ARE BEHAVIOURAL RISK FACTORS CLUSTERS ASSOCIATED WITH SELF-REPORTED HEALTH COMPLAINTS? UNIVERSITY STUDENTS IN FINLAND

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SUMMARY

Objectives: No previous research of university students in Finland assessed lifestyle behavioural risk factors (BRFs) and categorized students into clusters, explored the associations of the clusters with self-reported health complaints (HCs), whilst controlling for potential confounders. The current study undertook this task.

Methods: Students at the University of Turku (1,177) completed an online well-being questionnaire that assessed socio-demographic variables, 5 BRFs – problematic alcohol consumption, smoking, illicit drug use, food consumption habits, moderate-to-vigorous physical activity (MVPA), and 22 HCs. A food frequency questionnaire assessed students' consumption of a range of foods, and a dietary guideline adherence score was computed based on WHO dietary recommendations for Europe. Three separate regression models appraised the associations between the cluster membership and HCs factors, adjusting for sex, income sufficiency and self-rated health.

Results: Mean age was 23 ± 5.2 years, 77% had never smoked and 79% never used illicit drug/s. Factor analysis of HCs resulted in four-factors (psychological, circulatory/breathing, gastro-intestinal, pains/aches); cluster analysis of BRFs identified two distinctive student clusters. Cluster 1 represented more healthy students who never smoked/used illicit drugs, had no problematic drinking, and undertook MVPA on 4.42 ± 3.36 days/week. As for cluster 2 students, half the cluster smoked occasionally/daily, used illicit drug/s, and > 50% had problematic drinking and students undertook MVPA on 4.02 ± 3.12 days/week. More cluster 2 students adhered to healthy eating recommendations, but the difference was not significant between clusters. Regression analysis revealed that females, those with sufficient income, and with excellent/very good self-rated general health were significantly less likely to report all four HCs. Cluster 2 students were significantly more likely to report psychological complaints, circulatory/breathing and gastro-intestinal complaints. There was no significant association between BRFs clusters and pains/aches factor.

Conclusions: Risk taking students with less healthy lifestyles and behaviour were consistently associated with poorer psychological and somatic health.

Key words: behavioural risk factors, psychological, somatic, complaints, university students, cluster analysis

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INTRODUCTION

The university years is a unique period, and college students are a high-risk group. The numerous stressors that they are exposed to include family, financial, academic, exams and performance challenges, as well as long working hours, psychological issues, and uncertainty regarding future career prospects. Unsurprisingly, college students report depressive signs and symptoms, anxiety, and headache among others (1).

Indeed, health complaints are prevalent among college students. In terms of pains and aches, in Italy, 43.5% and 33.5% of students experienced neck and lower back pain, respectively (2), and in Iran, students of both sexes reported musculoskeletal disorders and physical conditions (3). In Poland, musculoskeletal complaints among students exhibited a 2.8 ± 2.4 severity on the visual analogue scale (4), and in China, university students were a high-risk group for psychological strain (5). Among students in Greece, musculoskeletal pain was common in the neck (59.5%), shoulders (22.8%), back (29%), and low back (66.7%) (6). Similarly, headache is a significant common problem among university students, where in Saudi Arabia, the prevalence of headache and tension headache among students was 53.8%, and 41.7% respectively (7).

Equally, as regards to psychological conditions, mental disorders are common among university students and there is a growing global awareness of the poor mental health of these young adults (8). Reports of university students indicate that depression and anxiety were common (9), and that these young adults comprise a high prevalence and vulnerable group for depression (10). Depressive disorders might have their onset during emerging adulthood, an evolutionary phase characterized by role transitions, where the environmental and social demands of transition to university favour the occurrence of depressive signs and symptoms (11).

In terms of somatic complaints, in Belgium 12.9% of the participants reported having experienced such complaints, including pain/pressure on the chest, loss of appetite, intestine-related complaints, e.g., constipation, indigestion, nausea, as well as sleep and concentration problems, hyperventilation, skin rash, and hair loss (12). Despite such a wide range of health complaints, students frequently do not seek help from health professionals (9).

The move from secondary education to university is a critical period where several factors come into play to either facilitate or impede an individual's behaviour (13). University students are hence exposed to a range of behavioural risk factors (BRFs) and unhealthy lifestyle habits. In Canada, students were vulnerable to inadequate diet and physical activity (PA) (14), where about 16% and 54% of college students met the Canadian 24-Hour Movement Guidelines for Adults (18–64 years), respectively (15). In Spain, students had low PA (16), and in Italy, students' PA levels were 19.9% no activity and 30.1% light activity (2). As for smoking, during college, students have a greater likelihood of experimenting with smoking status changes and usually consolidate their smoking behaviours (17).

The inter-relationships between BRFs and health complaints are also evident. Among Italian college students, there was a positive significant correlation between the levels of PA and frequency of neck and low back pain, where low PA levels were associated with musculoskeletal pain onset and pain worsening, and PA of < 150 min/week predisposed students to neck and low back pain (OR = 1.95, 95% CI: 1.44–2.64 and OR = 1.79, 95% CI: 1.29–2.49, respectively) (2). Similarly, higher depression and anxiety were associated with more bulimia nervosa (18).

Other variables are also important. For instance, research has found that the incidence of common mental health problems differed significantly by socio-demographic characteristics such as sex, age, living place during the university time, and lifestyle characteristics (19).

Due to the interplay of the abovementioned BRFs and the range of health complaints, cluster analysis of BRFs among adolescents and young adults is increasingly being used to uncover such relationships (20, 21). The literature reveals inquiries that have assessed the effects of individual health risk factors. However, sparse studies viewed such factors as clusters of lifestyle habits in the university milieu. Some authors reported that unhealthy lifestyle behaviours were likely to concurrently accompany each other (22, 23). When BRFs cluster, they could result in substantial health and disease implications, and consequently for strategies and interventions that guide preventive and health promotion efforts, there is a need for more holistic interventions addressing several rather than isolated or sequestrated lifestyle risk habits (14).

Therefore, to bridge these knowledge gaps and add new insights to the limited research, the current study cluster analysed several BRFs among university students and assessed their association with a range of health complaints. The specific objectives were to explore five lifestyle BRFs (tobacco smoking, illicit drug use, problematic alcohol consumption, dietary habits, physical activity), and categorize students accordingly into clusters; assess the socio-demographic characteristics of students that comprise each of the emerging clusters; analyse a wide range of 21 self-reported health complaints; and appraise the associations between the emerging BRFs clusters and students' health complaints. To the best of our knowledge, this is the first study to cluster a wide range of behavioural risk factors among a large sample of university students in Finland, and to link the clusters with health complaints.

MATERIALS AND METHODS

Ethics, Sample, Procedures

The Ethics Committee at the University of Turku in Turku, Finland, approved the study. We used an online English language questionnaire as students in Finland are fluent in English. An invitation email with an information sheet and research objectives was sent to all students (n = 4,387) enrolled at the seven faculties of the University of Turku (Humanities, Mathematics and Natural Sciences, Medicine, Law, Social Sciences, Education, and Economics).

Participation was voluntary and anonymous, and data was confidential and protected. Students were informed that by completing the survey they consented to participate. Two weeks later, another email was sent as a reminder. The total number of responses was 1,177 (response rate: 27%). The average age of the students was ≈ 23 (± 5) years, and 823 (70.4%) were females.

Survey Tool: Questionnaire

Problematic alcohol drinking was assessed using the 4 standard items that form the CAGE screening test for problem alcohol use, with 2 response options ("yes", "no"). Using the total score of these items, a binary variable was formulated, where a cut-off of scores ≥ 2 indicated the presence of "problem drinking", while scores < 2 indicated "no problem drinking" (24).

Smoking was measured with the item "Within the last 3 months, how often did you smoke (cigarettes, pipes, cigarillos, cigars)?" with response options "daily", "occasionally", and "never" (25).

Illicit drug use (ecstasy, marijuana, cocaine, heroin, crack, LSD, amphetamines) was assessed by the question "Have you ever use/used drugs?" with response options "yes, regularly", "yes but only a few times", "never" (26).

Dietary guideline adherence score was computed using responses to 12-item food frequency questionnaire (27). For sweets, cake/cookies, snacks, fast food/canned food and lemonade/soft drinks, no specific guidelines exist; hence we employed '1–4 times a month' and 'never' as recommended. To consider all sweets, cake/cookies and snacks together, we used the above composite food intake pattern score (sweets, cookies and snacks score), and healthy eating was considered present if this score was ≤ 6, corresponding to 3 times intake of these items of 'less often than 1–4 times a month'. Each of the fast food/canned food and lem-

onade/soft drinks were included as individual items in computing the objective guideline adherence index. For the remaining food groups, we used the WHO dietary guidelines recommendations for the European region (28). Consequently, for the number of daily fruit, raw and cooked vegetable servings, the cutoff was 'daily' or 'several times a day'. For meat, the cutoff was 'less than daily'; and for fish 'several times per week' was the cutoff. Milk and cereals were not included in computing of dietary guideline adherence index as the information about milk and cereals was generally too unspecific to categorize as healthy or unhealthy nutrition. The dietary guideline adherence has a maximum of 8 points (8 guidelines) calculated based on the recommendations of: sweets, cookies, snacks; fast food/canned food; lemonade/soft drinks; fruits; salad, raw vegetables; cooked vegetables; meat; and fish (27).

Two forms of physical activity (vigorous PA, moderate PA) were assessed with the following questions: "On how many of the past 7 days did you: participate in vigorous exercise for ≥20 min?; participate in moderate exercise for ≥30 min?" For each form of PA, students reported the number of days for which they engaged in any such activity (ranging from 0–7 days). Moderate-to-vigorous PA (MVPA) was computed by combining moderate PA and vigorous PA.

Self-reported health complaints (22 items): students were asked how often they have had health complaints (subjective reports of physical or psychosomatic symptoms or discomfort) in the last year. Responses were coded on a four-point scale from never to very often. The following symptoms were asked about: depressive mode, nervousness/anxiety, mood swings, difficulties concentrating, fear/phobia, sleep disorders/insomnia, nightmares, fatigue, lack of appetite, stomach trouble/heartburn, abdominal problems, neck and shoulder pain, back pain, diarrhoea, constipation, headaches, trembling hands, trembling, rapid heartbeat/circulatory problems, breathing difficulties, speech impediment, and weight gain/weight loss. The scale was taken from the German Youth Health Survey (29) and was previously used among university students in a range of countries (30, 31).

Due to their possible associations with risky behaviour, other variables (potential confounders) employed in the analysis included age; gender; and income sufficiency: "Would you say the amount of money you have is…" with 4 response options: "always sufficient", "mostly sufficient", "mostly insufficient", and "always insufficient", subsequently coded into sufficient vs. not sufficient; and self-reported health: "How would you describe your general health", rated a five-point scale from excellent to poor, collapsed into two categories 'excellent/very good' vs. 'good/fair/poor' for the current analysis.

Statistical Analysis

Independent samples t-test compared the quantitative variables, while Pearson chi-square test compared the qualitative variables. For all the variables examined, the percentage of missing values was ≤ 1.5%, except for one health complaint (speech impediment), where 56/1,177 (4.8%) of values were missing. We did not use any imputation for the missing values.

Exploratory factor analysis using principal component analysis with varimax rotation and Kaiser normalization was undertaken on the health complaints. One health complaint (weight gain/loss) was excluded from further analysis due to unclear precision. Cronbach's alpha assessed the internal consistency (reliability analyses) of the items that make up each of the four factors.

Cluster analysis was employed on the five BRFs under examination (tobacco smoking, illicit drug/s use, problematic drinking, physical activity, and dietary intake behaviour). Two-step cluster analysis identified groupings that differed on criterion variables within a data set and the procedure combines pre-clustering and hierarchical methods. Log-likelihood distance measure was applied in the two-step cluster analysis as the BRFs comprised both continuous and categorical variables. Cluster number selection was automated using Schwarz's Bayesian Criterion.

We also conducted three separate multiple linear regression models to appraise the association between cluster membership and the four factors emerging from the factor analysis of self-rated health complaints, while adjusting for participants' sex, income sufficiency and self-rated health. Statistical analyses were conducted using SPSS v 25.0, with significance level set at $p < 0.05$.

RESULTS

General Characteristics of the Sample

Mean age of the sample was 23 ± 5.2 years. More than half the respondents reported always/mostly sufficient income, and excellent/very good self-rated general health (Table 1). Across the sample, about 77% never smoked and 79% never used illicit drug/s. Mean MVPA was 4.27 ± 3.27 days per week. Sex differences were apparent for some variables, where significantly more males had used illicit drug/s only few times or regularly, reported problematic drinking, and had worse eating habits.

Factor Analysis of 21 Self-reported Health Complaints

The exploratory factor analysis of the 21 self-reported health complaints generated four factors with eigenvalues of 6.9, 1.5, 1.3 and 1.2 that cumulatively explained 52% of the total variance. Kaiser-Meyer-Olkin measure of sampling adequacy was 0.925, and Bartlett's test of sphericity was significant (chi-square test = 7103, df = 210, p-value < 0.001). The first four principal components had eigenvalues > 1. Hence, based on Kaiser's rule, we kept a four-component solution.

These four factors were broadly classified into: psychological complaints (9 items: depressive mood, nervousness/anxiety, mood swings, difficulties to concentrate, fear/phobia, sleep disorders/insomnia, nightmares, fatigue, lack of appetite); circulatory/breathing (5 items: trembling hands, trembling, rapid heartbeat/circulatory problems, breathing difficulties, speech impediment); gastro-intestinal (4 items: diarrhoea, stomach trouble/heartburn, abdominal problems, constipation); and pain/aches (3 items: neck and shoulder pain, back pain, headaches).

For the first factor (psychological complaints), factor loadings ranged between 0.46–0.78 with Cronbach's alpha 0.86; for the circulatory/breathing, factor loadings were between 0.52–0.78 and Cronbach's alpha 0.74; gastro-intestinal had factor loadings

Table 1. *General socio-demographic and behavioural characteristics of the sample (N = 1,177)*

Variable	Whole sample n (%)	Male n = 346 n (%)	Female n = 823 n (%)	p-value
Socio-demographic characteristics				
Age (years), mean (SD)	22.96 (5.21)	22.83 (4.36)	23.01(5.55)	0.585
Perceived income sufficiency				
Always sufficient	149 (12.5)	54 (15.6)	94 (11.4)	0.223
Mostly sufficient	526 (44.2)	153 (44.2)	372 (45.2)	
Sometimes insufficient	321 (27)	92 (26.6)	227 (27.6)	
Always insufficient	166 (14)	43 (12.4)	12 (14.7)	
Self-rated general health				
Excellent/very good	626 (52.6)	199 (57.5)	425 (51.6)	0.066
Good/fair/poor	544 (45.8)	145 (41.9)	393 (47.8)	
Behavioural risk factors				
Smoking (past 3 months) (n = 1,168)				
Never	911 (76.6)	257 (74.9)	648 (79.2)	0.234
Occasionally	183 (15.7)	63 (18.4)	119 (14.5)	
Daily	74 (6.3)	23 (6.7)	51 (6.2)	
Illicit drug/s (ever use) (n = 1,166)				
Never	921 (79)	249 (73)	669 (81.8)	**0.001**
Only few times	228 (19.6)	82 (24)	142 (17.4)	
Regularly	17 (1.5)	10 (2.9)	7 (0.9)	
Problem drinking (CAGE score) (n = 1,138)				
No problem drinking	810 (71.2)	218 (66.1)	588 (73.3)	**0.014**
Problem drinking	328 (28.8)	112 (33.9)	214 (26.7)	
Physical activity (days/week) (n = 1,157)				
Moderate to vigorous physical activity, mean (SD)	4.27 (3.27)	4.31 (3.49)	4.24 (3.18)	0.752
Nutrition habits (n = 1,160)				
Dietary guideline adherence index, mean (SD)	4.84 (1.57)	4.22 (1.54)	5.10 (1.51)	**< 0.001**

Numbers in bold indicate statistically significant values.

that varied between 0.65–0.73, Cronbach's alpha was 0.71; and, for the pain/aches, factor loadings fell between 0.64 and 0.77, with Cronbach's alpha 0.65.

Clustering of Students by Behavioural Risk Factors

The cluster analysis of the five behavioural risk factors resulted in two well-defined clusters with significant differences across most of the socio-demographic characteristics (Table 2). Cluster 1 (healthier group) had significantly more females, respondents with always/mostly sufficient income, and excellent/very good self-rated general health compared to cluster 2 (risk takers).

The clusters displayed significant differences across most of BRFs examined. Cluster 1, compared to cluster 2, represented more healthy students who never smoked or used illicit drug/s, had no problematic drinking, and undertook more MVPA (4.42±3.36 days/week). Adherence to the healthy eating recommendations was not significant between the clusters. Conversely, cluster 2, compared to cluster 1, represented students that exhibited more BRFs, where about half the cluster smoked occasionally/daily, used illicit drug/s a few times/ regularly, and more than half had problematic drinking and undertook less MVPA (4.02±3.12 days/ week).

Association between Behavioural Risk Factor Clusters and Self-rated Health Complaints

The regression analysis (Table 3) revealed that three socio-demographic characteristics were independent predictors of each of the four health complaint factors. Males, those with always/mostly sufficient income, and those with excellent/very good self-rated general health were significantly less likely to report all four health complaints. Cluster 2 students were significantly more likely to report psychological, circulatory/breathing and gastro-intestinal complaints. There was no significant association between the BRFs cluster and the pains/aches health complaints factor.

Table 2. *Comparison of socio-demographic characteristics and self-rated behavioural risk factors of two clusters of university students in Finland.*

Variable	Cluster 1 (healthier group) n = 567 n (%)	Cluster 2 (risk takers) n = 521 n (%)	p-value
Socio-demographic characteristics			
Age (years), mean (SD)	22.87 (5.86)	23.05 (4.22)	0.561
Sex			
Female	420 (74.1)	349 (67)	**0.022**
Male	146 (25.7)	167 (32.1)	
Perceived income sufficiency			
Always sufficient	84 (14.8)	54 (10.4)	**0.001**
Mostly sufficient	264 (46.6)	215 (41.3)	
Sometimes insufficient	146 (25.7)	151 (29)	
Always insufficient	65 (11.5)	96 (18.4)	
Self-rated general health			
Excellent/very good	329 (58)	248 (47.6)	**< 0.001**
Good/poor	234 (41.3)	272 (52.2)	
Behavioural risk factors			
Smoking (past 3 months)			
Never	567 (100)	277 (53.2)	**< 0.001**
Occasionally	0 (0)	172 (33)	
Daily	0 (0)	72 (13.8)	
Illicit drug/s (ever use)			
Never	567 (100)	287 (55.1)	**< 0.001**
Only few times	0 (0)	218 (41.8)	
Regularly	0 (0)	16 (3.1)	
Problem drinking (CAGE score)			
No problem drinking	567 (100)	207 (39.7)	**< 0.001**
Problem drinking	0 (0)	314 (60.3)	
Physical activity (days per week)			
Moderate and vigorous, mean (SD)	4.42 (3.36)	4.02 (3.12)	**0.043**
Eating healthy (points)			
Dietary guideline adherence index, mean (SD)	4.78 (1.53)	4.93 (1.57)	0.097

Numbers in bold indicate statistically significant values.

DISCUSSION

The current study assessed the clustering and co-distribution of five lifestyle BRFs (tobacco smoking, illicit drug use, problematic alcohol use, dietary habits, PA) among a large sample of Finnish students. Our main findings revealed two distinct BRFs clusters of almost even sizes, with significant differences across almost all the BRFs under examination. Cluster 1 (healthier group) comprised students with more favourable/healthier lifestyle habits who never smoked or used illicit drug/s and had no problem drinking. Conversely, cluster 2 (risk takers) represented a group of students with behaviourally riskier characteristics, as about half of them smoked occasionally/daily, used illicit drug/s a few times/regularly, and more than half exhibited problematic drinking.

In terms of the number of clusters, our findings are consistent with previous research among college students in a range of countries that consistently observed two conceptually (behaviourally) different clusters of students. Such a pattern of clustering was reported in Libya (clustering physical activity, health consciousness, daily fruit/vegetable intake, sleep, smoking) (20), China (clustering physical inactivity, sleep, dietary behaviour, internet use, alcohol consumption, smoking) (32), and Saudi Arabia (clustering fruit/sweets consumptions, PA, smoking) (33). However, such clear-cut opposing polar clusters as those we observed (e.g., zero smokers in the healthier group, 100% daily/occasional smokers in the risk takers group) are not always the case, as other studies of college students identified more than two BRFs clusters. A recent study on behavioural health risk profiles of 3,706 university students in the UK identified four clusters, and there

Table 3. *Association between behavioural risk factor clusters and self-rated health complaints*

Variable	Psychological complaints		Circulatory/breathing		Gastro-intestinal		Pains/aches	
	Std-β	**β (95% CI)**	**Std-β**	**β (95% CI)**	**Std-β**	**β (95% CI)**	**Std-β**	**β (95% CI)**
Controlling variables								
Sex (male)	−0.24	−1.83 (−2.21, −1.45)	−0.09	−0.45 (−0.74, −0.16)	−0.26	−1.35 (−1.64, −1.07)	−0.30	−1.31 (−1.55, −1.08)
Perceived income sufficiency (sufficient)	−0.15	−1.03 (−1.38, −0.67)	−0.12	−0.56 (−0.83, −0.29)	−0.05	−0.25 (−0.51, −0.02)	−0.11	−0.43 (−0.65, −0.22)
Self-rated general health (excellent/very good)	−0.33	−2.29 (−1.38, −0.67)	−0.31	−1.54 (−1.72, −1.19)	−0.27	−1.30 (−1.56, −1.04)	−0.26	−1.07(−1.28, −0.86)
Predictor								
Cluster 2 (vs. cluster 1)	0.11	0.76 (0.42, 1.13)	0.07	0.33 (0.06, 0.59)[a]	0.08	0.38 (0.12, 0.64)[b]	0.01	0.04 (−0.17, 0.26) NS

Multilinear regression was used controlling for socio-demographic characteristics; Std-ß – standardized beta coefficient; ß – beta coefficient; CI – confidence interval; models adjusted for gender, income perception, perceived health; all associations are statistically significant at $p < 0.001$ except where indicated; [a]$p < 0.05$; [b]$p < 0.01$, NS – not significant

were students with some type of risky behaviour in every cluster (21). Similarly, among young female college students in the USA, three distinct clusters emerged, and about 65% of students had two or more unhealthy behaviours (34).

As regards the clusters' characteristics, the two contrasting groups we identified, namely the healthier group and risk takers also concur with other studies (21, 33). These two behaviourally different student groups, representing quite opposing clusters of BRFs might be explained by the fact that behaviour does not operate in an isolated manner, as individuals who engage in a risky behaviour are likely to engage in other risky behaviours. Conversely, people with healthier lifestyles are likely to follow a healthy diet, not smoke, and be physically active. Such behavioural 'transfer effect' (35) could be a consequence of behavioural domains being mutually supportive, where individuals transfer their knowledge and confidence from one behaviour to another (35). For example, individuals who undertake regular PA are also likely to begin to modify their eating behaviours. This represents a carry-over effect in which ability (e.g., being physically active) in one domain promotes an increase in healthy behaviour in another domain (e.g., adopting a healthy diet) (35).

An interesting finding we observed is that although our cluster 2 (risk takers) students exhibited more unhealthy characteristics, surprisingly, they were more adherent to the healthy eating recommendations compared to cluster 1, although the difference was not statistically significant. This finding is congruent with a study of undergraduates across seven universities in England, Wales and Northern Ireland, where the cluster of students with the highest regard for healthy eating and second highest fruit/vegetable consumption was also simultaneously moderately high on alcohol, tobacco, and other drugs (ATOD) use (21). Such findings are compatible with the compensatory health belief model (36). The 'compensation effect' refers to the phenomenon where individuals engaging in risky behaviour may compensate for it by performing healthy behaviour in another area. For example, individuals who do not consider modifying their high alcohol consumption habits might perform PA regularly to compensate for their alcohol consumption (36).

As for the relationships between the emerging BRFs clusters and the four health complaints factors while adjusting for sex, income sufficiency and self-rated health, cluster 2 (risk takers) membership, compared to cluster 1, was positively associated with psychological complaints. This concurs with several studies on adolescent and university students in different countries, where risky behaviour was associated with a wide range of psychological complaints, including anxiety or depression (37, 38). The same pattern has also been reported among Dutch high school students, where unhealthy behaviour was associated with poor psychosocial and physical health (39). Whilst the design of the current study does not allow inferences about the direction of the effects, it could be that individuals with psychological conditions may engage in risky behaviour as a coping mechanism or to seek relief from psychological burdens (40).

We also observed that cluster 2 students (risk takers) were significantly more likely to report circulatory/breathing than cluster 1. About 47% of cluster 2 students smoked occasionally/daily, a significant risk factor for circulatory and respiratory conditions, and can be associated with a range of vascular and breathing complaints, lung disease, and respiratory conditions (41). Indeed,

university students who smoked had more respiratory problems than those who did not (42).

Equally, we also found that cluster 2 students (risk takers) were significantly more likely to report gastrointestinal complaints than cluster 1. A body of evidence supports the association of risky behaviours, e.g., alcohol consumption and illicit drug use with gastrointestinal complaints, inflammation, and ulcers (43, 44). Among medical students, research on the association between lifestyle and dietary factors and dyspepsia found a significant association between smoking and dyspepsia (45), and among an adolescent school population, smoking and alcohol were risk factors for oesophageal symptoms (46). As for the direction of the effects, some gastrointestinal complaints themselves might lead to risky behaviour where people with irritable bowel syndrome or inflammatory bowel disease may experience significant pain and discomfort, leading to self-medicating pain relief with drugs or alcohol (47).

In the current study, there was no association between BRFs cluster and pains/aches factor. The relationship between risky lifestyle behaviour and pain symptoms remains unclear. Our findings are congruent with those of adolescents, where the associations between pain and risky behaviour were inconsistent, including positive associations (48), no association (49), or a negative association (50).

This study has limitations and generalizations should be cautious. This survey was cross-sectional, so the direction of the association between BRFs and health complaints cannot be ascertained. Data were self-reported (possible recall bias, social desirability/sociability), the participants were recruited at one university in Finland, and the response rate was not very high, however, this is a common challenge in internet-based surveys. We did not assess differences between students who participated in the survey and those who did not, as we were unable to obtain data about those who did not participate in the survey. The study also has many strengths. It is the first among university students in Finland that assessed and categorized students into clusters based on several BRFs and explored the associations of the clusters with four factors of self-reported health complaints, whilst controlling for potential confounders.

CONCLUSION

Cluster analysis of BRFs can reveal high-risk groups, and hence guide health promotion interventions. We found that females, those with sufficient income, and with excellent/very good self-rated general health were significantly less likely to report all four health complaints. Risk-taking students were significantly more likely to report psychological complaints, circulatory/breathing and gastrointestinal complaints. Prevention and intervention efforts should offer harm reduction and other interventions to people with problematic use. Such efforts should aim at encouraging and promoting regular physical activity through sports programmes and fitness facilities, as well as smoking cessation advice and substance use prevention and intervention services.

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Conflicts of Interest

None declared

Adherence to Ethical Standards

This study has been reviewed and approved by the University Research and Ethics Committee (Approval # Lausunto 10/2010). Students were informed that by completing the survey, they agreed to participate in the study.

Authors' Contributions

R.S., W.E.A. – developing research questions; R.S. – statistical analyses; R.S., W.E.A. – interpretation of data and writing; K.E.A. – literature searches; K.E.A., S.S. – reviewing manuscript. All authors read and approved the final version of the manuscript.

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