-0.700	0.380	1-5	850

Note. Bold is items retained after reduction.

Appendix 3: Visual presentation of second-order model

Values are standardised estimates (standard error).



May Olaug Horverak is a senior researcher at NORCE Research. She holds a masters degree in English and in special education, and a doctoral degree in English. She has extensive experience as a teacher, headmaster, project leader and researcher, with several publications on mastery, motivation and health promotion in education.
ORCID: https://orcid.org/0009-0004-8172-2749
Email: mayh@norceresearch.no

Gerd Martina Langeland is a teacher at Lillesand Upper Secondary school, Norway [https://www.vilbli.no/en/agder/adr/8369/lillesand-videregaende-skole]. She has a masters degree in Nordic literature, and her teaching subjects are psychology and Norwegian language and literature. She has developed methodology related to working with motivation, participation and mastery, and published several articles and books.
Email: gerd.martina.langeland@lillesand.vgs.no

Migle Helmersen is an associate professor in the Faculty for Health and Sport Sciences at the University of Agder. Thematically, her research focuses on health promotion concerning sick leave, ability to work, coping and organisational work environments, as well as health promotion in kindergartens and schools and prevention of exclusion.
ORCID: https://orcid.org/0000-0003-2508-2076
Email: migle.helmersen@uia.no

Øyvind Hellang is a senior researcher at NORCE Research. He holds a masters degree in information systems. He has extensive experience as a researcher and project leader within public sector innovation, with publications on health promotion in education and co-production in public services.
ORCID: https://orcid.org/0000-0003-2954-3255
Email: oyhe@norceresearch.no

Emre Sarı is a senior researcher at NORCE Research, working on inequalities in health and society. He holds a PhD in health economics, and he has contributed to several research and development projects on childhood and youths, including studies on adverse childhood experiences, youth vulnerabilities, risky health behaviours, and suicide.
ORCID: https://orcid.org/0000-0001-9805-9227
Email: emre@norceresearch.no

Unni Karin Moksnes is a professor of health sciences at the Department of Public Health and Nursing at the Norwegian University of Science and Technology (NTNU). She is also affiliated with the NTNU Centre for Health Promotion Research. She holds a background in nursing and a PhD in health sciences.
ORCID: https://orcid.org/0009-0001-8031-9710
Email: unni.moksnes@ntnu.no

Mariette Aanensen is an assistant professor and PhD research fellow at the University of Agder. Her doctoral research focuses on artificial intelligence and language learning in vocational education and training. Her research interests include school development, motivation, and assessment.
ORCID: https://orcid.org/0009-0006-1641-9406
Email: mariette.aanensen@uia.no

Anne-Kristin Imenes is a psychologist and a specialist in child and adolescent psychology and works as a senior advisor at a regional competence centre for substance use, KORUS Sør [https://korus.no/sor]. She is a public speaker, supervisor, project manager and author. She has developed teaching materials on public health and life skills.
Email: anne-kristin.imenes@korus-sor.no

Kjærsti Thorsteinsen has a PhD in psychology and works as a senior researcher at NORCE Research. Her areas of interest are motivation and emotion, personal growth, and health promotion, with a distinct expertise within positive psychology and wellbeing research.
ORCID: https://orcid.org/0000-0001-7486-0802
Email: ktho@norceresearch.no

Tommy Haugen is Professor of Sport Science at the University of Agder, where his areas of interest are sport psychology, motivation, mental health, group dynamics, coaching, and physical education. He earned his PhD in Sport Science in 2013 and has published over 100 scientific texts including journal articles and books.
ORCID: https://orcid.org/0000-0001-7909-473X
Email: tommy.haugen@uia.no

Please cite as: Horverak, M. O., Langeland, G. M., Helmersen, M., Hellang, Ø., Sari, E., Moksnes, U. K., Aanensen, M., Imenes, A.-K., Thorsteinsen, K. & Haugen, T. (2026). Initiation of the *Health Promoting Learning Environment Scale*: Contributing to students' mental health. *Issues in Educational Research*, 36(3), 1012-1035.
http://www.iier.org.au/iier36/horverak.pdf