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Risk factors for sexual harassment and abuse victimization among adolescent athletes and non-athletes: A one-year follow-up study

Nina Sølvsberg^{a,*}, Monica Klungland Torstveit^b, Bård Erlend Solstad^b,
Margo Mountjoy^{c,d,e}, Jan H. Rosenvinge^f, Gunn Pettersen^g,
Jorunn Sundgot-Borgen^a

^a Department of Sports Medicine, The Norwegian School of Sport Sciences, Postboks 4014 Ullevål stadion, 0806 Oslo, Norway

^b Department of Sport Science and Physical Education, Faculty of Health and Sport Science, University of Agder, Postboks 422, 4604 Kristiansand, Norway

^c Department of Family Medicine, McMaster University, 1280 Main St W, Hamilton, ON L8S 4L8, Canada

^d International Olympic Committee Working Group on the Prevention of Harassment and Abuse in Sport, Lausanne, Switzerland

^e International Research Network on Violence and Integrity in Sport, Antwerp, Belgium

^f Department of Psychology, UiT - The Arctic University of Norway, Postboks 6050 Langnes, 9037 Tromsø, Norway

^g Department of Health and Care Sciences, UiT - The Arctic University of Norway, Postboks 6050 Langnes, 9037 Tromsø, Norway

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ABSTRACT

Background: The association between SHA and negative mental health increases the need to understand risk factors for SHA victimization, which is important for future development of prevention programs.

Objective: To examine which combinations of demographic- and mental health factors were associated with subsequent SHA victimization, and the prevalence of elite athletes, recreational athletes, and reference students who experienced sexual revictimization.

Participants and setting: Norwegian elite athletes and recreational athletes attending sport high schools, and reference students attending non-sport high schools (mean age: 17.1 years) were eligible for participation.

Methods: The participants answered an online questionnaire at two measurement points one year apart, T1 and T2 ($n = 1139$, 51.1 % girls). After testing for measurement invariance, data were analyzed with Classification and Regression Tree analysis (CRT) using demographic- and mental health variables from T1 as independent variables, and SHA at T2 as outcome.

Results: The combination of being a girl with high level of symptoms of eating disorders and other psychological symptoms was associated with subsequent reporting of SHA. Among the students with lifetime experience of SHA at T1 ($n = 533$, 58.3 %), 49.5 % reported revictimization at T2 (60.9 % girls, 32.2 % boys, $p \leq .001$). The prevalence of SHA revictimization was lower among elite athletes (44.3 %) compared with recreational athletes (49.1 %) and reference students (59.4 %, $p = .019$).

Conclusion: The combination of female gender and mental health symptoms are risk factors for subsequent SHA victimization. These findings, and the high prevalence of SHA revictimization is

* Corresponding author at: Department of Sports Medicine, The Norwegian School of Sport Sciences, Sognsveien 220, 0863 Oslo, Norway.

E-mail addresses: ninas@nih.no (N. Sølvsberg), monica.k.torstveit@uia.no (M.K. Torstveit), bard.e.solstad@uia.no (B.E. Solstad), mountjm@mcmaster.ca (M. Mountjoy), jan.rosenvinge@uit.no (J.H. Rosenvinge), gunn.pettersen@uit.no (G. Pettersen), jorunnsb@nih.no (J. Sundgot-Borgen).

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important knowledge for developing preventive programs targeting elite athletes, recreational athletes, and reference students.

1. Introduction

Adolescence is a critical period both for experiencing sexual harassment and abuse (SHA) (Li et al., 2022) and developing mental health disorders (Solmi et al., 2022). SHA among adolescents, referring to subjectively uncomfortable or unwanted sexualized experiences of verbal, non-verbal, or physical character (Mountjoy et al., 2016) is concerning for both adolescent athletes and non-athletes (Bendixen et al., 2018; Solvberg et al., 2022). There is a well-established association between SHA victimization and negative mental health outcomes in the general adolescent population (Bendixen et al., 2018; Chiodo et al., 2009; Dahlqvist et al., 2016; Gruber & Fineran, 2008; Hébert et al., 2021; Li et al., 2016; Petersen & Hyde, 2013), but limited research regarding this association in sports. For athletes, mental health outcomes after experiencing SHA are mainly based on adult samples, cross-sectional and qualitative studies, as well as studies without comparison groups (Fasting et al., 2002; Ohlert et al., 2019; Reardon et al., 2019; Vertommen et al., 2018). One study among adolescent athletes showed an association between sexual violence and lower self-esteem, higher psychological distress, and symptoms of post-traumatic stress disorder (Parent et al., 2021). Among general adolescents, SHA victimization is associated with lower self-esteem and well-being, symptoms of depression and anxiety, self-harm, traumatic symptoms, negative body image, and disordered eating (Bendixen et al., 2018; Chiodo et al., 2009; Dahlqvist et al., 2016; Gruber & Fineran, 2008; Hébert et al., 2021; Li et al., 2016; Petersen & Hyde, 2013). The association between experiences of SHA and disordered eating/eating disorders may be explained by several pathways, primarily one pathway concerning body perceptions and one pathway concerning coping with psychological difficulties (Madowitz et al., 2015). The body perception pathway relates to how experiences of SHA is often appearance-based in content, which may lead to self-objectivization and increased self-surveillance and body-surveillance. This, in turn, may increase weight- and shape concerns and lower self-esteem, which are further associated with disordered eating and eating disorders (Buchanan et al., 2013; Hayes et al., 2021; Petersen & Hyde, 2013). The psychological difficulties pathway concerns disordered eating behavior as a coping mechanism and emotion regulation strategy to regain control and handle psychological

Definition Box

Abbreviations and descriptions of terms used in the paper.

Term/measure	Abbreviation	Description
Sexual harassment and abuse	SHA	Any form of unwanted sexual attention that has the purpose or effect of being offensive, frightening, hostile, degrading, humiliating or troublesome (The Norwegian Equality and Anti-Discrimination Act (§ 13).
SHA victimization		Experience of one or more forms of verbal-, non-verbal- or physical SHA in lifetime (T1) or last 12 months (T2).
SHA revictimization		Students who reported 12 months SHA at T2 among those who had already reported lifetime SHA at T1.
Subsequent SHA victimization		Used to express risk factors for experiencing SHA in the future, regardless of having a history of experiences with SHA or not.
Construct validity		A measure concerning how well an instrument measures the concept it was designed to measure.
Measurement invariance	MI	Used to test whether a construct has the same meaning between different groups (multiple-group) or across different time points (longitudinal).
Confirmatory factor analysis	CFA	Used to test whether the data fit a hypothesized measurement model.
Unidimensional CFA model		The items in the instrument create a single dimension.
Multidimensional CFA model		The items in the instruments create several sub-dimensions.
Configural invariance		Tests whether the factor structure is the same between groups/over time (factor loadings and intercepts are free).
Metric invariance		Tests whether the factor loadings are the same between groups/over time (intercepts are free).
Scalar invariance		Tests whether the factor loadings and intercepts are the same between groups/over time.
Comparative fit index	CFI	A model fit measure used to examine the discrepancy between the data and the hypothesized model, adjusted for sample size. CFI ranges from 0 to 1 where a larger value indicates better model fit.
Root mean square error of approximation	RMSEA	An absolute fit index which assesses how far a hypothesized model is from a perfect model. RMSEA ranges from 0 to 1 where a smaller value indicates better model fit.
Standardized root mean square residual	SRMR	An absolute fit index for the difference between the observed and the predicted covariance matrix. SRMR ranges from 0 to 1 where a smaller value indicates better model fit.
Classification and regression tree	CRT	A nonparametric and clinically interpretable statistical method which examines interaction between independent variables to identify subgroups of a population at risk of experiencing an outcome. The results are visualized in a tree-shaped diagram with the dependent variable on top, followed by a hierarchical pattern of nodes with combinations of independent variables that best explains the dependent variable.
Parent node		A node that is divided into sub-nodes: a node that precedes another node.
Child node		The child of a parent node: a sub-node that falls under another node.
Tree pruning		A method to reduce the size of a tree by removing non-significant nodes. This is done to avoid overfitting, reduce the complexity of the tree, and increase the predictive accuracy.
Surrogate splits		In case of missing values for an independent variable, other independent variables which are highly associated with the original variable are used for classification.

(Hooper et al., 2007; IBM, s.a., 2023; Ivarsson & Stenling, 2019; Svetina et al., 2019)

difficulties following traumatic experiences (Madowitz et al., 2015), possibly associated with maladaptive interpersonal behaviors like reassurance-seeking, negative feedback-seeking, silencing the self, and co-rumination (Mason et al., 2022). Most existing studies have presented the association between SHA and eating disorder psychopathology in the direction of SHA preceding the development of an eating disorder. However, the studies are predominantly based on cross-sectional data (Hayes et al., 2021), hence prospective studies are necessary to further examine the direction of the relationship between SHA and disordered eating/eating disorders.

Adolescents with previous experiences of SHA seem to be at increased risk of experiencing it again (revictimization) (Chiodo et al., 2009; Dahlqvist et al., 2016; Young & Furman, 2008). A meta-analytic review investigating survivors of childhood sexual abuse showed that almost half of the survivors were revictimized in the future (Walker et al., 2019), but the prevalence of SHA revictimization in adolescent athletes is unknown. Knowledge about the prevalence of SHA revictimization is important to increase understanding about the scope of SHA. Also, given the reported negative consequences of SHA, and the symptom complexity associated with revictimization (Hébert et al., 2021), it is important to understand risk factors for SHA victimization which may guide the development of prevention programs. Therefore, the aims of this study were to prospectively examine 1) which combinations of demographic- and mental health factors were associated with subsequent SHA victimization and 2) the prevalence of male and female elite athletes, recreational athletes, and reference students who experienced sexual revictimization (see Definition box for description of subsequent SHA and SHA revictimization).

2. Methods

2.1. Study design and procedure

A prospective cohort study was conducted in Norway with data collected between October 2019–May 2020 (T1) and October 2020–March 2021 (T2). All private elite sport high schools and public high schools with specialized elite sport programs ($n = 32$, Fig. 1) were invited to participate in the study with the aim of including the total population of 12th-grade elite athlete students in Norway. All students are screened based on prior school- and sports-related results, long-term goals, and motivation for combining school and high-level sport development before acceptance into an elite sport high school/program (Olympiatoppen [The Norwegian Olympic and Paralympic Committee and Confederation of Sports], 2019). In our study, the students attending an elite sport high school/program were defined as elite athletes. Students studying a general sport education program at public sport high schools (not elite sport) were designated as recreational athletes in this study. Separating the elite- and recreational athlete groups was of interest because of the different cultures they live in, where elite sport is associated with high professionalism, top-motivated and dedicated athletes and coaches, and a high-performance culture. Furthermore, a sample of non-sport high schools ($n = 27$, Fig. 1) in four counties in Norway were invited as a reference group. The students attending a general educational program without sport specialization at these non-sport high schools were classified as reference students.

For the first data collection (T1), members of the research group travelled to the consenting schools ($n = 26$ (81.3 %) elite sport high schools, $n = 6$ (22.2 %) non-sport high schools, Fig. 1) and informed all eligible students about the study by an oral presentation. Subsequently, the students received an e-mail with a written information letter and a link to an online questionnaire. The participants who chose to participate signed an electronic consent form and answered the on-line questionnaire during school time. Participation was voluntary and the participants could withdraw at any time without consequences. Students (48.9 % boys, 51.1 % girls, $n = 4$ non-binary) attending 12th grade at the consenting high schools were invited to participate ($n = 1587$, Fig. 1). The mean age was 17.1 (SD = 0.4) years. The response rate for the total sample was 78.8 % at T1 ($n = 1251$, Fig. 1). Because of the COVID-19 pandemic, the schools in Norway closed March 12, 2020. Five schools had to attend the information session through Skype for Business (Microsoft, Redmond, WA) or Teams (Microsoft) at T1, with the adolescents participating from home.

The same cohort was invited to answer a follow-up questionnaire one year later (T2), during their final year of high school in Norway (13th grade), regardless of whether they had participated at T1 ($n = 1666$, Fig. 1). The response rate was 80.7 % ($n = 1344$) at T2. A higher number of invited students at T2 compared to T1 (Fig. 1) was mainly related to the COVID-19 pandemic restrictions. Specifically, 150 students at one non-sport high school missed the data collection at T1 and were invited to T2 only. The digital data collection procedure continued throughout T2 (except for one school which received a physical visit at T2) where the students attended through Skype/Teams from home or in small groups in school depending on the schools' preferences and organization during the pandemic. The data were de-identified by use of individual ID-numbers connecting the responses from the same person at T1 and T2.

2.2. Instruments - questionnaire

2.2.1. Demographics

A questionnaire was created in the online program SurveyXact offered by Ramböll, Aarhus, Denmark. Demographical questions included gender (boy, girl, other/non-binary), age (years), school affiliation (elite sport, recreational sport, general studies), immigration status (first- or second generation immigrant, non-immigrant), living situation (with parents in the same house, with one parent, with friends, boarding school, alone, other), sexual orientation (heterosexual, homosexual (lesbian or gay), bisexual, other (pansexual, asexual), do not know/do not want to answer), training hours per week, and competitive sport participation (yes, no). Gender refers to the socially constructed characteristics of girls, boys, and gender-diverse people, influencing identity, behaviors, social roles, and interaction with others (Heidari et al., 2016).

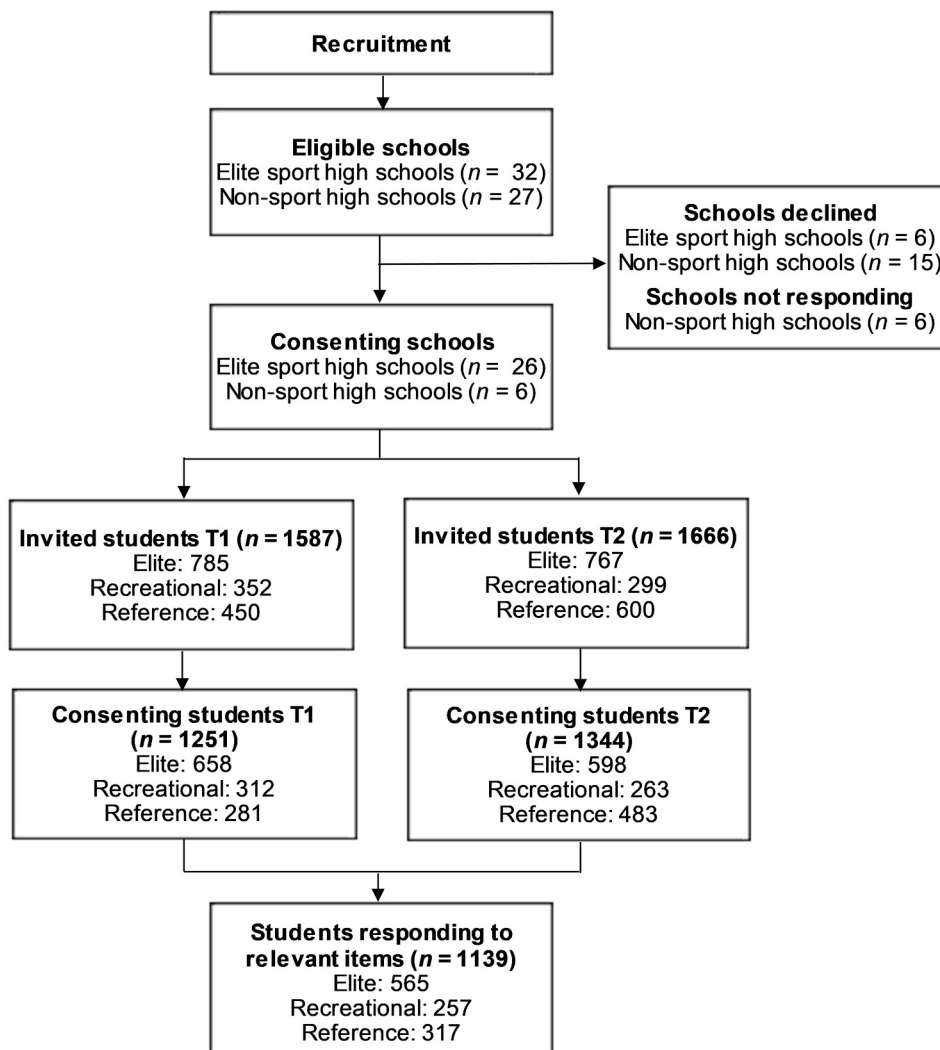


Fig. 1. Flow chart of the recruitment of schools and inclusion of participants in the study.

2.2.2. Sexual harassment and abuse (SHA)

The questions regarding SHA were based on earlier research (Fasting et al., 2003), and adapted to fit an adolescent sample including specification about the possibility that SHA may also happen online. The participants were introduced to the definition of sexual harassment (SH) from the Norwegian Equality and Anti-Discrimination Act (§ 13): “Sexual harassment means any form of unwanted sexual attention that has the purpose or effect of being offensive, frightening, hostile, degrading, humiliating or troublesome”. In total, thirteen questions covered verbal SHA (three items, e.g., unwanted sexual comments/remarks), non-verbal SHA (six items, e.g., unwanted sexual staring/glances), and physical SHA (four items, e.g., unwanted physical contact) (for more details, see (Solvberg et al., 2022)). The questions were answered dichotomously (no/yes) and covered lifetime experiences of SHA at T1 and 12 months experiences at T2. Those who reported at least one experience of lifetime verbal, non-verbal, and/or physical SHA at T1 were categorized as having experienced SHA at T1. Those who reported at least one experience of verbal, non-verbal, and/or physical SHA the last 12 months at T2 were categorized as having experienced SHA at T2. Revictimization was measured as the percentage of students who reported SHA at T2 among those who had already reported lifetime SHA at T1. The participants who responded “yes” to any of the SHA items received follow-up questions regarding in which social setting they had experienced SHA (in school, sports outside school, or free time). Prevalence rates stratified by social settings have been presented in a former publication (Solvberg et al., 2022). The results in the current study are presented for all three settings combined. The participants could not proceed to the next question without answering but were able to drop-out at any time if they changed their mind about participating in the study.

2.2.3. World Health Organization Quality of Life questionnaire (WHOQOL-BREF) (The WHOQOL Group, 1998)

We used two items from WHOQOL-BREF to assess overall quality of life and satisfaction with health, respectively (i.e., “How would you rate your quality of life?” and “How satisfied are you with your health?”). Based on the two preceding weeks, the participants rated

each item on a 5-point Likert scale ranging from 1 = very poor/unsatisfied to 5 = very good/satisfied, hence the possible score range was 1 to 5. Higher scores indicate higher quality of life and satisfaction with health.

2.2.4. Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965)

RSES ten-item scale measures overall self-esteem by five positively worded items, e.g., “I feel that I have a number of good qualities”, and five negatively worded items, e.g., “I certainly feel useless at times”. The items were answered on a 4-point Likert scale where 1 = strongly agree and 4 = strongly disagree. The positively loaded items were reversed before summing the item scores into a global score ranging from 10 to 40. A higher score indicates higher self-esteem ($\alpha = 0.89$).

2.2.5. Eating Disorder Examination Questionnaire (EDE-q) (Fairburn & Beglin, 2008)

The EDE-q 6.0 is a 28-item self-report questionnaire addressing symptoms of eating disorders based on the last 28 days. The participants responded to 22 of the 28 items on a 7-point Likert scale ranging from 0 = no days/not at all to 6 = every day/markedly. The remaining six items are free response items concerning frequency of engaging in different disordered eating behaviors and are not included when calculating the global EDE-q score. The global score is the average score of four subscale scores (restraint, eating concern, shape concern, and weight concern) and ranges from 0 to 6. A high global score indicates a greater number of eating disorder symptoms ($\alpha = 0.95$).

2.2.6. Health Behavior in School-aged Children - symptom checklist (HBSC-SCL) (Currie et al., 2014)

HBSC-SCL is an eight-item questionnaire assessing subjective health complaints. Four items represent somatic symptoms (headache, stomachache, backache, and dizziness) and four items represent psychological symptoms (e.g., feeling low, irritability or bad temper, nervousness, and difficulties sleeping). The items were rated on a 5-point scale based on how frequently they had experienced the symptoms during the last six months: 1 = about every day, 2 = more than once a week, 3 = about every week, 4 = about every month, and 5 = rarely or never. The scale was reversed so higher scores represent more complaints before the scores of the items representing the somatic- and psychological subscale, respectively, were summed. The possible score range was 4 to 20 for each subscale. ($\alpha = 0.75$ for the somatic subscale and $\alpha = 0.82$ for the psychological subscale).

2.2.7. Resilience scale for adolescence (READ) (Hjemdal et al., 2006)

READ consists of 28 positively worded items, rated on a 5-point Likert scale from 1 = totally agree to 5 = totally disagree. The scale was reversed so a higher score indicated higher resilience. The subscales personal competence (eight items), social competence (five items), structured style (four items), family cohesion (six items), and social resources (five items) were created by summing the items representing each subscale divided by the number of items in each subscale. A global score was obtained by summing the subscale scores divided by the total number of subscales (five), hence the possible scoring range was 1 to 5 ($\alpha = 0.95$).

2.3. Piloting of the measures in the questionnaire

Three male elite athletes attending elite sport high schools and three female non-sport high school students, not eligible for this study, piloted the different measures included in the questionnaire. Minor specifications of the wording and additional response options were added to demographic questions only.

2.4. Statistical analyses

To provide evidence of construct validity, we used *Mplus* version 8.4 to conduct a categorical multiple-group confirmatory factor analysis (CFA) of the SHA measure, for both T1 and T2. We also conducted a multiple-group and longitudinal measurement invariance analysis of the SHA measure (Rutkowski et al., 2019; Svetina et al., 2019) (see Definition box for description of statistical terms). Meaningful comparisons of means between psychological constructs across groups and over time must demonstrate evidence that measurement is equivalent both across the studied groups and measurement points (Svetina et al., 2019). In other words, invariance analyses are important to conduct to assess whether the construct measured (SHA) was understood similarly across groups (gender, school groups) and across time (T1 to T2). This is done by creating increasingly constrained models and test the fit of the models (van de Schoot et al., 2012) by use of standardized model fit measures; Comparative Fit Index ($\Delta\text{CFI} < 0.01$), Root Mean Square Error of Approximation ($\Delta\text{RMSEA} < 0.015$), and Standardized Root Mean Square Residual ($\Delta\text{SRMR} < 0.03$ for metric and < 0.01 for scalar) (Rutkowski et al., 2019; Svetina et al., 2019).

Further analyses were conducted in SPSS version 28.0 (IBM, Armonk, New York, USA). The reliability of the mental health measures, based on the internal consistency among scale items, was reported as coefficient alpha. Descriptive data were presented as number and percentages or mean with standard deviation (SD). Group differences were analyzed using Chi-Square Test of Independence. We used Classification and Regression Tree analysis (CRT), which is a valid method to analyze data and provide information about real-world problems by examining interactions in the data material (Ivarsson & Stenling, 2019). The participants who responded to one or more of the SHA-items at T2 and one or more of the following demographic items or mental health instruments (independent variables); gender, school group, WHOQOL-quality of life, WHOQOL-satisfaction with health, RSES, EDE-q, HBSC-SCL somatic subscale, HBSC-SCL psychological subscale, and/or READ, were included in the analyses ($n = 1139$). We used data-driven cut-points and a stopping rule of minimum 100 cases in parent node and 50 cases in child nodes (IBM, s.a., 2023) (see Definition box for description of terms related to the CRT-analysis). We applied tree pruning to avoid overfitting. Tree pruning allows the tree to grow until the stopping

rule is reached before trimming the tree by removing non-significant nodes. Thereby, the complexity of the tree was reduced, and the predictive accuracy increased. The maximum difference in risk between the pruned tree and the subtree with the smallest risk was one standard error (IBM, s.a., 2023). Missing data were treated with surrogates splits (IBM, s.a., 2023). We calculated prevalence differences with 95 % confidence intervals (CI). Four participants reporting non-binary gender were treated as missing on the gender variable because a separate non-binary group would be too small for meaningful comparisons. No power calculation was performed because we aimed to include the total population of 12th-grade athletes at elite sport high schools in Norway.

2.5. Ethics

This study was approved by the Regional Committees for Medical and Health Research Ethics (No. 8673) and the Norwegian Center for Research Data (No. 960987) and was registered in Clinical Trials (NCT04003675). In Norway, adolescents above 16 years can consent themselves to participate in medical and health-related research (Norwegian Health Research Act §17). The adolescents received contact information to the project leader and the nurse at their respective schools and were encouraged to take contact if they needed a conversation regarding SHA or mental health-related difficulties. There was also a possibility to ask for help at the end of the questionnaire, giving the project leader permission to contact the participant.

3. Results

Most participants reported a heterosexual orientation (96.5 %), 77.3 % lived with one or both parents, and 8.6 % were first- or second-generation immigrants. Training hours per week were on average 16.1 (SD = 5.6) for the elite athletes, 15.0 (SD = 6.0) for the recreational athletes, and 6.9 (SD = 5.5) for the reference students. Fifty-two different types of competitive sports were represented in the sample. Sample characteristics and mental health scores separated by gender is presented in Table 1.

The CFA of SHA at T1 yielded a good fit to the data: $\chi^2(65) = 172.753, p = .0000, SRMR = 0.08, RMSEA = 0.04, (90\% \text{ CI } RMSEA = 0.03 \text{ to } 0.04), CFI = 0.97$. Similarly, the CFA of SHA at T2 also yielded a good fit: $\chi^2(65) = 158.052, p = .0000, SRMR = 0.09, RMSEA = 0.03, (90\% \text{ CI } RMSEA = 0.03 \text{ to } 0.04), CFI = 0.97$. However, the multiple-group (boys and girls) and longitudinal measurement invariance analysis (T1 and T2) of the SHA measure, with more restrictive invariant models, yielded an unacceptable fit (see model fit statistics in Appendix 2 and model fit decision guidelines in Statistics). This was also the case with the multiple-group and longitudinal measurement invariance analysis of the different school types (elite, recreational, and reference students) (see model fit statistics in Appendix 2 and model fit decision guidelines in Statistics). Attempting to establish multiple-group measurement invariance of the SHA measure at T2, we conducted separate analyses using both gender and school type. The first multiple-group (gender)

Table 1
Baseline (T1) sample characteristics, lifetime experience of sexual harassment and abuse (SHA), and mental health scores.

	Total		Boys		Girls		p-value, gender comparison
	n ¹	n (%) / mean (SD)	n	n (%) / mean (SD)	n	n (%) / mean (SD)	
Demographics							
Age, mean (SD)	940	17.1 (0.4)	458	17.1 (0.5)	478	17.1 (0.4)	0.665
Heterosexual orientation, n (%)	940	907 (96.5)	458	450 (98.3)	478	455 (95.2)	0.010
First- or second-generation immigrants, n (%)	940	81 (8.6)	458	41 (9.0)	478	39 (8.2)	0.726
Living with one or two parents, n (%)	939	726 (77.3)	457	333 (72.7)	478	389 (81.4)	0.002
Training sessions per week, mean (SD)	930	8.6 (3.7)	451	9.2 (3.7)	475	8.1 (3.6)	≤0.001
Training hours per week, mean (SD)	930	13.8 (6.8)	451	15.0 (6.7)	475	12.6 (6.6)	≤0.001
Active in competitive sport, n (%)	929	701 (75.5)	451	364 (80.7)	474	334 (70.5)	≤0.001
Sexual harassment and abuse							
Lifetime SHA (T1), n (%)	919	536 (58.3)	447	211 (47.2)	468	322 (68.8)	≤0.001
12-month SHA (T2), n (%)	1139	412 (36.2)	458 ²	100 (21.8)	478 ²	227 (47.5)	≤0.001
Mental health							
WHOQOL-QOL, mean (SD)	905	4.1 (0.9)	444	4.2 (0.8)	457	4.0 (0.9)	≤0.001
WHOQOL-SWH, mean (SD)	905	4.0 (0.9)	444	4.2 (0.9)	457	3.9 (1.0)	≤0.001
RSES, mean (SD)	905	30.1 (5.8)	444	31.8 (5.5)	457	28.5 (5.7)	≤0.001
EDE-q, mean (SD)	902	0.9 (1.1)	444	0.6 (0.7)	454	1.2 (1.3)	≤0.001
HBSC-SCL somatic, mean (SD)	902	7.4 (3.4)	444	6.7 (3.0)	454	8.0 (3.5)	≤0.001
HBSC-SCL psychological, mean (SD)	902	9.3 (3.8)	444	8.3 (3.5)	454	10.2 (3.8)	≤0.001
READ, mean (SD)	901	4.2 (0.6)	443	4.2 (0.6)	454	4.1 (0.5)	≤0.001

SHA = sexual harassment and abuse; T1 = first measurement period; WHOQOL-QOL = World Health Organization Quality of Life questionnaire - quality of life; WHOQOL-SWH = World Health Organization Quality of Life questionnaire – satisfaction with health; RSES = Rosenberg Self-Esteem Scale; EDE-q = Eating Disorder Examination Questionnaire; HBSC-SCL = Health Behavior in School-aged Children - symptom checklist; READ = Resilience scale for adolescence.

¹ n = 4 non-binary gender included in the total column only.

² n = 203 missing responses on the gender item at T1, resulting in a lower number of participants when separated by gender for 12-months SHA at T2.

measurement model, with partial scalar factorial invariance constraints in place, yielded an acceptable fit to the data: $\chi^2(146) = 237.366, p = .0000, SRMR = 0.13, RMSEA = 0.04, (90\% \text{ CI } RMSEA = 0.03 \text{ to } 0.05), CFI = 0.96$ (see Appendix 2). The second multiple-group (school type) measurement model, with partial scalar factorial invariance constraints in place, also yielded an acceptable fit: $\chi^2(233) = 358.094, p = .0000, SRMR = 0.14, RMSEA = 0.04, (90\% \text{ CI } RMSEA = 0.03 \text{ to } 0.05), CFI = 0.96$ (see Appendix 2). Based on these preliminary analyses, we did not include SHA at T1 in the further CRT analysis.

In total, 36.2 % of the adolescents reported experiences of SHA at T2. The results from the CRT analysis (see Fig. 2) showed that gender was the main risk factor for SHA victimization at T2. Specifically, girls had a higher risk of experiencing SHA than boys (prevalence difference = 20.2 %, 95 % CI = [14.8, 25.6]). In combination with being a girl, symptoms of eating disorders were a risk factor where girls with higher EDE-q scores (> 2.866) were more likely to report SHA at T2 (prevalence difference = 33.2 %, CI = [21.4, 45.0]). Among the girls with low EDE-q scores (< 2.866), a high level of psychological symptoms (> 11.5 on the HBSC-SCL psychological subscale) was also a risk factor for SHA at T2 with a prevalence difference of 16.8 % (CI = [7.0, 26.6]). The remaining independent variables in the CRT-analyses (school group, WHOQOL-quality of life, WHOQOL-satisfaction with health, RSES, and HBSC-SCL somatic subscale) did not appear as significant risk factors.

As described earlier, the results from the invariance analyses restricted meaningful statistical comparisons between SHA at T1 and T2, hence SHA at T1 was not included in the main CRT-analysis. However, descriptive analyses showed that among the students who reported lifetime experiences of SHA at T1 ($n = 533, 58.3\%$), 49.5 % experienced revictimization at T2 (60.9 % girls and 32.2 % boys, $X^2(1, 533) = 41.833, p \leq .001, \text{Phi: } 0.28$). A lower percentage of the elite athletes (44.3 %) reported revictimization compared with the recreational athletes (49.1 %) and the reference students (59.4 %). The difference was significant between the elite athletes and the reference students ($X^2(2, 536) = 7.903, p = .019, \text{Cramer's } V: 0.12$). Based on these results, and former studies highlighting that previous experiences of SHA is a risk factor for subsequent SHA victimization (Chiodo et al., 2009; Dahlqvist et al., 2016; Young & Furman, 2008), we conducted a separate CRT-analysis with SHA at T1 as an additional independent variable. This analysis showed SHA at T1 to be the most significant risk factor for SHA at T2 (see Appendix 3 for this decision tree).

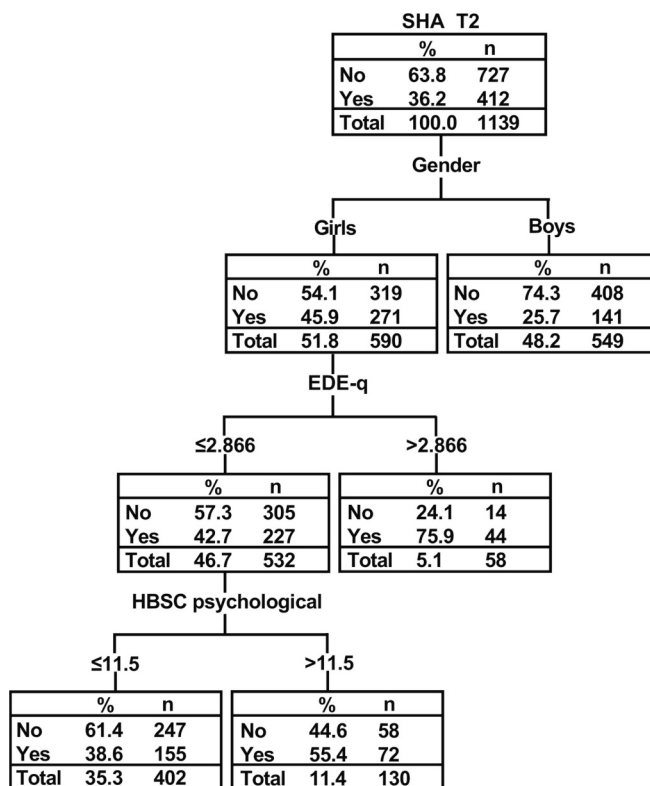


Fig. 2. Classification and regression tree (CRT) of demographic- and mental health factors for sexual harassment and abuse victimization (SHA) at T2.

EDE-q: Eating Disorder Examination Questionnaire; HBSC: Health Behavior in School-aged Children symptom checklist (psychological subscale).

4. Discussion

The present study investigated which combinations of demographic- and mental health factors were associated with subsequent SHA victimization, and the prevalence of male and female elite athletes, recreational athletes, and reference students who experienced sexual revictimization. The strongest risk factor for subsequent SHA victimization was female gender, in line with other studies reporting girls to be at higher risk for SHA than boys (Turner et al., 2010; Vertommen et al., 2016). Girls are considered to report SHA more frequently than boys (Vertommen et al., 2016), and also more likely to be distressed by such experiences (Young et al., 2009), possibly affecting self-ratings of SHA. Furthermore, living in a society that sexualizes the female body may increase the risk of sexual victimization for girls (Fredrickson & Roberts, 1997).

Furthermore, our findings indicated that symptoms of eating disorders may be a risk factor for subsequent SHA victimization among girls. An association between SHA and eating disorder psychopathology has also been reported in previous research, but often presented in the direction of SHA preceding the onset of an eating disorder (Chen et al., 2010; Hayes et al., 2021; Madowitz et al., 2015; Petersen & Hyde, 2013; Sundgot-Borgen et al., 2003). Adolescents who struggle with disordered eating or eating disorders are likely to have high weight- and shape concerns (Gowers & Shore, 2001) and high body- and self-surveillance (Petersen & Hyde, 2013). The latter indicate that they evaluate themselves and their bodies based on how they believe others evaluate them, likely in a negative manner (Hayes et al., 2021; Petersen & Hyde, 2013). Hence, the adolescents in this study, with high levels of symptoms of eating disorders, may have an increased vulnerability to internalize and/or misinterpret appearance-based comments, glances, and behaviors (Sundgot-Borgen et al., 2003). The data-driven cut off for EDE-q in the CRT-analysis was 2.866. This was higher than the clinical cut off value suggested for adolescent girls at 2.7 (Rø et al., 2015) and boys at 1.68 (Schaefer et al., 2018). It is reasonable to believe that more adolescents would have been categorized with high level of symptoms of eating disorders if the cut off in the CRT analysis would have been lower. This could possibly result in an even stronger interaction between EDE-q and SHA. In addition, the tree could have grown bigger/showed more significant risk factors because the subgroup with scores above the EDE-q cut off would be larger and therefore could have split into more child nodes/significant risk factors.

As we did not control for a history of SHA victimization or other traumatic experiences, some of the adolescents may have experienced SHA before, which could be associated with the development of an eating disorder or other mental health problems before subsequent experiences of SHA at T2.

Psychological symptoms were also a significant risk factor for subsequent SHA victimization for the girls in this study. Other researchers have also reported, among adolescent non-athletes, that mental health problems might occur before SHA victimization (Pittenger et al., 2018; Turner et al., 2010). Adolescents who experience mental health problems may be regarded as “easy” targets as they may be extra vulnerable to display internalizing (e.g., sadness) or externalizing (e.g., anger) behaviors which can trigger perpetrators to behave in harmful manners (Turner et al., 2010). Setting boundaries for sexual- and relational experimentation may be more challenging for adolescents who experience mental health problems (Turner et al., 2010), possibly limiting their ability to communicate their experience of unwanted sexual situations.

Elite athletes are highlighted as a risk group for experiencing SHA in sports (Mountjoy et al., 2016). However, according to a previous publication, high school elite male and female athletes (32.2 %) reported less SHA than recreational athletes (46.6 %) and reference students (47.0 %) (Solvberg et al., 2022), and it was therefore not surprising that the high school elite athletes did not occur as a risk group for subsequent SHA in the present study.

The prevalence of SHA revictimization in this study corresponds to the mean prevalence of revictimization reported in general for survivors of childhood sexual abuse (Walker et al., 2019). Other researchers have reported higher (Young & Furman, 2008) and lower (Edwards & Banyard, 2022) rates of SHA revictimization in middle- and high school adolescents. This is likely a result of methodological choices like different time perspectives for calculating revictimization and types of SHA measured. The higher prevalence of SHA revictimization among girls in our study supports findings in previous studies (Edwards & Banyard, 2022; Pittenger et al., 2018; Young & Furman, 2008), but the results regarding school group differences are difficult to compare because of the lack of comparable studies among athletes. These findings may reflect real differences in experience of SHA revictimization between genders and between school groups, but it could also be related to other factors like reluctance to report among boys (Pittenger et al., 2018), systematic method bias (MacKenzie & Podsakoff, 2012), and normalization of abusive behaviors in elite sports (Fasting et al., 2003; Parent & Fortier, 2018).

4.1. Strengths, limitations, and future directions

The main strengths of this study include a prospective research design and the use of CRT-analysis with high predictive accuracy. Furthermore, a large sample size, high response rate, schools geographically spread across Norway, different sports and competitive levels included, and an age-matched reference group make us consider the sample representative of male and female athlete- and general high school student populations in Norway. We included validated instruments measuring positive- and negative mental health outcomes, contributing to a holistic perspective on mental health. However, bias related to self-report questionnaires cannot be avoided. Additionally, we did not consider frequency or severity of SHA which should be included in future studies to investigate whether risk factors for different types (verbal-, non-verbal, and physical SHA) and severities of SHA differ. Future studies should also examine context- and situational-specific risk factors for SHA, and target risk factors for boys specifically because the risk factors appearing in this study were only significant among girls. The invariance analyses showed high SRMR-values, indicating a difference between the observed and the predicted correlations (Kline, 2016), most likely explained by overlapping items in our questionnaire, e.g. #11 coerced sexual act and #12 rape. Consequently, future research should emphasize the operationalization of SHA victimization

and adjustments and validation of the questionnaire items (DeVellis & Thorpe, 2021).

4.2. Practical implications

Half of the sample in our study who had experienced SHA prior to the study period reported SHA revictimization during the study period. Previous research has shown that SHA revictimization is associated with mental health symptom complexity (Hébert et al., 2021). Therefore, it is important to increase the effort to protect adolescents from both first-time and repeated experiences of SHA. Here, our study provides new information about the interaction between psychological factors (symptoms of eating disorders and other psychological symptoms) as risk factors for subsequent SHA victimization, which may inform interventional initiatives (i.e., educational programs) in the future. High school leaders, teachers, and coaches should be educated about signs and symptoms of SHA and mental health issues (e.g., utilizing the Sport Mental Health Recognition Tool) (Gouttebarga et al., 2021). Health care practitioners in sports and school settings should be trained in trauma-informed care and acquire the clinical competence to recognize, report, and support adolescents who experience SHA and concurrent mental health problems (Mountjoy & Verhagen, 2022). Targeted prevention measures must be developed and implemented in high school, aiming to prevent eating disorders at the primary-, secondary-, and tertiary level, and screen for and implement early intervention to support students with psychological symptoms with the aim of reducing the occurrence of initial and recurrent SHA victimization.

5. Conclusion

The combination of female gender, having high level of symptoms of eating disorders, and other psychological symptoms were identified as significant risk factors for subsequent SHA victimization among adolescents. These results, in addition to the high prevalence of SHA revictimization, is important knowledge to inform the development of multi-pronged prevention programs in sport- and non-sport high schools aimed at addressing the environment, culture, and competence of the leaders, teachers, coaches and health- and performance team. In addition, developing and implementing student-centered prevention programs addressing eating disorders and addressing mental health resilience and well-being are needed.

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Author contributions

All authors were involved in the planning of the project, initiated by JSB. NS and JSB ran the data collection. NS and BES conducted the statistical analyses. NS wrote the first draft of the manuscript. All authors contributed to revision of the manuscript and approved the final version.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.chiabu.2023.106592>.

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