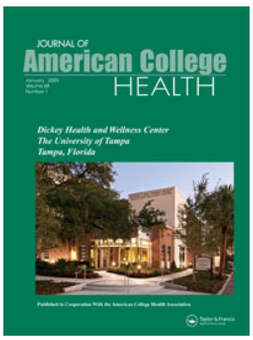

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MAJOR ARTICLE

Associations between backache and stress among undergraduate students

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ABSTRACT

Objective: Low back pain (LBP) is a very common symptom. It occurs in all age groups from children to the elderly population. Globally, years lived with disability caused by LBP increased by 54% between 1990 and 2015. Our objective was to investigate measures that associate with LBP in students. **Participants:** A structured, anonymous, self-report questionnaire was distributed in two study years, 2009 and 2015. Participants included 1,026 students, 57.7% of them female, with a mean age of 27.2 ($SD = 6.4$). **Methods:** The questionnaire included validated questions on various subjects related to health status and health behaviors. **Results:** The associated factors of undergraduate students experiencing backaches are higher if they engage in smoking (AOR = 2.15; $p < .01$), report study-based stress (AOR = 2.39; $p < .01$), and show depressive symptoms (AOR = 2.69; $p < .000$). **Conclusions:** Smoking, stress, and depression are strong measures associated with backache in undergraduate students, significantly more than BMI, physical activity, or sedentary behaviors.

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KEYWORDS
Low back pain (LBP); undergraduate students; stress; depression symptoms

Introduction

Low back pain (LBP) is the leading cause of disability worldwide and sixth in terms of overall disease burden.[1,2] LBP is an extremely common problem, which most people experience at some point in their lives. Most cases run a chronic–episodic course. It has a huge impact on individuals, families, communities, governments, and businesses throughout the world.[3] LBP is a symptom rather than a disease. Like other symptoms, such as headache and dizziness, it can be attributable to many causes.[1] Most LBP is nonspecific (commonly cited as 90%).[4]

A review[5] of LBP worldwide prevalence included 165 studies from 54 countries found the mean overall prevalence of LBP to be 31%. LBP was more common in women than men and in those aged 40–69 years than in any other age group.[5]

Although LBP has been studied extensively in adults, its exact causes are not fully understood.[1] There is reasonable evidence that various factors contribute to the development of LBP. A review of lifting at work identified both weight of load (OR =1.11 [95% CI 1.05–1.18] per 10 kg lifted) and the number of lifts (OR =1.09 [1.03–1.15] per ten lifts per day) as factors that increased pain.[6] In terms of lifestyle, smoking (OR =1.30 [1.16–1.45]),[7] obesity (OR =1.53 [1.22–1.92]),[8] and depressive symptoms (OR =1.59 [1.26–2.01])[9] all increased the risk of developing LBP. These risk factors increased the probability of back pain by only a modest amount. In recent years, there has been strong evidence that psychosocial and psychological factors such as depression, anxiety, catastrophic thinking, and fear of activity play an important role in the development of LBP.[10,11]

LBP also affects young people such as schoolchildren and university students.[12,13] It was found that pain, including backache, was associated with reduced physical activity in adolescents, although this association varies according to gender, age, and type of pain experienced.[13] LBP was slightly more common in girls than boys (38.9% vs 35.0%).

A literature review on the prevalence and risk factors of LBP among young people included 60 publications over the past 15 years.[12] The results show that the prevalence of LBP among different groups of university students enrolled in different faculties ranges between 23% and 81%. Inconsistencies were noted among university student back pain risk factors, particularly those relating to gender. However, overall, the review suggested that women might suffer greater back pain burden than men. Psychosocial issues also

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appear to be important among university nursing students, revealing correlations between back pain and high mental pressure as well as anxiety and high scores on the General Health Questionnaire (GHQ).[14]

One study[15] measured back pain for more than 12 months and daily activity of students who reported back pain. The study included 1311 students in the first to third year of physiotherapy, physical education, pedagogy, tourism, and recreation at four different universities in Poland. Their questionnaire included personal information such as curriculum, age, school year, gender, weight and height as well as pain-related subjects such as pain experience, frequency, and intensity of pain. In addition, the VAS scale was used to estimate pain intensity. The results of the study showed that 61% of the participants experienced LBP in the past year and that the pain caused daily difficulties. No correlation was found between pain intensity and school year. They found that the main trigger for pain was sitting (46.5%) followed by standing (37%), although other factors such as depression and stress were not checked.[15]

In contrast, Moroder et al.[16] compared LBP reports among medical and physical education students. The medical students ($N = 103$) were 2.5 times less physically active and spent 3 more hours per day sitting than the physical education students ($N = 107$) ($p < .001$). The 12-month frequency of LBP in the sample group yields no statistically significant difference ($p = .329$). Strangely, the prevalence of LBP was not higher in medical students than in physically more active students, despite their more sedentary hours. These results show there might be other interfering variables that could explain this paradox.

Another study from Australia ($N = 346$) found 69% (lifetime), 63% (12 month), 44% (one-month), and 28% (one-week) reports of LBP in physiotherapy students.[17]

In the LANCET series, of two papers[18,19] and a Viewpoint[20] on low back pain, the issues that highlighted were that LBP is a very common symptom, and it occurs in all age groups from children to the elderly population. Globally, years lived with disability caused by low back pain increased by 54% between 1990 and 2015. The high frequencies of reports of LBP also among students underlie the importance of factors that may be associated with its appearance. As such, our research questions consist of the following:

1. Do differences exist between different educational disciplines and reports of backache among undergraduate students?
2. What associations can be made concerning backache among students? Is stress associated with LBP, more than physical activity or BMI?

We hypothesized that significant differences between reports of backache among students enrolled in different disciplines do, in fact, exist. In addition, we posit that study-related stress will be a primary associated with backache.

Undergraduate students are known to experience higher levels of study-related stress, and this makes this population unique and interesting from a research perspective. This research considers whether back pain is more strongly negatively associated with physical activity and BMI or study-based stress.

Methods

Research tool

Structured, anonymous, self-report questionnaires were distributed in two study years, 2009 and 2015. Most questions were based on two main sources: Jessor's *Survey of Personal and Social Development* originally distributed to college students at the University of Colorado in Boulder[21] and the Israeli Health Behavior in School-Aged Children (HBSC) questionnaire.[22] The questionnaires included valid and reliable questions on various subjects related to health status and health behaviors such as nutrition, physical activity, health perceptions, psychosomatic symptoms, and risk behaviors.

Research procedure

The Ethics Committee of the university approved the study methodology prior to data collection. Questionnaires were administered in all undergraduate classrooms of the School of Health Sciences, Faculty of Natural Sciences, and some departments of the Faculty of Social Sciences, and Faculty of Engineering, as well as the School of Architecture. All the students who were present in class received a questionnaire. The team of surveyors was provided with adequate training to administer the survey in class. The students were told that they were not obligated to participate or answer all the questions. The surveyors entered more than 100 classrooms in both survey years within a single university. Each student in the class received a questionnaire only once. Completion time for the questionnaire was approximately 25 min.

Table 1. Sample distribution of gender and age by department. (Unweighted sample)

	Men		Women		All final sample		Age	
	n	%	*n*	%	*n*	%	Mean	SD
Final sample	434	42.3	592	57.7	1026	100	27.2	6.4
Physiotherapy	85	33.1	172	66.9	257	25.0	25.8	3.0
Computer & Math	123	75.5	40	24.5	163	15.9	25.9	4.5
Multidisciplinary studies	75	19.1	318	80.9	393	38.3	29.2	9.1
Mechanical Engineering & Mechatronics	120	93.8	8	6.3	128	21.2	26.6	2.7
School of Architecture	31	36.5	54	63.5	85	8.3	25.6	2.0

Population and sample

The research sample consisted of 2,997 undergraduate students, constituting more than 20% of the undergraduate population of one university. The approximate rate of response to the questionnaire was 91% for 2009 and 89% for 2015. Participants who did not state their gender were omitted from the sample (11 participants). A single department was selected from each faculty, comprising five disciplines in total. This was due to variation in curriculum, study-related stress rates as well as patterns of study, course work, and departmental environment. The selected departments were as follows: (a) Physiotherapy Department, Health Sciences Faculty; (b) Computer & Math Department, Natural Sciences Faculty; (c) Multidisciplinary Studies Department, Social Sciences & Humanities Faculty; (d) Mechanical Engineering & Mechatronics Department, Engineering Faculty; and (e) School of Architecture. The final sample thus included 1,026 participants, 434 men and 592 women. The mean age of the final sample was 27.2 years ($SD = 6.4$). Distribution of the sample by ethnicity was as follows: Ashkenazi/West Europe – 30%, Sephardic/Eastern origin – 43%, Russia/Eastern Europe – 9%, Ethiopia – 1%, and others (mixed origins, Israeli Arabs, Druze and else) – 16%.

Table 1 shows the sample distribution of gender and age by department in the final sample. Inaccuracy of sample proportion versus the population concerning gender and department necessitated a weighting procedure to match the natural proportion of the population.

Description of the variables

The description of the relevant variables for survey years unless otherwise mentioned is as follows:

Control variables: Demographic variables included gender, age, and faculty. Participants were asked to report their year of birth. An age variable was computed from the year of survey minus their year of birth. Faculty and department variables were reported by the surveyors and coded to the electronic file. Participants were asked what ethnic origin best describe them. Nine responses were 1. Ashkenazi/West Europe, 2. Sephardic/Eastern origin, 3. Russia/Eastern Europe, 4. Ethiopia, 5. Mixed from different origins, 6. Israeli Arab, 7. Bedouin, 8, Druze and 9. Else. 5–9 responses were recoded to one category.

Backache:[13,22] Participants were asked to mark frequency of pain in their back experienced over the last six months. Values ranged from 1 – "never or rarely" to 5 – "almost every day."

BMI:[23] Participants were asked to self-report their height and weight. BMI was calculated as weight in kilograms divided by squared height in meters. The scale range was from 13.7 to 63.2. BMI categories were defined according to the customary literature (<18.5: underweight; 18.5–24.9: normal weight range of BMI; 25–29.9: overweight range of BMI; and >30: obesity).

Physical Activity:[24] Participants were asked to mark the frequency of engaging in a physical activity (running, riding a bike, or lifting weights). Values ranged from 1 – "not at all" to 6 – "more than 15 hours a week".[24]

Sedentary behaviors:[25] Participants were asked to report how many hours a week they engage in playing video games and (separately) watching network TV shows, cable, webisodes, or videos in their free time. Responses ranged from 1 – "none at all" to 6 – "15 hours or more." Responses were summed (ranging from 4 to 36) and then dichotomized by the median (12) to none versus a half an hour a day or more (four items scale). For the 2015 survey, only questions on TV were distributed in the questionnaire.

Smoking:[21] Participants were asked to mark how many cigarettes they smoked on a regular day in the past month. Values ranged from 1 – "none at all" to 8 – "about two packages a day." Values were dichotomized to 1 – "less than one cigarette a day" and 2 – "one cigarette a day or more."

Study-related stress:[21] Participants were asked to mark how much stress they experienced during the last month due to studying. Values ranged from 1 – "none at all" to 4 – "a lot." Although different kind of

Table 2. Distribution of study variables by department (sample weighted for gender and department).

Department		All sample	Physiotherapy	Computer & Math	Multidisciplinary Studies (Humanities)	Mechanical Engineering & Mechatronics	School of Architecture	Sig.
Backache (%)	At least once a week in the last six months	**38.6**	33.8	30.6	38.1	31.6	56.7	$p = .000$
BMI (%)	Overweight and obese BMI >25	**26.5**	24.0	28.7	29.2	32.7	18.5	$p < .05$
Physical Activity (%)	Not even one hour a week	**34.2**	24.4	33.3	42.0	29.9	40.3	$p < .01$
Sedentary behaviors	Spending more hours on TV and games	**57.2**	50.2	65.4	59.3	61.6	51.2	$p < .01$
Smoking (%)	More than one cigarette a day	**32.7**	18.0	46.2	38.3	34.7	27.3	$p = .000$
Stress from studies (%)	Pretty much	**71.2**	51.4	71.4	65.8	79.7	90.2	$p = .000$
Depression symptoms (%)[a]	More negative symptoms	**37.7**	20.0	35.5	36.4	39.2	51.2	$p < .05$
Backache	Mean (*SD*)	**2.32 (1.33)**	2.19[a] (1.28)	2.05[a] (1.14)	2.32[a] (1.37)	2.08[a] (1.25)	2.87[b] (1.40)	$p = .000$
BMI	Mean (*SD*)	**24.45 (14.61)**	23.90[a] (11.21)	23.71[a] (3.72)	23.43[a] (11.0)	24.01[a] (3.22)	27.06[a] (27.47)	NS
Physical Activity	Mean (*SD*)	**2.10 (1.05)**	2.27[a] (1.04)	2.22[a] (1.17)	1.99[a] (1.09)	2.20[a] (1.05)	1.85[b] (.84)	$p = .000$
Sedentary behaviors (TV)	Mean (*SD*)	**2.83 (1.27)**	2.66[a] (1.19)	2.97[b] (1.25)	2.90[b] (1.33)	3.04[b] (1.32)	2.63[a] (1.23)	$p < .01$
Smoking	Mean (*SD*)	**2.18 (1.60)**	1.72[a] (1.19)	2.71[b] (1.94)	2.40[b] (1.77)	2.19[a] (1.54)	1.91[a] (1.34)	$p = .000$
Stress from studies	Mean (*SD*)	**2.97 (0.89)**	2.53[a] (.94)	2.89[b] (.87)	2.85[b] (.86)	3.10[c] (.77)	3.50[d] (.70)	$p = .000$
Depression symptoms[a]	Mean (*SD*)	**4.72 (1.28)**	4.32[a] (.78)	4.61[a] (1.12)	4.64[a] (1.11)	4.90[a] (1.58)	5.02[b] (1.45)	$p = .01$

[a]Depression questions presented here refer to 2015 sample only.

stress were checked in the questionnaire (study-based stress, residence-based stress, family-based stress, and stress from personal or social life) in this sample of student's, study-based stress was the one that was reported very frequently compare to the other stressors. No significant results were found for the combined measure of stress.

Depression symptoms:[26] Four questions formed a depression symptom scale, based on sadness, failure, despair, and pleasure from life. Responses were summed (Cronbach's alpha, .66; range 4–13) and then dichotomized by the median (5) to less versus more symptoms of depression. Depression symptom questions were only included in the 2015 survey.

Data analysis

Data were analyzed using IBM SPSS Statistics 21. Table 1 presents the unweighted sample description. Cross-tabulation frequencies were used for gender and department, while mean and standard deviation were used for age. A weight procedure was employed for gender (to match 50% each) and department (to match 20% for each department in this sample). In Table 2 for percentage outcomes, we used cross tabulation frequencies, with Chi-square analysis for differences between departments, while for means we used one-way ANOVA with Bonferroni post hoc comparisons for significant differences between department means. Table 3 explores associations between sociodemographic, lifestyle, and personal vulnerability measures with backache using multinominal logistic regression. The table presents adjusted odds ratios with marked significance *p* value.

Results

Table 2 shows the distribution of study variables by department on the weighted sample. The findings reveal better results for physiotherapy students as compared to the entire sample in all measures presented in the table, percentage, or means. For example, the former report significantly lower frequencies of smoking (ie more than one cigarette a day in the past month) (18.0% vs. 32.7% in all sample; p=.000), sedentary behaviors (50.2% vs. 57.2% for the entire sample; p<.01), and study-based stress (51.4% vs. 71.2% for the entire sample; p=.000). These results are also supported by measures of mean differences, demonstrating outcomes for physiotherapy students

Table 3. Adjusted odds ratios for associations between backache and study measures (weighted of gender and department.[a]

Models		Model 1 Sociodemographic		Model 2 – *SD* & Lifestyle		Model 3 – *SD*, lifestyle, and personal vulnerability	
Measures		Nonfrequent backache	Frequent backache	Nonfrequent backache	Frequent backache	Nonfrequent backache	Frequent backache
Sociodemographic							
Gender	(ref = men)	1.00	2.16*** (1.53–3.17)	1.00	1.95* (1.16–3.27)	1.00	1.68 (.97–2.92)
Age	(ref = younger)	1.00	1.00 (.97–1.03)	1.00	1.03 (.99–1.07)	1.00	1.03 (.98–1.07)
Department	(ref = physiotherapy)	1.00	1.03* (1.00–1.07)	1.00	1.01 (.96–1.06)	1.00	1.02 (.94–1.04)
Ethnicity	(ref = Ashkenazi)	1.00	1.21** (1.07–1.36)	1.00	1.35** (1.13–1.62)	1.00	1.30** (1.08–1.58)
Lifestyle							
BMI	(ref = normal BMI)			1.00	.83 (.45–1.52)	1.00	.84 (.44–1.59)
Physical Activity	(ref = more active)			1.00	.81 (.61–1.07)	1.00	.84 (.62–1.13)
Sedentary Behaviors	(ref = less sedentary)			1.00	1.05 (.86–1.27)	1.00	.96 (.78–1.18)
Smoking	(ref = less than 1 cigarette a day)			1.00	2.15** (1.24–3.74)	1.00	2.61** (1.42–4.79)
Personal vulnerability							
Stress from studying	(ref = less stress)					1.00	2.39** (1.22–4.69)
Depression scale	(ref = less depress)					1.00	2.69*** (1.54–4.69)
Sig			$p>.000$		$p=.001$		$p=.000$
Adj R^2			7.7%		12.9%		22.3%
N			568		478		460

*$p<.05$.
**$p<.01$.
***$p<.001$.
[a]Table 3 presented here refers to 2015 sample only.

superior to the sample mean. The worst results were achieved by the School of Architecture. Significantly, they reported the highest frequency of backache complaints (56.7% vs. 38.6% for the entire sample; $p=.0001$) and engaged in the least amount of physical activity (40.3% vs. 34.2% for the entire sample; $p<.01$).

Table 3 presents the results of the multinominal logistic regression with adjusted odds ratios for associations with backache among undergraduate students. In Model 1, sociodemographic measures showed gender (AOR =2.16; $p<.001$), department (AOR =1.03; $p<.05$) and ethnicity (AOR =1.21; $p<.01$) as significant associate measures for backache. In Model 2, lifestyle measures were entered and exhibited significant results for smoking (AOR =2.15; $p<0.01$). There were no significant results for BMI, physical activity, or sedentary behaviors associated with backache. In the last model, personal vulnerability measures were added, with significant measures of experiencing stress from studies (AOR =2.39; $p<.01$) and the depression scale (AOR =2.69; $p<.000$). According to these results, stress and depression are strong measures that associate with backache – significantly more so than BMI, physical activity, or sedentary behaviors among undergraduate students. The association of undergraduate students experiencing backache is higher if they do not have an Ashkenazi ethnicity, if they smoke, report study-based stress, and are depressed.

Discussion

This research focused on the association between back pain and other associated factors among a sample of undergraduate students. The questionnaire addressed frequencies differences and experience of backache between disciplines, attribution of disciplinary differentiation, and the possibility of stress to have significantly associations with backaches, more than physical activity or sedentary behaviors.

Our sample showed that 38.6% of students reported experiencing a backache at least once a week in the last six months. This rate was higher than what Hoy et al[5] reported, although it was lower than other findings (44% in Nyland and Grimmer[17]; 53%–61% in Moroder et al[16]). Our results revealed higher probability of female backache complaints, and this is supported by others as well[12] aside from Hoy et al.[5]

Our first hypothesis posited significant differences between reports of backache among students enrolled in different departments. Moroder et al.[16] found medical students were less physically active than physical education students. Even though the former were more sedentary, they reported the same frequencies of back pain. This presented a kind of paradox suggesting the interference of other explanatory variables. Unlike Moroder's results, our study found that physiotherapy students reported lower frequency of backaches. They also engaged in more physical activity

and less sedentary behavior as compared to the rest of the sample. In contrast, Architecture students exhibited the worst sample results in terms of higher BMI mean, less physical activity, and stress. Our findings also show an interesting gap between two parameters in the school of architecture – lowest frequency of obesity (18.5 vs. 26.5 in all sample) and highest mean BMI among all departments (27.06 [*SD* 27.47] vs. 24.45 [*SD* 14.61] in the entire sample). These findings represent a large variance among architecture students. As such, it is additionally important to consider percentages as well as means and standard deviation measures.

As noted, this research also investigated backache reports based on departmental affiliation. Differences between departments may reflect variation in stress levels that could possibly have a significant association with backaches. Research on stress relying on subjective measures found student self-reports to be important associated with back pain. However, enrollment in a certain department (ie an objective measure) proved to be less relevant in accounting for backache incidence. Indeed, our findings showed that study-related stress comprises a significant association with backache – beyond the influence of belonging to a particular department. This considers the issue of stress as a meaningful associated measure with backache among undergraduate students.

The second research question dealt with measures that may be associated with backache, focusing on lifestyle and personal vulnerability. Our findings show that the chances of undergraduate students experiencing backache are higher if their ethnicity is not Ashkenazi, if they are smokers, report study-based stress, and show symptoms of depression. Stress and depression are strong measures associated with backache, significantly more than BMI, physical activity, or sedentary behaviors among undergraduate students. Ethnicity that found out to be significant in our paper is not known in the literacy as associated with LBP. Still, after adding it as a covariance in the model, smoking, stress, and depression were still strong and significant.

Our results are strengthened by the inclusion of a robust number of subjects, which allows for comparison of a wide range of departments from different faculties.

Limitations

Nevertheless, some research limitations should be noted. These include the use of a cross-sectional survey, which enable associations between variables without considering the temporal dimension or cause-effect relations. Another limitation is the reliance on a self-reported questionnaire that could suffer from a social desirability bias. Finally, this database was structured to test many other subjects and thus did not enable the specific use of all familiar full scales for some of the tested variables.

Conclusion

This paper offers important insights. First, our results indicate that elevated frequencies of LBP among young undergraduate students may be higher than generally assumed. That is, LBP does not only characterize older people, but young adults as well. Second, as a psychosomatic symptom, LBP associated with the student lifestyle characterized by sedentary behaviors over many hours is associated less by physical activity, but by stress and depression symptoms. As such, this paper highlights the association between stress, depression symptoms, and back pain. Further research is needed to determine whether a reduction in any one of these will result in a reduction in the others.

Conflict of interest disclosure

The authors have no conflicts of interest to report. The authors confirm that the research presented in this article met the ethical guidelines, including adherence to the legal requirements, of Israel and received approval from the Ethics Committee of Ariel University, Israel.

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