BEHAVIOURAL RISK FACTORS CLUSTERS AND THEIR ASSOCIATIONS WITH SELF-REPORTED BURDENS AMONG UNIVERSITY STUDENTS IN FINLAND

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SUMMARY

Objectives: No research among Finnish universities grouped students into clusters, based on their lifestyle behavioural risk factors (BRFs), and appraised relationships of the clusters with self-reported burdens, adjusting for confounders. The aim of the study was to undertake this task.

Methods: Students (N = 1,169) at Turku University completed online questionnaire comprising socio-demographic variables (age, sex, income, social support), 18 burdens, and 4 BRFs (smoking, alcohol, drug use, food habits). Factor analysis reduced burdens into factors; cluster analysis of BRFs categorized students into clusters. Regression models appraised associations between socio-demographics and clusters with burdens.

Results: Mean age was 23 ± 5 years, with 70.4% females, 23.4% smokers, 28.8% problematic drinkers, 21.1% illicit drug/s users, and mean dietary guideline adherence 4.84 ± 1.57 (maximum score of 8 points). Factor analysis of burdens generated four factors: 'Studies' – 3 items; 'Future' – 3 items; 'Relationships' – 7 items; and 'Needs' – 5 items. Cluster analysis produced four BRFs clusters with significantly different BRFs and socio-demographics. Cluster 1 exhibited less risk-taking behaviours, cluster 4 comprised more risk-taking, and the other two clusters fell in between. Regression showed that females were more likely to report all four burdens; higher social support was associated with less burdens generally; older age was associated with less 'Studies' + 'Future' + 'Relationships' burdens; and sufficient income was associated with less 'Studies' + 'Future' burdens. Compared to cluster 1, cluster 3 and 4 membership was more likely to feel 'Needs' burdens; cluster 2 and 3 was more likely to report 'Relationships' burdens (p-range: < 0.05 to < 0.001 for all).

Conclusion: Controlling for socio-demographics, cluster membership was more influenced by students' perceptions of 'Relationships' + 'Needs', rather than academic difficulties of 'Studies' or unsecure 'Future'. Risk taking was more likely with relationship difficulties, isolation, and day-to-day problems (housing, financial situation, health) rather than academic load or concerns for future prospects. Preventive and intervention efforts tackling students' lifestyle behaviours need to consider programmes aimed at better relationship building/maintenance to prevent isolation, while mitigating 'on-the-ground' everyday challenges that students face.

Key words: behavioural risk factors, burdens, university students, cluster analysis, social support

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INTRODUCTION

University students face a range of burdens during transition from adolescence to adulthood, rendering them a particularly vulnerable group (1). Moreover, their lifestyles are frequently characterized by unhealthy behaviours (2). While young adulthood is a period for adopting and stabilizing lifelong healthy behaviour, university life is independently associated with burdens that may further affect health and well-being (3).

In terms of burdens, across university students in Germany, Poland, and Bulgaria, students felt burdened by their course work, exams, uncertainty of the future, problems with relationships and feeling isolated (4). Other significant burdens that students face include financial obligations, overwhelming workload, pressure to succeed, and work-life balance (5). Studies found that 35.9%–60.4% of undergraduates felt burdened by studies, assignments and presentations, lack of time for studies, and bad job prospects (6). For instance, across 7 universities in Northern Ireland, Wales and England, one third of the students were highly burdened by finances (7), as well as exams, workload, and lack of time (8). Likewise, in the USA, the cognitive burden created by student loans is significant (9, 10). Collectively, such burdens exert pressure on students, manifested as poor academic performance (11), depression (12), anxiety (13), or even suicidal thoughts (14).

Pertaining to behavioural risk factors (BRFs), unhealthy lifestyle behaviours are prevalent among university students. Many exhibit low rates of healthy nutrition or dietary patterns that are below the recommended guidelines (15–17). Likewise, cigarette

smoking is frequently initiated as individual's transition from high school to university (18). In addition, university students have been reported to be heavy drinkers (19), with higher consumption of alcohol than their non-university peers (20), and illicit drug use is common (21–23).

The congregation of unhealthy behaviours (smoking, alcohol consumption, illicit drug/s use, bad eating habits) influence students' health and mortality risk (24), as unhealthy behaviours cluster together to generate multiplier effects. More than 65% of young full time female students at a USA university reported ≥ 2 unhealthy behaviours (25), and BRFs co-occur with each other (26–28). Clustering of BRFs refers to an observed proportion of a combination of risk factors in excess of its expected proportion (29).

Other variables related to both burdens and BRFs play a confounding role. Among university students, differences related to sex (6, 8), age or year of study (30–32), and income (33, 34) have been observed in the levels of perceived burdens and in BRFs. Likewise, adequate social support, defined as supportive actions by others that facilitate one's ability to cope with a stressful situation (35), may attenuate the burden of stressful events (36, 37) and significantly buffer the effects of risky behaviour on physical and psychological health (38).

The literature reveals knowledge gaps. Despite the variety of burdens and BRFs characterizing this young adult population, surprisingly few studies have examined the range of student-related perceived burdens (categorized into factors) and the relationships of such burdens with a range of BRFs (categorized into clusters) (23, 39, 40). We are not aware of any studies that undertook this task among Finnish university students. The current study bridges this knowledge gap by utilizing a cluster analysis approach (41), an increasingly popular method in the assessment of BRFs. We employed a large sample of students at a university in Finland in order to analyse their 18 self-reported burdens in components; identify and describe the clustering of four major lifestyle BRFs (tobacco, alcohol, illicit drugs, nutrition behaviour); characterize the student characteristics of each of the emerging clusters in terms of socio-demographics and BRF distribution; and to examine the associations between the emerging BRFs clusters and the groups of self-reported burdens, controlling for confounders (sex, age, income sufficiency, social support).

University settings are important in shaping life-long health behaviours (42). Hence, it is important to monitor students' behaviour at this young adulthood stage (43, 44). The current study adds new insights to the limited research on students' self-reported burdens and their association with BRFs clusters. The findings would be useful for educators, policy makers, and other stakeholders to guide policies and approaches for prevention as well as tailoring intervention strategies aimed at university students' well-being.

MATERIALS AND METHODS

Ethics, Sample and Procedures

The Research and Ethics Committee at the University of Turku in Finland approved the study. Data were collected through an online survey using an English-language questionnaire. An email invitation outlining the research objectives was sent to all 4,387 Finnish students enrolled across the university's seven faculties: Humanities, Mathematical and Natural Sciences, Medicine, Law, Social Sciences, Education, and Economics. As English proficiency is generally high among young adults in Finland, particularly among university students, translation of the questionnaire into Finnish was considered unnecessary.

Participation was voluntary and anonymous, with data kept confidential and protected. This involved no identifiers, strict access limited to the research team, secure computer storage, and monthly password updates. No paper copies were maintained. Students received detailed information about the study, including contact details for any questions. They were informed that completing the questionnaire implied their consent to participate. Once the questionnaire was completed, responses were automatically saved and forwarded to the university's student office. A total of 1,169 students responded, resulting in a response rate of 27%. The average age of the participants was approximately 23 ± 5 years, with 823 (70.4%) being female.

Research Tool: Survey Questionnaire

Socio-demographic information included the students' sex and age. The subjective financial situation was assessed with the question, "How sufficient is your income?" Participants responded using a 4-point scale, which was later dichotomized into "always/mostly sufficient" versus "always/mostly insufficient" (45).

Social support was measured by the item: "Are you on the whole satisfied with the support you get in such situations?" using a 5-point scale (1 – very satisfied, 5 – very dissatisfied) (46).

Perceived burdens associated with coursework and exams, relationships, isolation, and expectations regarding the future were assessed by asking the students: "To what extent do you feel burdened in the following areas?" (18 individual burdens). Responses were coded on a six-point scale from: "not at all" to "very strongly" (4).

Problematic alcohol use was assessed using the four standard items from the CAGE screening test, with response options "yes" or "no". Two or more affirmative responses indicate problem drinking. Respondents were classified as non-problematic drinkers (fewer than two positive responses) or problematic drinkers (two or more positive responses) (47).

Smoking was assessed with the question, "Within the last 3 months, how often did you smoke (cigarettes, pipes, cigarillos, cigars)?" The response options were "daily", "occasionally", and "never" (48).

Illicit drug use (including ecstasy, marijuana, cocaine, heroin, crack, LSD, and amphetamines) was assessed with the question, "Have you ever used drugs?" The response options were "yes, regularly", "yes, but only a few times", and "never" (49).

Dietary habits were assessed using a 12-item food frequency questionnaire. Respondents reported their consumption of various food groups, including sweets, cakes/crackers, fast food, canned foods, fresh fruit, raw and cooked vegetables, salads, meat, fish, dairy products, and cereals. The question "How often do you eat the following foods?" asked students to indicate the frequency of their usual consumption for each food group on a 5-point scale: "several times a day", "daily", "several times a week", "1–4 times a month", and "never". This question gathered information on the students' overall food consumption (50).

Dietary guideline adherence score was calculated based on the students' responses to the food frequency questionnaire. Since there are no specific guidelines for sweets, cakes/cookies, snacks, fast food/canned foods, and sodas/soft drinks, we used "1–4 times a month" and "never" as the recommended values. For assessing sweets, cakes/cookies, and snacks together, we combined the intake scores of these items and considered a score of ≤6 (corresponding to consuming these items "< 1–4 times per month") as indicative of healthy eating. Fast food/canned foods and soda/soft drinks were included as separate items in the calculation of the dietary adherence score. For other food groups, we used the WHO European Region recommendations (51). The thresholds were set as follows: "daily" or "several times a day" for fruit and raw/cooked vegetables, "less than daily" for meat, and "several times a week" for fish. Milk and cereals were not included in the compliance score calculation due to the non-specific nature of the information provided about these items. The maximum dietary adherence score was 8 points, based on the recommendations for the following 8 food groups: sweets, cookies, snacks; fast food/canned food; lemonade/soft drinks; fruit; salad, raw vegetables; cooked vegetables; meat; and fish (50, 51).

Statistical Analysis

We used independent samples t-tests to compare quantitative variables and Pearson chi-square tests for qualitative variables. Exploratory factor analysis, utilizing principal component analysis with varimax rotation and the Kaiser-Meyer-Olkin test for sampling adequacy was conducted on the self-reported perceived burdens items. The internal consistency of the items forming each factor was assessed using Cronbach's alpha. A two-step cluster analysis was applied to four behavioural risk factors (tobacco smoking, alcohol drinking, illicit drug use, and eating behaviour) to identify clusters that varied in criterion variables within the dataset. This procedure combined pre-clustering and hierarchical methods. A log-likelihood distance measure was used in the two-step cluster analysis because the BRFs included both continuous and categorical variables. The number of clusters was determined automatically using the Schwarz Bayesian criterion. For each cluster, categorical BRFs were reported as frequencies and percentages, while continuous BRFs were reported as means and standard deviations. Differences in the distribution of socio-demographic characteristics and BRFs across clusters were tested using chi-square tests for categorical variables and analysis of variance for continuous variables.

Multiple linear regression models were used to examine the association between cluster membership and four perceived burdens factors, adjusting for participants' gender, age, income sufficiency, and satisfaction with social support. No imputation was used for missing values as the number of missing values was negligible; thus, complete case analysis was employed, limiting the analysis to respondents with complete data. Statistical analyses were performed using SPSS v25.0, with statistical significance set at $p < 0.05$.

Table 1. *Socio-demographic and behavioural characteristics of the sample (N = 1,169)*

Variable	Whole sample n (%)	Males n = 346 n (%)	Females n = 823 n (%)	p-value
Socio-demographic characteristics				
Age (years), mean (SD)	22.96 (5.21)	22.83 (4.36)	23.01 (5.55)	0.59
Perceived income sufficiency				
Always/mostly sufficient	675 (56.8)	207 (59.8)	466 (56.6)	0.30
Always/mostly insufficient	487 (41)	135 (39)	348 (42.3)	
Behavioural risk factors				
Illicit drug/s (ever use)				
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)	
Problematic drinking (CAGE score)				
No	810 (71.2)	218 (66.1)	588 (73.3)	**0.014**
Yes	328 (28.8)	112 (33.9)	214 (26.7)	
Smoking (past 3 months)				
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)	
Nutrition habits, mean (SD)[a]				
Dietary guideline adherence index	4.84 (1.57)	4.22 (1.54)	5.10 (1.51)	**< 0.001**

Numbers in bold indicate statistically significant values. Numbers might not sum up to total because of missing values.
[a]Range 1–8, each point increase represents an additional food group that shows adherence to dietary guidelines.

RESULTS

Characteristics of the Sample

Table 1 shows that the mean age was about 23 years, the majority of the sample always/mostly had sufficient income during semesters, and about three-quarters of students never smoked. There were no sex differences in age, perceived income sufficiency, and smoking. Based on the CAGE score, significantly more males than females had problematic drinking. Conversely, although most respondents never used illicit drug/s, significantly more females (81.8%) reported it, and more females had better nutritional habits, scoring higher on the dietary guideline adherence index.

Factor Analysis of 18 Self-reported Burdens

Table 2 shows the exploratory factor analysis of the 18 self-reported burdens generated by four factors with eigenvalues of 5.6, 1.9, 1.4 and 1.1 that cumulatively explained 55.2% of the total variance. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.87, and Bartlett's test of sphericity was significant (chi-square test = 6,609, df = 153, $p < 0.001$).

Table 2 also depicts the four factors, their items and factor loadings. They were broadly classified into: 'Studies' (3 items, Cronbach's $\alpha = 0.74$); 'Future' (3 items, Cronbach's $\alpha = 0.63$); 'Relationships' (7 items, Cronbach's $\alpha = 0.81$); and 'Needs' (5 items, Cronbach's $\alpha = 0.7$).

Clustering of Behavioural Risk Factors among Students

The silhouette measure of cohesion and separation indicates that four high-quality clusters were generated. At the two extremes, cluster 1 (lower risk takers) comprised students who generally exhibited less risk-taking behaviours, while conversely, cluster 4 (higher risk takers) membership was characterized by more risk-taking behaviours. The other two clusters fell in between, namely, cluster 2 (problem drinkers) and cluster 3 (illicit drug takers).

Table 3 shows that in terms of socio-demographics, across the clusters there were no significant differences in age. Clusters 1 and 2 had more females and more income-sufficient respondents. There were also significant differences in satisfaction with social support across the four clusters, where cluster 1 students reported the highest level of satisfaction with their social support and clusters 3 and 4 the lowest.

Pertaining to the BRFs, there were significant differences across all four BRFs between the clusters. Cluster 1 (lower risk takers) was generally characterized by that none of the respondents ever smoked, had problematic drinking or used illicit drug/s, although they displayed the second lowest healthy eating score. On the other hand, cluster 4 (higher risk takers) members comprised all students who were occasional/daily smokers, half used illicit drug/s regularly or a few times, half were problematic drinkers, and they also exhibited the lowest healthy eating score.

The other two clusters fell in between these two polars, where students exhibited some extent of "preference". Cluster 2 students

Table 2. *Factor analysis of 18 self-reported burdens into four factors*

Burden	Subscale			
	Studies	Future	Relationships	Needs
Cronbach's alpha	0.74	0.63	0.81	0.70
Eigenvalue	1.1	1.4	5.6	1.9
Studies in general	0.826			
Exams, assignments, presentations	0.829			
Lack of time for studies	0.595			
Lack of practical relevance of studies		0.627		
Anonymity at university		0.679		
Bad job prospects		0.670		
Problems with parents			0.622	
Problems with fellow students			0.750	
Problems with friends			0.765	
Relationship with significant other			0.454	
Sexuality			0.556	
Isolation at the university			0.585	
Isolation in general			0.627	
Housing				0.670
Health problems				0.540
Financial situation				0.626
Workload in addition to studying				0.569
Bad working conditions				0.607

Extraction method: principal component analysis; varimax rotation with Kaiser normalization; rotation converged in 9 iterations

Table 3. *Comparison of socio-demographic characteristics and behavioural risk factors across four clusters of university students in Finland*

Characteristics	Cluster 1 n = 574 n (%)	Cluster 2 n = 161 n (%)	Cluster 3 n = 121 n (%)	Cluster 4 n = 249 n (%)	p-value
Risk taking behaviours	Overall less	↔		Overall more	
		'Preference'			
		Alcohol	Illicit Drug/s		
Socio-demographic					
Age (years), mean (SD)	22.83 (5.83)	22.77 (4.30)	23.84 (4.42)	22.98 (4.34)	**0.253**
Sex					
Female	425 (74.0)	118 (73.3)	69 (57.0)	168 (67.5)	**0.003**
Male	148 (25.8)	42 (26.1)	49 (40.5)	80 (32.1)	
Perceived income sufficiency					
Always/mostly sufficient	352 (61.3)	94 (58.4)	60 (49.6)	120 (48.2)	**0.001**
Always/mostly insufficient	214 (37.3)	66 (41.0)	61 (50.4)	125 (50.2)	
Social support, mean (SD)[a]	1.96 (1.05)	2.07 (1.13)	2.17 (1.12)	2.33 (1.26)	**< 0.001**
Behavioural risk factors					
Smoking (past 3 months)					
Never	574 (100.0)	161 (100.0)	121 (100.0)	0 (0)	**< 0.001**
Occasionally	0 (0)	0 (0)	0 (0)	175 (70.3)	
Daily	0 (0)	0 (0)	0 (0)	74 (29.7)	
Problematic drinking (CAGE score)					
No	574 (100.0)	0 (0)	77 (63.6)	133 (53.9)	**< 0.001**
Yes	0 (0)	161 (100.)	44 (36.4)	116 (46.1)	
Illicit drug use					
Never	574 (100)	158 (98.1)	0 (0)	133 (53.4)	**< 0.001**
Yes, regularly	0 (0)	3 (1.9)	1 (0.8)	13 (5.2)	
Yes, only a few times	0 (0)	0 (0)	120 (99.2)	103 (41.4)	
Healthy eating (points)[b]					
Dietary guideline adherence score	4.77 (1.53)	5.04 (1.48)	5.12 (1.52)	4.76 (1.65)	**0.04**

[a]higher score – higher dissatisfaction; [b]range 1–8, each point increase represents an additional food group that shows adherence to dietary guidelines
Numbers in bold indicate statistically significant values. Numbers might not sum up to total because of missing values.

(problem drinkers) were characterized by their higher alcohol consumption, as all students were problem drinkers, despite that all never smoked, mostly all never used illicit drug/s, and were the second highest in terms of their healthy eating habits. On the other hand, cluster 3 (illicit drug takers) was distinguished by a higher illicit drug/s use, where all students had used illicit drug/s regularly or a few times, more than a third were problem drinkers, despite that all were never-smokers, and they had the healthiest eating habits of all the clusters.

Associations between Socio-demographic Variables and Behavioural Risk Factor Clusters with Self-reported Burdens

Table 4 shows the associations of the socio-demographic variables, social support, and BRFs clusters with individual burdens components. For the socio-demographic variables, in terms of the number (breadth) of the associations, generally, sex was significantly associated with all four burdens, whilst age was significantly associated with three burdens. As for the direction of the associations, females were more likely to report all four types of burdens. Additionally, having sufficient income was significantly associated with less 'Studies' and 'Future' burdens. Higher satisfaction with social support was significantly associated with less burdens generally. Older age was significantly associated with less 'Studies', 'Future' and 'Relationships' burdens.

Pertaining to the clusters, generally, there were differences in 'Relationships' and/or 'Needs' burdens rather than the 'Studies' and 'Future' burdens. For instance, compared to cluster 1, cluster 3 and cluster 4 membership was significantly more likely to feel 'Needs' burdens, and cluster 2 and cluster 3 membership was significantly more likely to report 'Relationships' burdens.

DISCUSSION

The current study adds new insights to the limited research on lifestyle habits of university students pertaining to the clustering of

Table 4. Association of behavioural risk factor cluster with individual burden components

Predictors	Studies		Future		Relationships		Needs	
	Std-β	β (95% CI)	Std-β	β (95% CI)	Std-β	β (95% CI)	Std-β	β (95% CI)
Sex (female)	0.20	1.34 (0.97, 1.72)***	0.11	0.66 (0.31, 1.01)***	0.09	1.13 (0.44, 1.81)***	0.23	2.17 (1.64, 2.70)***
Age	−0.09	−0.05 (−0.08, −0.02)**	−0.11	−0.06 (−0.09, −0.03)***	−0.11	−0.11 (−0.17, −0.05)***	0.01	0.01 (−0.04, 0.06)
Income sufficiency (sufficient)	−0.16	−0.98 (−1.33, −0.64)***	−0.08	−0.45 (−0.78, −0.13)**	−0.06	−0.52 (−1.14, 0.10)		NA[c]
Social support[a]	0.41	0.15 (0.26, 0.56)***	0.18	0.44 (0.30, 0.59)***		NA[b]	0.22	0.87 (0.66, 1.09)***
Cluster 4 (vs. cluster 1)	−0.01	−0.06 (−0.49, 0.39)	−0.01	−0.07 (−0.48, 0.34)	0.06	0.89 (−0.05, 1.81)	0.17	1.24 (0.62, 1.87)***
Cluster 2 (vs. cluster 1)	0.04	0.39 (−0.16, 0.91)	0.05	0.36 (−0.11, 0.84)	0.08	1.00 (0.20, 1.81)*	0.04	0.48 (−0.25, 1.22)
Cluster 3 (vs. cluster 1)	0.02	0.17 (−0.41, 0.75)	0.02	0.17 (−0.38, 0.71)	0.09	1.55 (0.48, 2.61)**	0.11	1.54 (0.72, 2.36)***

Std-ß – standardized beta coefficient; ß – beta coefficient; CI – confidence interval; all variables in the model adjusted for all the other variables; perceived social support *p < 0.05, **p < 0.01, ***p < 0.001; [a]higher ratings of social support represent less satisfaction with social support; [b]social support was not included in the analyses as it is part of 'Relationships' burden component; [c]perceived income sufficiency was excluded as it is encompassed within the 'Needs' burden component

BRFs (nutrition behaviour, alcohol, tobacco, illicit drug/s use), and their association with self-reported burdens. To our knowledge, this is the first study of a large sample of university students in Finland to undertake such analysis.

Our main findings were that there were four unique sets of burdens that students felt (Studies, Future, Relationships, Needs). The study also noted four distinct BRFs clusters that were significantly different from each other in terms of their relative configurations of the four risk factors (lower risk takers, problem drinkers, illicit drug takers, higher risk takers), and also significantly different in terms of their students' socio-demographic characteristics.

Collectively, these findings suggest several points regarding the characteristics of clusters of lifestyle habits. First, BRFs do not exist in a solitary fashion, rather they group together in constellations. Individuals engaging in one risky behaviour probably engage in other risky behaviours; and conversely, students with healthier lifestyles are likely to maintain healthy diets, not smoke and be physically active. Second, despite this, such clusters do not represent clear-cut opposite-facing constellations of behaviours. Hence, we noted that although some clusters, e.g., cluster 4 (higher risk takers) was characterized by several unhealthy behaviours, the cluster still harboured healthy patterns of eating; and vice versa, where despite that some clusters were characterized by generally healthy behaviours, e.g., cluster 1 (lower risk takers), their members still engaged in unhealthy activities, reflected by less healthy nutritional habits.

Such observed contrast or paradox might be explained by the principle of compensatory health beliefs, where individuals engage in risky behaviour/s in one area of their lives, and attempt to balance it out by performing healthy behaviour/s in another sphere of their life (52). For example, individuals who drink alcohol on regular basis might also regularly exercise and eat healthy to feel like balancing out the health risks associated with the regular alcohol use. However, such proposed trade-offs remain unclear. Whether any beneficiary effects accrued from exercise and a healthy diet actually counteract the negative health impacts of excessive alcohol consumption remain to be uncovered. Some propositions hold that improving physical fitness by working out and eating a healthier diet is one of the most effective ways to combat alcoholism and counteract the many negative health effects that it causes (53).

As for the prevalence of BRFs (unhealthy behaviours) within each cluster, we noted differences for three (alcohol consumption, illicit drug use, smoking) out of the four BRFs examined. Pertaining to alcohol consumption, with the exception of cluster 1, the other three clusters represented students with 46%, 100% and 36% prevalence of problematic alcohol consumption, respectively. These findings support other studies in university settings that found that problematic drinking patterns characterized student life (54, 55). University life symbolises the transitions from the stricter parental control and structured high school environment to a more independent and less supervised lifestyle, with freedom, desires to explore boundaries, and peer social pressure to fit in the group (56). These might contribute to a higher alcohol consumption. Others have also noted that students might consume alcohol as a mechanism to cope with academic stress, pressure and deadlines, or social anxiety (57–59).

Across our sample, 22% of the students regularly or occasionally used illicit drugs, with the highest prevalence observed in

cluster 3 (illicit drug takers) and cluster 4 (higher risk takers). Compared with data from other countries and regions, a national survey of 2,810 students in the UK reported that 56% of respondents had used drugs, and 39% currently used them (60); and a large scale North American survey showed that the annual prevalence of illicit substance use among university student populations was 43% (61).

Interestingly, smoking was observed only in cluster 4, characterized by members with more risky behavioural patterns as all students in this cluster smoked occasionally/regularly. More recent data from the 2021 Finnish Student Health and Well-being Survey observed that, among university students, 6% of women and 5% of men were daily smokers (62) suggesting a decreasing trend, a pattern observed globally and supported, for example, by data from the USA (63).

Relationship between BRF Cluster Membership and Specific Burdens

Using regression analyses adjusted for sex, age, income sufficiency and social support, the current study appraised the relationships between the BRFs clusters and the four sets of self-reported burdens. Compared to cluster 1 (lower risk takers), cluster 4 (higher risk takers) and cluster 3 (illicit drug takers) were significantly more likely to report the 'Needs' burdens, comprising elements related to housing, health problems, finances, and workloads.

Such significant differences between the higher and lower risk takers in relation to the 'Needs' burdens might be partly attributed to the higher levels of illicit drug use and problematic drinking evident in cluster 3, along with the additional smoking observed in cluster 4, compared to cluster 1. Multiple substance use, e.g., alcohol, tobacco and other drugs (ATOD) is frequently associated with difficulties and negative life consequences, with higher likelihood of experiencing adverse outcomes, increased risk of physical and chronic health issues, as well as mental health conditions, all burdens that negatively impact well-being and render it harder to cope with daily challenges (64–67). ATOD use is also costly, posing additional financial burdens on students already facing financial strains. Collectively, such features might lead to the burdens of meeting basic needs, fulfilling responsibilities and goals, and negatively impacting academic performance (68).

We also noted that cluster 2 (problem drinkers) and cluster 3 (illicit drug takers) students were significantly more likely to report 'Relationship' burdens compared to cluster 1 (lower risk takers). Again, alcohol and illicit drug use, characteristic of our cluster 2 and 3 students may strain relationships with family, friends, and partners, potentially resulting in feelings of isolation and diminished support (69). Indeed cluster 3 students reported significantly lower satisfaction with the level of social support they receive compared to cluster 1 students.

In connection with links between socio-demographic and social support on the one hand and burdens on the other, across the current sample, higher social support was significantly associated with less burden components that were examined. Our findings support other research, where higher social support is viewed as a protective factor that can alleviate the burdens encountered in various aspects of life, and relieve emotional strains and stress (70) that are related to academic life and 'Studies' (71–73), and basic 'Needs' (74).

As for gender, across our sample females were significantly more likely than males to be burdened by the 'Studies', 'Future', 'Relationships', and 'Needs' burdens. Although the precise reasons why females felt 'Studies' as a burden are difficult to speculate, however, generally, women value higher education and attach more attention and focus on their studies, possibly to the extent of feeling 'burdened' by 'Studies'. Such propositions are in line with a number of studies that found higher general and academic stress levels among female students compared to their male counterparts (75, 76). The reasons why females felt the 'Needs' and 'Future' burden more than males are again difficult to pinpoint, but it is plausible that females value strongly the links between academic success and future financial stability, motivating them to focus on their future careers in order to satisfy needs.

In terms of age, we observed that older age was significantly associated with less 'Studies', 'Future' and 'Relationships' burdens. As younger university students progress in age and advance through their academic journey, they acquire more skills and life experience rendering them more adaptable to new situations, as well as effective strategies and better-coping mechanisms to navigate life challenges and stress. Pertaining to income sufficiency, across our sample, those with sufficient income were less likely to report 'Studies' and 'Future' burdens, congruent with research where perceived socioeconomic status predicted better well-being outcomes (33, 77).

This study has limitations. Cross-sectional survey designs do not allow the confirmation of the direction of associations. Data were self-reported, and we are unable to exclude recall and social desirability biases. The low response rate could have affected the sample's representativeness, and hence internal validity and generalizability. Our questionnaire focused on cigarette smoking rather than the use of electronic cigarettes, which are also prevalent among young adults. Future research would benefit from addressing these limitations. Despite these limitations, the study boasts many strengths, including a large sample of students from all the University's departments and faculties, categorized into clusters that report on a wide range of health-related BRFs. To our knowledge, it is the first study among university students in Finland to evaluate and categorize students into BRF clusters and to explore the associations of these clusters with burdens, while controlling for multiple potential confounders.

CONCLUSIONS

Cluster analysis of BRFs can reveal high-risk groups. The current study identified four BRFs clusters, which, although distinct, do not represent clear-cut opposite-facing constellations of behaviours. Generally, substance users were significantly more likely to report 'Needs', 'Relationships' and 'Needs' burdens. Higher social support was associated with fewer burdens. BRFs are products of lifestyle choices. Therefore, the identification of BRFs clusters as in the current study can guide health promotion prevention efforts to encourage regular physical activity, healthy eating habits and nutrition, as well as smoking cessation and responsible drinking programmes, and effective behavioural modification interventions to protect the health of these young adults. Our findings can assist educators, policymakers and other stakeholders involved with similar student populations.

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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). All students were informed that by completing the survey, they agree to participate in the study. All methods were carried out in accordance with relevant guidelines and regulations (Declaration of Helsinki).

Availability of Data and Materials

Data are available from the authors upon reasonable request to corresponding author.

Authors' Contributions

WEA – conceptualization; WEA, RS – methodology; RS – analyses; WEA, RS, KEA – investigation; WEA, RS, KEA – writing, original draft preparation. All authors have read and agreed to the published version of the manuscript.

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