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Posted Date: 13 May 2026

doi: 10.20944/preprints202605.0813.v1

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Health Literacy and Mental Health in Adolescents: Parental and Self-Reported Cross-Sectional Data in a Bilingual Region

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Highlights

Adolescents' higher mental health concerns are related to both, lower parental and lower adolescents' health literacy. Lower problematic internet use and higher social support not only relate to lower mental health concerns, but even to parental and adolescents' health literacy. German language relates to better adolescents' health literacy. Enhancing familiar health literacy through school-based programs may help adolescents to improve their mental health state. Existing German programs may be adapted to the needs of the bilingual region.

Abstract

Background/Objectives: Mental health issues among adolescents have increased during the pandemic necessitating targeted intervention programs. Improving health literacy (HL) of adolescents and parents could be a meaningful concept. This study aimed to explore the HL of parents and adolescents and its association with mental health screening outcomes in a bilingual region. **Methods:** A population-based anonymous online survey was conducted in South Tyrol, Italy. About 3,229 questionnaires provided information on HL and adolescents' mental health concerns using standardized internationally validated instruments. Parental and self-reported data were compared; the associations of HL with social support, problematic Internet use, language and mental health outcomes were explored. **Results:** Adolescents' HL was associated with questionnaire language, with better results observed for the German language (23.1% high HL) than for Italian (14.3%). Higher levels of HL among both parents and adolescents were related to better mental health outcomes in adolescents with higher associations to adolescents' HL. Social support and problematic internet use were associated with both mental health outcomes and parental- and self-reported HL. HL accounted as a mediator partly for of the relationship between these two variables and self-reported mental health outcomes. **Conclusions:** Enhancing HL among parents and adolescents through school-based programs might be a promising strategy to improve adolescents' mental health. In the bilingual context of South Tyrol, existing international German school-based programs can be adapted to fit the Italian health care and educational system. Further research is essential to evaluate the implementation of such programs and their effects on adolescents' mental health and HL outcomes. South Tyrol offers the unique opportunity to apply German actual school HL knowledge and adapt it to Italian needs.

Keywords: adolescents; HLS-EU-Q16; HLSAC; mental health; psychosomatic complaints; parental perception; cross-cultural screening; German; Italian

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1. Introduction

A “mental disorder” is characterized by a clinically significant disturbance in an individual’s cognition, emotional regulation, or behavior, whereas “mental health conditions” includes mental disorders, psychosocial issues, and other conditions linked to distress, impaired functioning, or self-harm risk [1]. Mental disorders impact a significant segment of the global youth population [2]. Before the pandemic, 13–20% of children and adolescents worldwide were affected by mental disorders [3]. Mental health conditions can be assessed by screening tools. Large meta-analyses have shown that mental disorders as well as mental health conditions in terms of symptomatic screening results have increased significantly during the pandemic across countries and have not yet returned to pre-pandemic levels [4-8].

In South Tyrol, a region in the North of Italy at the border to Austria and Switzerland, where about 70% of the population speaks German and 30% Italian, four repeated cross-sectional population-based surveys among students aged 6 to 19 years have been conducted since 2021 to screen for mental health conditions [9, 10]. Results confirm that high rates of mental health conditions in adolescents persist post-pandemic, requiring targeted prevention and intervention programs.

In this context, parental and adolescents’ competences to meet the complex demands of health in modern society may play an important role and need to be investigated. A theoretical framework for this principle was developed during the last decades in the European context based on different definitions of health literacy (HL). According to [11] HL is linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise, and apply health information in order to make judgments and take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve quality of life during the life course. Former research in high income countries shows that there exist effects of HL on young peoples’ wellbeing in general with associations to social parameters [12]. Better health information helps mitigate adolescents’ mental health conditions [13] and health illiteracy is a barrier in mental health treatment seeking [14]. An adequate HL serves as protective factor for long-term mental health conditions [15] in adolescents. Studies on the health of young people distinguish between the recognition of mental and physical health conditions in self- and parent reported studies [16-18]. While parents were better informed about physical than mental health of their children, adolescents were equally informed about both. Results demonstrate the need for further investigations to get a better understanding about the associations between adolescents’ mental health conditions and familiar knowledge about health. Studies based on parental and adolescents’ HL give a broad range of information, whereas evidence about a direct comparison of parental and adolescents’ HL is lacking. Pandemic-related research identified association between mental health and HL [19] for vulnerable subgroups and emphasized the important and increasing role of school interventions. Thus, post-pandemic evidence about the relations between adolescents ’mental health and families’ HL needs detailed investigations to give indications for future school intervention planning in high income countries

The European concept defining and measuring self-reported HL for adults [HLS-EU] [11, 20] is available in German [21, 22] and Italian language [23, 24]. Findings in Italy suggested that inadequate HL is a prevailing problem, and HL was found to be a mediator on the effect of socio-economic status, associated with female gender, higher educational status, younger age and not foreign nationality [25-27]. In Germany, a social gradient was observed [21], and actual longitudinal data of the Robert Koch Institute [28] show that after the COVID-19 pandemic about 80% of the adult population in Germany had a low HL.

The HL of adolescents has been investigated in many countries through the HBSC studies [29]. Generally, [30] shows that slightly more students had a low HL in 2022 (24.4%) than in 2017/18 (21.4 %). There were found differences in HL according to gender, age, type of school, and family affluence (FAS). Low HL was associated with a high psychosomatic burden. Italian students [27] reported the lowest levels of HL compared with other countries. School connectedness and educational approach were the most relevant associated factors underscoring the school's role in reducing inequalities and

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promoting health. for adolescents in Italy. Understanding the mechanisms and associates of HL is vital to find adequate strategies in developing school-based HL programs [31].

In South Tyrol the question about HL assumes a new dimension when asking for the health competency of young people in a mixed cultural context. While the healthcare system is managed according to the rules of the Italian-wide policies, the mainly spoken language driving information seek behavior is German [32]. While it is known that there exist differences in HL between different countries [21, 29], there doesn't exist evidence about the HL of different language groups within one healthcare system. The aim of this study is to contribute to this knowledge gap addressing two important issues. First, cultural differences and special needs of the two language groups may be addressed differently when developing strategies to improve HL in the population. Thus, exact knowledge of cultural differences in HL between language groups is of big interest. Second, existing known countries' differences in people's HL may be due to different healthcare systems and may exhibit other patterns when two languages coexist within one system. The bilingual setting of South Tyrol offers the unique opportunity to contribute to a broader understanding of self-reported HL using established questionnaires in German and Italian versions within one healthcare system. According to the Italian school system, questionnaires were distributed to parents of children aged between 6 and 19 years. Parent- and self-reports of adolescents between 11 and 19, going to lower and higher secondary school were investigated in this study. Parents' reports of children from elementary school (aged 6 to 10) were investigated separately [33].

Evidence suggests that a comprehensive approach targeting HL is needed when addressing mental health intervention programs for adolescents. It is not enough to focus on special themes of HL [34]. Detailed studies on familiar HL literacy and adolescents' mental health are rare. Recent studies show that adolescents' wellbeing is associated with adolescents' HL as well as with familiar social support [12] and that adolescents' and parental mental HL is linked to adolescents' mental health with differences between generations' perspectives [35]. Our study offers the unique opportunity to investigate parental and adolescents' HL using standardized and validated HL questionnaires in German and Italian language and to associate results with mental health screening data of the same cohort in a post pandemic sample.

The fourth cross-sectional COP-S (Corona and Psyche South Tyrol) study [9, 10] relates population-based post pandemic mental health screening data of students to HL outcomes of parents and adolescents using standardized and validated questionnaires in German and Italian language within one unique healthcare system.

The aims of this study were to explore the associations of parental and adolescents' HL with adolescents' mental health conditions and to identify vulnerable subgroups for targeted interventions in a bilingual context.

2. Materials and Methods

This population-based cross-sectional online survey was conducted between 17 March and 13 April 2025 using the SoSci Survey platform (Version 3.2.46, Munich, Germany). The survey was repeated for the fourth time after 2021, 2022 and 2023 named Corona and Psyche South Tyrol (COP-S) [9, 10]. It aimed to screen the mental health of children and adolescents in South Tyrol during and after the pandemic. The fourth wave of the study additionally collected comprehensive data on HL among children and adolescents Recruitment was carried out through all provincial schools by contacting parents via email, sending a link to the anonymous questionnaire. Parents of children and adolescents between 6 and 19 years were invited to complete a questionnaire. Additionally, adolescents between 11 and 19 years were invited to complete a self-report after their parents had completed the parent version. A reminder email followed after two weeks. Informed consent was obtained online from parents and adolescents prior to participation. More than 40,000 families were invited to participate. Parents completed the parent version followed by adolescents filling out their self-report form.

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The COP-S survey was designed following the German COPSY studies [7, 36] and was adapted for the post pandemic time and for South Tyrolean needs. In this study, parent-reports regard parent-reported data, self-reports regard the self-reported data of adolescents The study focused on data from adolescents aged from 11 to 19 participants, while data of participants aged 6 to 10 were analyzed separately [33]. Out of the 7,818 available datasets from 6 to 19 years, 4,496 regarded participants aged 11 to 19. Parent- and adolescent reports were analyzed and compared.

The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the Autonomous Province of Bolzano, Italy (protocol code 11-2025, 19 February 2025).

2.1. Assessment of Parental and Adolescent HL

Self-assessed adolescent HL was measured using the HL for School-Aged Children (HLSAC) 10-item scale [27, 37] with responses ranging from 1= not at all to 4= completely. The total sum score ranged between 10 and 40, with a lower score indicating lower HL. The scores were categorized as low (10-25), moderate (26-35), or high (36-40). Scores were calculated when all 10 questions were answered. The group of uncomplete answers (1 to 9 answers available) was defined as "missing" category and was analyzed in the last subsection of the results.

Self-assessed parental HL was measured using the HLS-EU-Q16 questionnaire [22, 24, 38, 39]. The total score ranged from 0 to 16 with higher scores indicating better HL with a Cronbach's alpha of 0.799 for the Italian [24] and of 0.88 for the German [22] versions. Three levels of HL were defined: inadequate (0–8), problematic (9–12), and adequate (13–16). Scores were calculated when at least 14 of the 16 questions were answered [24]. The group of uncomplete answers (1 to 13 answers available) was defined as "missing" category. The "missing" category was analyzed in the last subsection of the results.

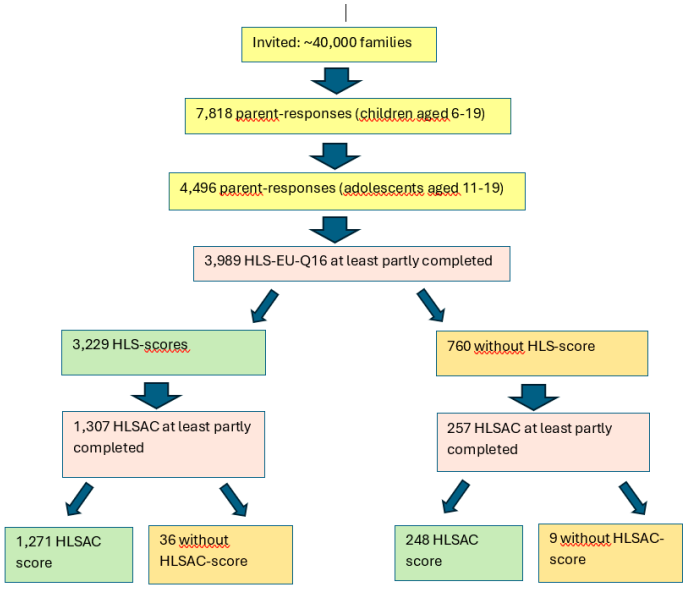

Figure 1. Data sets for sum score calculations for HLS-EU-Q16 and HLSAC; yellow: total data sets in the survey; brown: data sets with partially or totally completed HL questions; green: data sets with valid HL-scores (HLS-EU-Q16: 14-16 answers available; HLSAC: 10 answers available); orang: data sets without valid HL scores (HLS-EU-Q16: 1-13 answers available; HLSAC: 1-19 answers available).

Figure 1 illustrates how data distributed among available and not available HL scores. Out of the available datasets, 3,989 (88.7%) were at least partially completed regarding HLS-EU-Q16 score, while 507 (12.3%) participants aborted the survey without completing any HLS-EU-Q16 question. These 12.3% were not used for the analysis. 760 (19.1%) cases were not appropriate to calculate the sum score (only 1-13 answers available). Out of the 3,989 parent reports, 1,564 self-reports of

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adolescents with at least partially completed HLSAC data were available, with 45 (2.9%) cases not appropriate for sum score calculations (only partially completed).

2.2. Sociodemographic Variables

The sociodemographic variables included age and gender of both parents and children, parental educational level assessed via the CASMIN index [40], single parenthood status, residency based on zip codes, and migration background.

Perceived social support was measured using the Multidimensional Scale of Perceived Social Support (MSPSS) [41], reported by parents and adolescents, and family socioeconomic status was measured with the Family Affluence Scale III (FAS III) [42-[45] from parent's report. The FAS III scale is a validated six-item measure of material assets and family living conditions like number of cars, bathrooms, own bedrooms and family holidays.

2.2.3. Mental Health Measures

Self-reported adolescent problematic Internet use was assessed using the German [46] and Italian [47] versions of the Generalized Problematic Internet Use Scale 2 (GPIUS-2) [48].

The Health Behavior in School-aged Children Symptom Checklist (HBSC-SCL) was employed to assess parent- and self-reported psychosomatic complaints. It identified eight psychosomatic problems during the past week: headache, stomachache, backache, feeling down, irritability, feeling nervous, sleep problems, and dizziness. Responses were recorded on a 5-point scale ranging from 1 = "daily" to 5 = "not at all" [49, 50]. The number of different complaints per week was assessed as count data ranging from 0 to 8.

The parent- and self-reported SDQ (Strength and difficulties questionnaire) [51] assessed the mental well-being of adolescents across five dimensions: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior. The total problem score was calculated from the first four subscales (excluding prosocial behavior) and ranged from 0 to 40, with higher scores indicating greater difficulties.

Self-reported Screen of Child Anxiety Related Emotional Disorders (SCARED): The Generalized Anxiety Disorder (GAD-9) subscale asked nine questions, such as "I worry about other people liking me". It uses a 3-point response scale (0, "not or hardly true" to 2, "very or often true"). The total score ranged from 0 to 18, with higher scores indicating more problems. Good validity and reliability of the GAD-9 subscale have been demonstrated in adolescent populations [52-54].

Self-reported Patient Health Questionnaire-2 (PHQ-2): The questionnaire asked two questions regarding depression on a 4-point Likert scale (from 0, "nearly never" to 3, "nearly every day"). It is recommended for adolescents aged 12 years and older and has been validated for the corresponding cultural background [55, 56]. The total score ranged from 0 to 6, with higher values indicating more problems.

2.3. Data Analysis

The primary outcome variables were HLS-EU-Q16 and HLSAC-scores.

Descriptive statistics for continuous variables were calculated as means (M) with standard deviations (SD); nominal or categorical variables were presented as absolute counts and percentages. Group differences for two groups were tested using chi-square tests for nominal and categorical variables (effect size: Phi) and Mann–Whitney tests for non-normally distributed continuous variables (effect size according to [57] with small effect size ranging from 0.10-0.29; medium effect size from 0.30-0.49 and large effect size>=0.5). The Kruskal Wallis test was applied to compare three or more groups (effect size eta-squared with small effect size from 0.01-0.06; medium effect size:0.06-<0.14; large effect size>=0.14). Pairwise post hoc tests were performed using the Bonferroni correction. Distributions of metric variables were visualized using Box plots.

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Associations between nominal or ordinal variables were measured using Cramer's V, between dichotomous and continuous variables we used point-biserial correlation, and for continuous variables Spearman's correlation coefficient was applied.

Jeffreys' binomial confidence intervals were calculated for proportions. p–values < 0.001 are indicated with ***, < 0.01 with **, < 0.05, *, and p-values ≥ 0.05 are considered non-significant (n.s.). All statistical analyses were performed using SPSS version 27.0.0.0.

Linear regression analysis was calculated for the outcomes HLS-EU-Q16 scores and HLSAC scores. Beta coefficients with 95%-confidence intervals (CI), standardized beta coefficients and p-values were reported for each independent variable. Corrected R^2 was reported to account for model fit. Regression diagnostics checked for independence and normality of residuals, homoscedasticity and multicollinearity (Variance inflation factor VIF). Outliers were identified using centered leverage points.

One of our interests was to get indications of what may happen when establishing HL programs at schools with special focus on young people having a lower MSPSS or higher digital media use. A moderated mediation model was implemented to explore the mediating role of HLS-EU-Q16 and HLSAC on the association of the two different predictors MSPSS score and GPIUS-2 score with mental health outcomes using language as moderator. Due to the cross- sectional character of the data, the modelling approach has an explorative character. According to [58], we have chosen this approach, since in future time dependent modelling approaches are planned, with the aim to introduce HL programs at school with focus on vulnerable subgroups. Even if temporal ordering in a cross-sectional dataset is not given, we may get an idea on how HL as a mediator may act in a future longitudinal data set. Our approach followed [59].

Modelling was performed using the SPSS macro "PROCESS", employing Model 4 and Model 14. The theoretical models are visualized in Figure 2.

Mediation Model Overview

Independent variables were selected based on significant associations with the dependent mental health variables. HLS-EU-Q16 score and HLSAC score were incorporated as mediators when they exhibited significant associations with both the independent variables and the outcome.

A mediation model was established based on the following requirements:

- Predictors must show significant associations with the outcome
- Predictors must also show significant associations with the mediator.
- Both predictors and mediator significantly predict the dependent variable in a regression model.

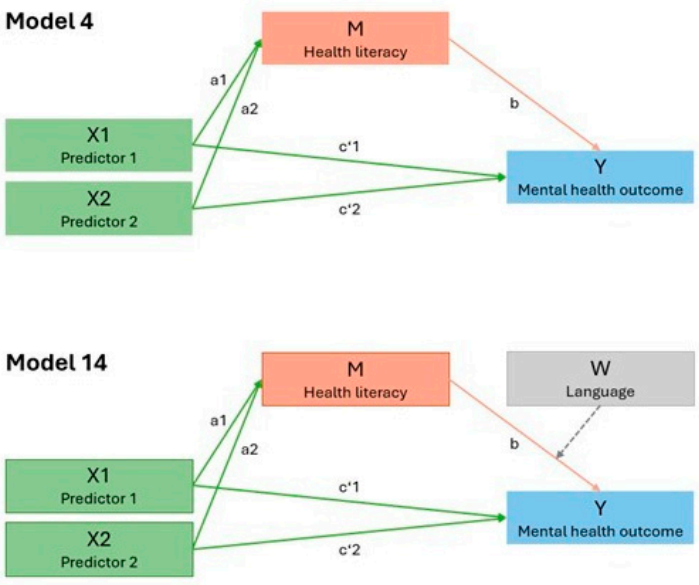

Figure 2. Upper panel (A): Mediation model 4 (SPSS PROCESS macro). The total effect c of the independent predictors X1 and X2 on the outcome Y is modelled as c1 = c1'+ a1* b1 and c1 = c1'+ a1* b1, with c1' the

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direct effect of the independent predictor X1 and c_2 the direct effect of the independent predictor X_2 on Y, a the effect of X on the mediator M, and b the effect of the mediator M on outcome Y; lower panel (B): Mediation model 14 with predictors X_1 and X_2 , Mediator M and outcome Y as before, with additional Moderator W (language) moderating the effect of the mediator on the outcome.

3. Results

Among the 4,496 available parent-reports of adolescents between 11 and 19 years, 3,989 filled in at least one of the 16 HLS-EU-Q16 questions. Out of them, 7.3% had an inadequate, 18.8% a problematic, 54.8% an adequate HL and 19.1% were incomplete and thus, were coded as missing. Thus, of the 3,229 complete cases, 9.0% had an inadequate, 23.2% a problematic and 67.7% an adequate HL.

Of the 2,030 adolescent-reported cases (self-reports), 1,570 adolescents filled in at least one of the 10 HLSAC questions. Out of them, 10.7% had a low, 64.6% a middle, 21.8% a high HL and 2.9% were incomplete and thus, coded as missing. Thus, of the 1,525 complete cases, 11.0% had a low, 66.6% a medium and 22.4% a high HL.

Parental HL was measured in 2,649 (82.0%) German questionnaires and in 580 (18.0%) Italian questionnaires. Self-reported adolescents' HL was reported in 1,296 (85%) German and in 229 (15%) Italian questionnaires.

3.1. Demographic and Socioeconomic Characteristics of the Dataset

Among the 3,229 parents, participants were predominantly (88.7%) female, and the mean age was 47.6+-5.7 years. 12.7% were single parents, 30.8% were urban residents and 9.7% had migration backgrounds. Regarding FAS III, 15.8% reported low socioeconomic status, 56.2% middle and 28.0% high. The parent-reported MSPSS score was categorized low in 14.0%, moderate in 13.5% and high in 72.6% of cases.

According to the CASMIN index, 16.8% of the families had a low, 40.1% a middle and 43.1% a high parental educational attainment For paired samples (if available), the educational level of the parent who completed the questionnaire was significantly higher than the educational level of the second parent who did not complete the questionnaire (Phi=0.603; p<0.001). Among the completing parents, 4.0% had a primary school degree, 21.7% a vocational school degree, 35.1% a high school degree and 37.0% a university degree and 2.1% had a degree from abroad. In contrast, among the partners (not completing parent, if available), 10.3% had a primary school degree, 40.0% a vocational school degree, 25.6% a high school degree and 22.3% a university degree and 1.7% had a degree from abroad.

According to parent reports 49.9% of the children were female and the overall mean age was 14.5 +-2.4.

Among 1,525 self-reporting adolescents, the mean age was 14.4+-2.3, 49.8% were female, 11.6% came from a single parent household, 28.8% were urban residents, 8.6% had migration background, 6.8% stated a low, 10.9% a moderate and 82.3% a high self- reported MSPSS, 17.4% had a low, 56.6% a middle and 26.0% a high FAS III. Regarding parental education, 18.9% come from families with low, 42.0% with medium and 39.0% with high CASMIN index.

The following demographic variables differed for German and Italian survey language: urban residency (Ger: 21.9 vs. Ita: 71.6%; Phi=0.413; p<0.001), migration background (Ger: 8.7% vs. Ita: 14.5%; Phi=0.075; p<0.001), CASMIN (Ger: 18.1% low; 41.0% medium; 40.9% high vs. Ita: 10.8% low; 36.2% medium; 53.0% high; Phi=0.103; p<0.001), FAS III (Ger: 14.8% low; 57.3% middle; 27.9% high vs. Ita: 20.6% low; 51.3% medium; 28.1% high; PHI=0.064; p=0.001), parental MSPSS (Ger: 15.2% low; 12.6% moderate; 72.3% high vs. Ita: 8.3% low; 17.8% moderate; 73.9% high; Phi=0.089; p<0.001), adolescent's gender (Ger: 51.5% males vs. Ita: 45.3% males; Phi=0.044; p=0.012) and single parenthood (Ger: 11.7% vs. Ita: 17.5%; Phi=0.067; p<0.001). No difference was found for self-reported MSPSS categories.

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3.2. HL Categories for German- and Italian-Speaking Families

Analyses of categorized HL are presented in figure 3. There were 2,649 (82.0%) German and 580 (18.0%) Italian cases available. 9.4% [8.4%;10.6%] of the German participants resulted to have an inadequate, 23.0% [21.4%;24.6%] a problematic and 67.6% [65.8%;69.4%] an adequate HL, while 7.2% [5.3%;9.6%] of the Italian participants had an inadequate, 24.5% [21.1%;28.1%] a problematic and 68.3% [64.4%;72.0%] an adequate HL. There was no significant difference between languages. For German adolescents, 10.6% [9.0%;12.3%] reported a low, 65.7% [63.0%;68.2%] a middle and 23.8% [21.5%;26.1%] a high HL. Italian adolescents reported low HL in 13.5% [9.6%;18.4%], 71.6% [65.5%;77.2%] reported middle HL and 14.8% [10.7%;19.9%] high HL. There was a significant difference between languages (effect size=0.091; p=0.009).

Cramer's V for parent- and self- reported HL categories was 0.159 (p<0.001) for German questionnaires and 0.166 (p=0.021) for Italian questionnaires. Figure 3 (lower panel) shows the distribution of adolescents' HL categories among parental HL categories.

3.3. HLS-EU-Q16 and HLSAC Scores and Associations to Demographic Variables

HLS-EU-Q16 score did not significantly differ between German (13.17+-3.12) and Italian (13.3+-2.94) language. HLSAC score differed significantly between German (32.01+-5.11) and Italian (30.61+-4.80) language (effect size=0.091; p<0.001). Parental and adolescents' HL scores correlated positively (German: 0.238; p<0.001; Italian: 0.189; p<0.001) according to Spearman's correlation coefficient.

Figure 4 shows the HLS-EU-Q16 scores with Bonferroni corrected significant post hoc differences for demographic factors, and Figure 5 shows the same for HLSAC scores. Urban residents had a significantly higher HLS-EU-Q16 score than rural residents (effect size=0.081; p<0.001) and single parents had significantly lower HLS-EU-Q16 scores than not single parents (effect size=0.035; p<0.045).

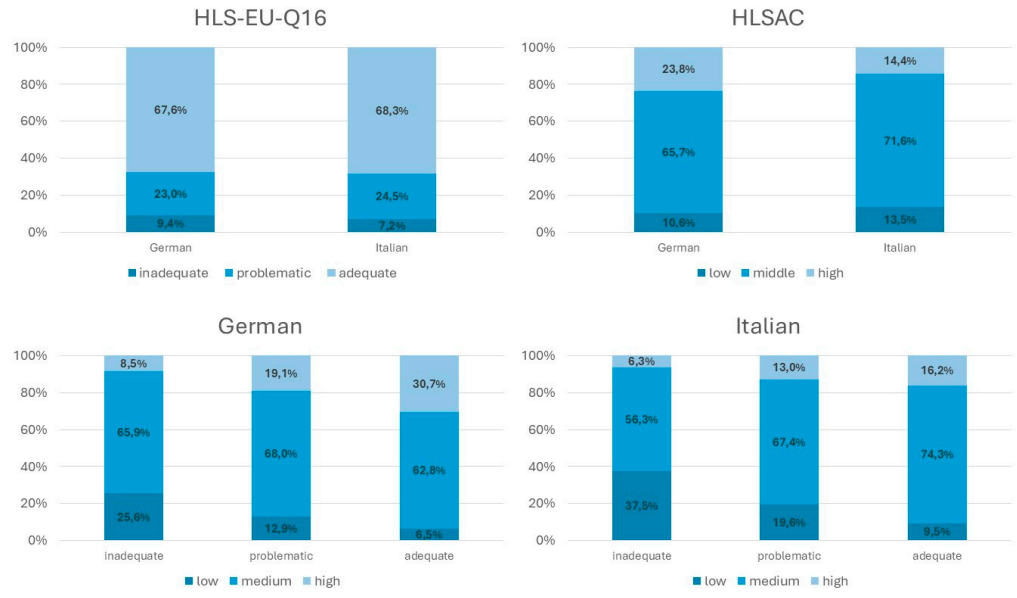

Figure 3. upper panel: HL categories for parents (HLS-EU-Q16) and adolescents (HLSAC) per for German and Italian questionnaires; lower panel: adolescents' HL (HLSAC; y-axis) categories per parental HL (HLS-EU-Q16; x-axis) categories for German and Italian questionnaires.

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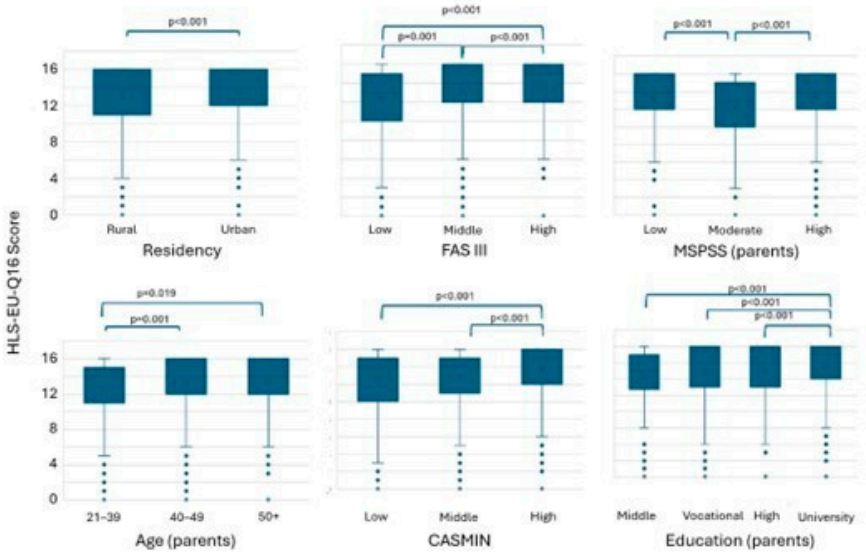

Figure 4. HLS-EU-Q16 score and its associations to demographic variables, p-values refer to Man Whitney tests for two groups and Bonferroni corrected post-hoc tests of Kruskal Wallis test for more than two groups.

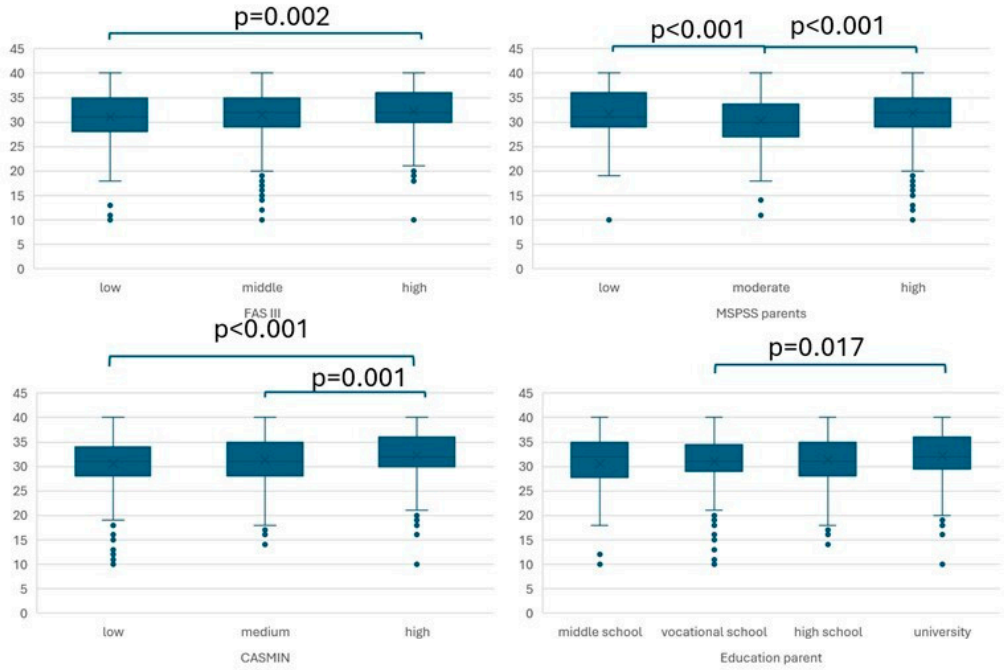

Figure 5. HLSAC score and its associations to demographic variables, p-values refer to Man Whitney tests for two groups and Bonferroni corrected post-hoc tests of Kruskal Wallis test for more than two groups.

HLS-EU_Q-16 differed significantly between parental age groups (effect size=0.004;p<0.001), HLS-EU-16 and HLSAC differed significantly between MSPSS categories (effect sizes=0.019 and 0.001; resp; p<0.001, both) with lowest values in the moderate group and FAS III categories (HLS-EU-Q16: effect size=0.016; p<0.001; HLSAC: effect size=0.004; p=0.016) with higher scores in higher socioeconomic classes. HLS-EU-Q16 (effect size=0.023; p<0.001) and HLSAC (effect size=0.013; p<0.001) differed significantly between CASMIN index categories with higher scores in the highest

 doi:10.20944/preprints202605.0813.v1

educated group. HLS-EU-Q16 was not associated with parent's gender and migration background. HLSAC was not associated with adolescent's gender, migration background, single parenthood and residency.

Since CASMIN index and parental education of the parent who filled in the questionnaire were highly correlated (0.880; p<0.001), further analyses were conducted only for CASMIN index.

3.4. Mental Health Outcomes and Their Associations to HL and Language

The correlations of metric adolescent's mental health outcomes, GPIUS-2 scores and MSPSS scores reported by parents and adolescents with parental HLS-EU-Q16 score, adolescents HLSAC scores and questionnaire language are reported in Table 1. There was no significant correlation of mental health outcomes with German and Italian questionnaire language, despite for number of psychosomatic complaints in parent and self-reports and parent reported MSPSS score.

Higher self- and parent- reported mental health scores and higher GPIUS-2 scores were negatively related to parental and adolescents HL, while higher MSPSS scores were related positively to parental and adolescents' HL. Relations of self-reported mental health scores were stronger with self-reported HLSAC than with parent-reported HLS-EU-Q16 scores.

Table 1. Correlations of adolescents' mental health outcomes with HLS-EU-Q16, HLSAC and questionnaire language.

Self-reports	**HLS-EU-Q16**		**HLSAC**		**Language (German=1; Italian=0)**	
	Spearman	p-value	Spearman	p-value	Point-Biserial	p-value
SDQ	-0.144	<0.001	-0.291	<0.001		n.s.
PHQ-2	-0.126	<0.001	-0.157	<0.001		n.s.
SCARED	-0.107	<0.001	-0.173	<0.001		n.s.
Number of psychosomatic complaints	-0.120	<0.001	-0.177	<0.001	-0.078	0.002
MSPSS	0.115	<0.001	0.237	<0.001		n.s.
GPIUS-2	-0.155	<0.001	-0.234	<0.001		n.s.
Parent reports	HLS score		HLSAC score		Language (German=1; Italian=0)	
	Spearman	p-value	Spearman	p-value	Point-Biserial	p-value
SDQ	-0.221	<0.001	-0.275	<0.001		n.s.
Number of psychosomatic complaints	-0.200	<0.001	-0.158	<0.001	-0.061	<0.001
MSPSS	0.170	<0.001	0.159	<0.001	-0.038	0.024

3.5. The Mediation Models

Mediation modelling was performed to explore effects between HL scores, mental health outcomes and further predictors. For modelling a mediation model with mental health outcomes as dependent variable and HLS-EU-Q16 or HLSAC as mediator, the mediator must exhibit significant relations to both the predictors and the outcome.

3.5.1. Possible Predictors

It was shown in section 3.3. and 3.4., that the significant association statement holds for metric predictors MSPSS, GPIUS-2. For nominal or ordinal predictors, HLS-EU-Q16 score was associated significantly with FAS III category, residency, parental age group and CASMIN index, while HLSAC was related significantly to FAS III category, language and CASMIN index. Both HL measures were

 doi:10.20944/preprints202605.0813.v1

related positively to all metric outcomes, thus, PHQ-2 score, SDQ score (parent- and self-reported), SCARED GAD-9 score and number of psychosomatic problems (parent- and self-reported).

Further, the identified predictor must be associated with mental health outcomes. This holds for the following predictors:

For self-reports, GPIUS-2 total score was related to self-reported SDQ total score (0.507; p<0.001), PHQ-2 score (0.419; p<0.001), SCARED Score (0.405; p<0.001) and self-reported number of psychosomatic complaints (0.402; p<0.001).

Self-reported MSPSS score was related to SDQ score (-0.367; p<0.001), PHQ-2 score (-0.306; p<0.001), SCARED score (-0.251; p<0.001) and number of psychosomatic complaints (-0.290; p<0.001), GPIUS-2 score (-0.114; p<0.001).

Parent-reported MSPSS score was related to parent-reported SDQ score (-0.259; p<0.001), and parent-reported number of psychosomatic complaints (-0.172; p<0.001). FAS III category was related to parent-reported SDQ score (-0.071; p<0.001) and parent reported number of psychosomatic complaints (-0.058; p=0.003).

CASMIN index was related to parent-reported SDQ score (-0.080; p<0.001). Residency was not related to any of the mental health outcomes. Parental age group was related to SCARED GAD-9 (0.058; p=0.025), PHQ-2 (0.062; p=0.026), self-reported number of psychosomatic complaints (0.076;0.004). Finally, as shown in Table 1, language was related to number of psychosomatic complaints in self-reports (even in parent reports), but there was no relation to HLS-EU-Q16 score.

3.5.2. Regression Analysis for HLS-EU-Q16 and HLSAC

Regression analysis controlling for confounders was performed for HLS-EU-Q16 score and HLSAC score. Results are presented in Table 2. For HLS-EU-Q16 higher MSPSS (p=0.006) score was significantly related to higher HLS_EU-Q16 score as well as low (p=0.017) and medium (p<0.001) CASMIN index (CASMIN high used as baseline). The overall model (F=6.606; p<0.001) with corrected R^2=0.017. All VIF-values were <1.2. Residuals centered around 0 but were slightly right skewed. Centered leverage points analyses returned some outliers, but recalculation of the models leaving them away confirmed the former results. Finally, we added self-reported GPIUS-2 score to the model. The variable was significant, with the former variables remaining significant as well. The overall model (F=6.523; p<0.001) with corrected R^2=0.042 remained stable and did not change. Results are not presented in Table 2 due to the length of the paper.

For HLSAC, higher MSPSS (p<0.001), German language (p=0.003), higher children's age (<0.001) and lower GPIUS-2 (<0.001) were associated to higher HLSAC score, while low (p<0.001) and medium (0.026) CASMIN index were associated with lower HLSAC score. The overall model (F=16.43; p<0.001) with corrected R^2=0.86; VIF was <1.3 for all independent variables. Residuals were centered around 0 with quite randomly distributed variance and the normal PP-Plot showed that residuals clustered around the line. Centered leverage points analyses returned some outliers. Recalculation of the models leaving them away confirmed the former results.

Table 2. Coefficients and standardized coefficients of linear regression analysis for HLS-EU-Q16 score and HLSAC score as dependent variables.

	Variables	beta	standardized beta	p-value
HLS-EU-Q16	Constant	13.27 [12.53;14.02]		<0.001
	CASMIN low	-0.30 [-0.55;-0.05]	-0.051	0.017
	CASMIN medium	-0.42 [-0.60;-0.24]	-0.098	<0.001
	FAS low	-0.18 [-0.43;0.07]	-0.029	0.161
	FAS high	0.13 [-0.05;0.31]	0.028	0.168
	MSPSS	0.06 [0.02;0.11]	0.054	0.006
	Single parenthood	-0.04 [-0.30;0.22]	-0.006	0.767
	Parental age	0.01 [-0.01;0.02]	0.025	0.2

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	Residency	0.13 [-0.05;0.30]	0.028	0.162
HLSAC	Constant	27.70 [25.53;29.88]		<0.001
	CASMIN low	-1.60 [-2.35;-0.85]	-0.12	<0.001
	CASMIN medium	-0.66 [-1.23;-0.08]	-0.06	0.026
	FAS III low	-0.22 [-0.96;0.52]	-0.02	0.558
	FAS III high	0.17 [-0.43;0.78]	0.016	0.573
	GPIUS-2 score	-0.06 [-0.07;-0.04]	-0.222	<0.001
	Age	0.26 [0.15;0.38]	0.122	<0.001
	German language	1.11 [0.39;1.83]	0.08	0.003
	MSPSS score	0.37 [0.18;0.55]	0.102	<0.001

3.5.3. Results of Mediation Modelling

For the strongest associates of mental health outcomes MSPSS and GPIUS-2, we applied mediation model 4, modelling the associations of these two predictors with different mental health outcomes using HL as mediator. Self-reported predictors were related to self-reported outcomes, the same holds for parent-reported data when possible. Parent-reported HL was used as mediator for both parent- and self-reported data, while self-reported HL was used as mediator for self-reported data. Additionally, language was introduced as a mediator for the self-reported outcome "number of psychosomatic complaints" and as moderator on the effect of HLSAC on the self-reported outcome "number of psychosomatic complaints", using model 14.

Significant results of the models are presented in Table 3. For the outcome self-reported SDQ, MSPSS ($p<0.001$) and GPIUS-2 ($p<0.001$)2 resulted as significant direct associates. In both mediation paths, MSPSS ($p<0.001$) and GIUS-2 ($p<0.001$) were associated significantly with HLSAC and HLSAC was associated significantly with SDQ ($p<0.001$). Model coefficients are presented in Table 3. HL accounted for about 10% of the total relationship between MSPSS and self-reported SDQ. and for about 6% of the relationship between GPIUS-2 and self-reported SDQ. Modelling the same model using parental HLS-EU-Q16, the mediator was not significant, thus, results are not reported.

For SCARED (GAD-9), MSPSS ($p<0.001$) and GPIUS-2 ($p<0.001$) were directly related to the outcome. There was a significant indirect association represented by the associations of HLSAC with GPIUS ($p<0.001$), MSPSS ($p<0.001$) and the outcome ($p=0.02$). Coefficients are presented in Table 3. HLSAC accounted for about 7% of the relationship between self-reported SCARED-GAD-9 score and MSPSS and for about 3% of the relationship between self-reported SCARED-GAD-9 score and GPIUS-2 were due to the mediating role of HLSAC. Modelling the same model using parental HLS-EU-Q16, no significant mediating role was found.

For self-reported PHQ-2 score, the relation between HLSAC and PHQ-2 score did not result significant and thus, no mediating role of HLSAC was detected. The same holds for HLS-EU-Q16.

The outcome "number of psychosomatic complaints" was directly related to MSPSS ($p<0.001$) and GPIUS-2 ($p<0.001$). There was a significant indirect association represented by the associations of HLSAC with GPIUS-2 ($p<0.001$), MSPSS ($p<0.001$) and the outcome ($p=0.004$). Coefficients are presented in table 3. HLSAC accounted for about 6% of the relationship between self-reported number of psychosomatic complaints and MSPSS and for about 4% of the relationship between self-reported number of psychosomatic complaints and GPIUS-2.

Application of model 14, with language as moderator on the association of HLSAC with the outcome did not have a significant effect, thus results are not reported in detail. Application of model 4 with 3 independent variables (self-reported MSPSS, GPIUS-2, language) and HLSAC as mediator, returned a significant role of German language (dichotomous). The direct association with the outcome was significant ($p=0.021$) as well as the indirect association with HLSAC ($p=0.013$). All other p-values remained the same. HLSAC accounted for about 7% of the relationship between language and outcome. Coefficients are presented in Table 3.

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Table 3. Mediation models 4 with mediator M= HLS-EU-Q16 for parent-reported and M=HLSAC for self-reported mental health outcomes, Y= SDQ (self + parent)/SCARED,/PHQ-2,/psychosomatic complaints (self + parent), with two independent predictors X1=MSPSS score and X2=GPIUS-2 score.

SELF	***c1′***	***c2′***	***c1***	***c2***	***a1*b***	***%***	***a2*b***	***%***
y=SDQ	-0,697	0,133	-0,770	0,143	-0,074	10	0,009	6
y=SCARED	-0,301	0,088	-0,325	0,091	-0,024	7	0,003	3
*y=npc**	-0,230	0,041	-0,245	0,043	-0,015	6	0,002	4
y=npc with a3=German language*	-0.237	0.041	-0.252	0.043	-0.015	6	0.002	4
	c′3		c3		a3*b	%		
	-0.400		-0.424		-0.029	7		
PARENT	*c1′*	*c2′*	*c1*	*c2*	*a1*b*	*%*	*a2*b*	*%*
y=SDQ	-0,404	0,099	-0,450	0,105	-0,046	10	0,006	6
*y=npc**	-0,1451	0,025	-0,161	0,027	-0,016	10	0,002	7

**number of psychosomatic complaints.*

For parent-reported SDQ, table 3 shows that the outcome was directly related to self-reported GPIUS-2 ($p<0.001$) and parent reported MSPSS ($p<0.001$). There was a significant indirect association represented by the associations of HLS-EU-Q16 with GPIUS-2 ($p<0.001$), MSPSS ($p=0.007$) and the outcome ($p<0.001$). HLS-EU-Q16 accounted for about 10% of the relationship between parent-reported SDQ and parent-reported MSPSS and for about 6% of the relationship between parent-reported SDQ and self-reported GPIUS-2.

For parent reported "number of psychosomatic complaints", table 3 shows that the outcome was directly related to self-reported GPIUS-2 ($p<0.001$) and parent reported MSPSS ($p<0.001$). There was a significant indirect association represented by the association of HLS-EU-Q16 with GPIUS-2 ($p<0.001$), MSPSS ($p=0.002$) and the outcome ($p<0.001$). HLS-EU-Q16 accounted for about 10% of the relationship between parent-reported number of psychosomatic complaints and parent-reported MSPSS and for about 7% of the relationship between parent-reported number of psychosomatic complaints and self-reported GPIUS-2.

Recalculation of the model using parent-reported MSPSS as single mediator, returned HLS-EU-Q16 to account for about 11% of the relationship between MSPSS and parent-reported SDQ and about 11% of the relationship between parent-reported number of psychosomatic complaints and MSPSS.

3.6. Participants with Missing Parental HL Score

The distribution of categorized HL data, including missing HL data sets among German parents was as follows: 7.5% [6.7%;8.4%] reported an inadequate HL, 18.3% [17.0%;19.6%] a problematic HL, 53.8% [52.1%;55.5%] an adequate HL and for 20.4% [19.0%;21.8%] some answers were missing. Among Italian parents 6.3% [4.7%;8.4%] reported an inadequate, 21.5% [18.5%;24.7%] a problematic and 59.8% [56.0%;63.5%] an adequate HL, while 12.4% [10.0%;15.1%] were coded as missing. The difference between the two language groups was significant (Phi=0.081; $p<0.001$). Self-reported adolescents' HL was low in 10.3% [8.7%;12.0%] of the German cases, middle in 63.8% [61.2%;66.4%] and high in 23.1% [20.9%;25.4%] with 2.8% [2.0%;3.8%] missing. For Italian questionnaires, there were found 13.1% [9.2%;17.8%] of low, 69.2% [63.1%;74.8%] of middle and 14.3% [10.3%;19.2%] of high HL with 3.4% [1.6%;6.3%] missing. The difference between the two language groups was significant (Phi=0.020; $p=0.021$).

Finally, we are interested in whether the group of participants with more than two missing answers regarding parental HL (19.1%), resulting in a missing score, differs significantly from the group of parents with available HL score. Significant results are presented after Bonferroni correction for 13 tests ($p<0.05/13=0.00385$ significant). Despite the language, we found significant higher percentage of missing cases in families with lower CASMIN index (low: 26.6%; medium: 21.3%;

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high:12.8%; p<0.001), parental age group (21-39: 23.3%; 40-49: 20.1%; 50+: 16.5%; p=0.003), and families having a lower FAS III (low: 23.8%; medium:19.2%; high: 15.4%; p<0.001). No significant differences were found for single parenthood, migration background and parental gender.

Regarding metric variables, significant results are presented after Bonferroni correction for 13 tests (p<0.05/9=0.0056 significant). The two groups differed significantly for parent-reported MSPSS score with lower MSPSS score in the not missing group (effect size=0,062; p<0.001) and PHQ-2 score (effect size=0,078; p=0.002). No significant differences were found for self- reported MSPSS score, GPIUS-2 score, self- and parent reported number of psychosomatic complaints, SCARED GAD-9 score and self- and parent-reported SDQ total score.

4. Discussion

The study comprehensively examined parental and adolescents' HL and its association with youths' mental health conditions in a bilingual region. It aimed to contribute to the existing evidence gaps regarding the comparison of the associations of parent- and self-reported HL with adolescent's mental health conditions. First finding is that adolescent's HL is related to survey language with better results for the German language, while parental HL was not related to language. Second, adolescents' and parental HL were associated with adolescents' mental health conditions with higher associations of adolescents' than of parental HL. Additionally, social support and problematic internet use were related to both mental health conditions and parent- and self-reported HL. Mediation modelling found that self-reported HL accounted partially for the relation of self-reported mental health conditions with MSPSS and GPIUS-2. Further, it accounted partially for the relation of the number of self-reported psychosomatic complaints with language.

4.1. Parental and Adolescents' HL

In South Tyrol, parent-reported HL was found to be adequate in more than 50% of participating parents with a very high rate of not evaluable cases. A similar study in Germany [60] confirms our results, showing a similar rate of parents having an adequate HL. Positive relations between better HL and higher parental age as well as higher socioeconomic status, including educational level, confirm our results.

The large number of questionnaires which were not completed is not found in similar studies outside the region but was even found in former investigations in South Tyrol [61]. This may introduce bias, especially since missing data correlates with lower parent-reported social support (MSPSS). This bias could lead to an underestimation or overestimation of HL's mediating role in adolescent mental health conditions.

In Italy [24, 62], adults' HL was measured in a comparable sample regarding age and educational level. While only 33% had an adequate HLS-EU-Q16 score, about 60% had high HL when using the Newest Vital Sign (NVS- IT) questionnaire. Authors found that higher educational level, higher age class and better financial resources were significantly associated with higher HL skills. Since our results show a positive relation of parental HL to older age, higher FAS III and higher CASMIN index, parent-reported HL in South Tyrol aligns with HL in similar middle European cultural locations.

Adolescents' self-reported HL was found to be high in more than 20% of cases. A similar study in Italy in 2021 [27] found a corresponding rate of 6.8% and stated that the HL of Italian students is the lowest in Europe. At the same time, in Germany, the HL of adolescents and their parents was investigated, identifying 14.2% of adolescents having a high HL, using the same instrument [30]. The same study found about 60% of adults to have an adequate HL [63] and about 50% of the teachers [64]. These results align with our results as well and further indicate that parental HL may be slightly better than teachers' and thus confirm the important role of parents when implementing HL programs for young people.

 doi:10.20944/preprints202605.0813.v1

4.2. HL in a Bilingual Context

No significant difference in parental HL between languages was found in fully completed questionnaires. The results of the study should be interpreted with caution when compared to former published research. First, the levels of HL using the Italian HLS-EU-Q16 tool were higher than those observed in former population-based research [13, 16], while considering the NVS-IT there was the opposite situation [17]. Further in [17], authors point out differences not only between countries, but even between instruments within the same population.

The insight, that there is no difference between adults' questionnaires in German and Italian language in South Tyrol can be misleading. Parental complete HL is reported significantly more often in Italian than in German questionnaires. This is an interesting result, indicating once, that within the same healthcare system, the HLS-EU-Q16 questionnaire returns similar results and thus, may be more easily comparable that found in former research, where cultural differences between the Italian version and other European versions were discussed [24]. On the other hand, missing data differs in language and parental educational status. This result is reflected in CASMIN index disparities, since Germans more often have a lower educational status. Further, missing HL was found more often in younger parents and participants with lower FAS III. While the age resulted as a language independent factor, Italian participants were more likely to complete the questionnaire than Germans when having a lower FAS III. These results identify German lower educated and lower income parents as a target group when promoting HL.

Generally, adolescents' HL was reported in both languages nearly always completely. Lower adolescents' HL in Italian questionnaires has been found, supporting findings of (27). The higher score of German adolescents may be explained by different digital information seeking and the fact, that in Germany there has been already done a lot to introduce specific HL programs for adolescents [65], [66].

From these insights, it makes sense to develop targeted language specific HL programs for parents and children in South Tyrol, not only based on existing digital HL programs. German parental programs should address the importance of having a good HL within families, while for adolescents targeted school-based programs in both languages could be developed, based on already existing German programs, but adapting these programs to the Italian health care system and policy context. Providing an actual adapted bilingual program makes sense and can be a first step to improve HL in Italian adolescents in general. Thus, South Tyrol offers the unique opportunity to apply German actual HL knowledge and adapt it to Italian needs.

4.3. Demographic and Psychosocial Determinants

For parental and adolescents' HL, low FAS III and moderate MSPSS were strongly associated to lower HL, while a high parental education was associated to both, higher parental and adolescents' HL. These results go ahead with former international research [21, 25, 26, 27, 30]. Younger parental age was clearly associated with less HL.

This widely spread evidence shows the need for area wide dissemination of HL, which best is done through school-based interventions. In [67, 68] authors discuss that schools can be seen as an ideal venue for strengthening HL because they reach almost all school-aged children throughout their school years. Integrating HL into schools is challenging, as both schools and teachers already face numerous educational requirements that may prevent them from addressing health in the classroom because they perceive it as an additional task. In this context, curriculum and instruction on media literacy, information literacy, and digital literacy are most promising subjects to include HL because these concepts share many commonalities with HL and often are already part of the school curriculum.

 doi:10.20944/preprints202605.0813.v1

4.4. Adolescents' Mental Health and HL

Adolescents' and parental HL was clearly related to adolescents' mental health conditions. It was evident that higher self-reported mental health scores were stronger related to lower self-reported adolescents' HL than to lower parent-reported HL, while higher parent-reported adolescents' mental health scores were related to both lower parental and adolescents' HL. Thus, strengthening the HL of both parents and children makes sense to prevent and early detect mental health conditions in young people.

While the main target clearly should be to improve the HL of children and adolescents, improving the HL of parents as well as of teachers, is of big importance as well. First, they can help young people to improve their own HL. In [69] a tool for teaching critical HL to secondary school students was developed and found to be feasible and likely to enhance the competence of critical HL.

Second, good adult HL knowledge is needed even in early detection and dealing with mental health conditions of children and adolescents. In (64) more than half of the teachers showed a limited level of HL and an association between low level of HL and uncertainty in dealing with chronically ill pupils were found. To prevent such uncertainties, it makes sense to improve generally parents' and teachers' HL.

Theoretical frameworks to implement comprehensive school-based intervention concepts have been discussed in [67, 70, 68] to provide standards for the development of organizational HL in schools. Parental HL was not a significant mediator in self-reported mental health conditions. This result emphasized the importance of respecting and prompting adolescents' autonomy in health behavior.

4.5. Methodological Considerations

South Tyrol's bilingual context offers a unique opportunity to adapt and implement HL programs across languages and cultural settings. As the associations of lower MSPSS and problematic internet use with mental health conditions are evident, sophisticated targeted HL programs are needed. To get further evidence, long-term investigations may give evidence about possible effects of improved HL on young people's mental health.

Notably, HL in Germany has worsened between 2014 and 2020 [71]. This effect was particularly evident among people with low social status and financial deprivation. HL of the population in Germany tended to improve during the pandemic [72]. Women, people with low or medium education, younger people and those with a migration background appeared to have benefited to a more than average extent. To surmount socioeconomic differences in HL development in the younger populations, strategies to reach the whole population in the same way are needed.

As a facit for future planning of HL developmental programs for adolescents, we can address schools as important partner: Schools can reach all young people and their families at the same time. Socially disadvantaged families can be reached in the same way as socially advantaged families and no costs emerge for families when HL interventions are applied. Thus, families from different socioeconomic backgrounds get the same possibilities to develop an adequate HL. The parallel involvement of teachers, parents and adolescents is needed to provide a comprehensive program. The collaboration of health care institutions and schools is essential. A scientific longitudinal guidance may incorporate assessing and developing teachers' health literacy empowerment and the intervention of school nurses providing HL information for children, adolescents and parents. Such programs in Italy are lacking.

Between 2005 and 2015 HL has been promoted and discussed widely in Germany. Starting with the main goal [73] to strengthen the scientific basis for decision making in German healthcare services, promotion of general health- and scientific knowledge (critical health information, or HL) is strongly associated with good health outcomes and patient empowerment. Autonomy, empowerment and HL were regarded as useful theoretical concepts to guide the definition of evidence-based health information on websites [58]. School nurses [74] providing health related expertise increased HL of children, parents and teachers.

 doi:10.20944/preprints202605.0813.v1

Under these insights, based on existing evidence, the bilingual context in South Tyrol offers the unique possibility to implement a bilingual concept to improve HL of children and adolescents. Its implementation in the educational environment makes sense since it offers the possibility to reach all young people independent from their sociocultural background. Strengthening the HL knowledge of parents by addressing especially German families and improving teachers' HL regarding adolescents' mental health and general health should be included in the concept as well.

4.6. Strength and Limitations

This study has several strengths. It involves parental and adolescents HL skills at once and associates them with both parent and adolescent-reported mental health conditions. The whole study finds place in a bilingual context and offers the possibility of bringing together knowledge of both realities and developing new concepts adapted for this special region, but applicable in a broader context, especially in Italy.

Research is limited by the fact that the study is cross sectional and does not provide longitudinal data. Mediation modelling in this context was used as an explorative tool. Further it does only ask for general HL and not especially for mental HL. This special topic should be examined in future research. The Italian participation rate was low this may cause a response or selection bias. Finally, a high drop out in parental reported HL may under- or overestimate the mediating role of parental HL.

5. Conclusions

Our study gave evidence about differences in adolescents' HL between languages in a mixed cultural contexed. It confirmed associations with different socioeconomic backgrounds and showed the associations between familiar HL and adolescents mental health. School based interventions German and Italian settings are needed, targeting teachers, parents and students. Germany's HL school programs may act as underlying background but must be adapted to the bilingual situation and the Italian health care system.

Examination of teacher's HL may be the next step to develop targeted intervention programs. The combined information about parental, adolescents' and teachers' actual HL in combination with sociocultural effects can be the basis for adapting existing HL programs to special regional needs.

Longitudinal research examining HL knowledge of all three target groups during the intervention program can provide future insights into the development of the South Tyrolean HL intervention program.

The adaption of existing German HL school programs to our regional needs may be the basis for the development of an Italian HL school intervention program and offers the possibility to compare results of German and Italian backgrounds to give evidence about cultural differences when developing school intervention programs.

Additionally, targeted mental health literacy for adolescents can be addressed in these programs, given our results, that HL of adolescents is stronger related to their mental health than parental HL. Parents may get information about prevention and early detection of mental health conditions and about pathways in the health care system to deal with such problems.

Author Contributions: Conceptualization, V.B., D.A., A.E., G.P. and C.J.W.; methodology, V.B., D.A., C.J.W.; software, V.B.; validation, V.B..; formal analysis, V.B.; investigation, V.B.,D.A., C.J.W.; data curation, V.B.; writing—original draft preparation, V.B.; writing—review and editing, D.A., C.J.W., A.E. G.P. D.H.; visualization, V.B.; supervision, C.J.W., A.E. G.P., D.H.; project administration, V.B.; All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

 doi:10.20944/preprints202605.0813.v1

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the Autonomous Province of Bolzano, Italy (protocol code 11-2025, 19 February 2025).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Acknowledgments: The authors thank the school authorities and the management of public schools in South Tyrol for facilitating recruitment and participation. The authors also thank Irene Parnigotto for revising the Italian version of the questionnaire.

Conflicts of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.:

Abbreviations

The following abbreviations are used in this manuscript:

CASMIN	Comparative Analysis of Social Mobility in Industrial Nations
COP-S	Corona and Psyche South Tyrol
COPSY	Corona and Psyche
FAS	Family Affluence Scale
GPIUS	Generalized Problematic Internet Use Scale
HBSC-SCL	Health Behaviour in School-aged Children -Symptom CheckList
HL	Health Literacy
HLS-EU-Q	European Health Literacy Survey Questionnaire
HLSAC	Health Literacy for School-Aged Children
M	Mean
MSPSS	Multidimensional Scale of Perceived Support
n.s.	Not significant
NSV-IT	Newest Vital Sign - Italian version
PHQ	Patient Health Questionnaire
SCARED-GAD	Screen for Child Anxiety Related Disorders- Generalized Anxiety Disorder
SD	Standard Deviation
SDQ	Strengths and Difficulties Questionnaire
VIF	Variance Inflation Factor

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