**The role of pain, disability and perceived social support in psychological and academic functioning of university students with pain: An observational study**

**Abstract**

University students with pain face unique physical, psychological, social and academic challenges, but research on this is limited. The main aim of this study was to examine how pain, disability and perceived social support relate to psychological and academic outcomes in students with pain. It also compared students with pain and students without pain on measures of depression, anxiety and perceived social support. Three hundred and eleven students enrolled in Chinese universities took part in the study, 198 with pain (102 reported acute pain and 96 chronic pain) and 113 without pain. They completed measures of perceived social support, depression, anxiety, pain (intensity, frequency, duration), disability and pain interference with academic functioning. Students with chronic pain reported higher levels of anxiety and depression and lower levels of perceived social support than students without pain. There were no significant differences between students with acute and chronic pain, and between students with acute pain and those without pain. In the pain sample (containing both acute and chronic pain group), greater interference with academic functioning was predicted by higher levels of pain and disability, and disability also predicted higher levels of depression. After controlling for effects of pain and disability, lower levels of perceived social support predicted higher levels of both anxiety and depression. These results highlight the role of pain and disability in academic functioning and the role of perceived social support in psychological functioning of students with pain.

*Keywords*: at-risk youth; psychological functioning; academic functioning; pain; social support

**Introduction**

University life is associated with many challenges, such as new relationships and living away from home. University students are often described as at-risk population. For example, prevalence of mental health problems is significantly higher in university students than the general population, and psychological distress in students is associated with disability and poorer academic attainment ([1](#_ENREF_1)). The existing literature suggests that pain too is a common experience among university students ([2](#_ENREF_2), [3](#_ENREF_3)); however, to our knowledge this research is rather limited. In China, research has mainly focused on pre-university students. For example, in a sample of Chinese high school students aged 16 to 18 (n=2849), the incident rates of low back pain (LBP), headache, abdominal pain, neck and shoulder pain were 41.1%, 30.3%, 20.9%, and 32.8% respectively ([4](#_ENREF_4)). Similar findings were found in American university students, where the annual prevalence of LBP was found to be 42.8% (n=973) in one study ([2](#_ENREF_2)) and 38% (n=963) in another study ([3](#_ENREF_3)).

Prolonged pain results in pain disability but it also impacts on the person’s cognitions, emotions and behaviour ([5](#_ENREF_5)). Dysfunctional cognitions, emotions and behaviours in return can influence the person’s perceptions and experiences of pain, creating a vicious cycle ([6](#_ENREF_6)). Increased levels of depression and anxiety are known correlates of pain, in both adults ([5](#_ENREF_5)) and adolescents ([7](#_ENREF_7)). In student samples, one study found a positive relationship between depression, anxiety and pain ([8](#_ENREF_8)), and in another study anxiety and depression scores were significantly higher in students with LBP than in students without LBP ([9](#_ENREF_9)). Higher levels of depression were also found in a sample of college students with recurrent pain than students without recurrent pain, and their depression scores were positively correlated with pain intensity ([10](#_ENREF_10)).

In the present study, we are also interested in the role of social support in psychological and academic functioning in students with pain. Social support can function as a buffer in challenging and stressful situations, for example there is evidence that that it can assist recovery in clinical depression ([11](#_ENREF_11), [12](#_ENREF_12)). Evidence from non-student samples shows that high levels of perceived social support are associated with low levels of depression and anxiety ([13](#_ENREF_13), [14](#_ENREF_14)), less passive pain coping strategies in chronic pain ([15](#_ENREF_15)), while low social support is associated with musculoskeletal pain ([16](#_ENREF_16)) and its development ([14](#_ENREF_14)). There is also evidence that pain is associated with poorer social functioning in adolescents (12 to 17 years), and that social functioning impacts on the relationship between pain  and school or academic functioning ([17](#_ENREF_17)). Whether these relationships exist in university students with pain is not entirely clear. There are several conceptualizations of school or academic functioning across literature ([18](#_ENREF_18)), in this study we were primarily interested in interference of pain with attendance and academic progress.

Therefore, the main aim of this study was: a) to examine if students with pain, both acute (lasting < 3 months) and chronic (lasting > 3 months) report greater psychological distress and lower social support than students without pain; b) to examine if pain, disability and perceived social support predict psychological functioning (anxiety and depression) and academic functioning in university students. Regarding the first aim, we hypothesised that students without pain would report lower levels of depression and anxiety and higher levels of perceived social support than students with acute and chronic pain. We also hypothesised that students with chronic pain would report higher levels of depression and anxiety and lower perceived social support than students with acute pain. Regarding the second aim, we hypothesised that, after controlling for pain and disability, perceived social support would be a negative predictor of poor psychological and academic functioning, while pain and disability would be positive predictors.

**Methods**

**Design and planned analysis**

This was a cross sectional design. The following analyses were planned:

**Comparisons between participants with and without pain.** To test the first set of hypotheses, we planned to examine differences between participants with acute pain (lasting < 3 months), chronic pain (lasting > 3 months) and participants without pain. To this end, we planned to conduct one way independent measures analysis of variance (ANOVA) to compare the three groups on measures of anxiety, depression and perceived social support.

**Analyses of the pain sample.** To test the second set of hypotheses, we planned a series of hierarchical regression analyses to examine if pain, disability and perceived social support predicted psychological and academic functioning in students with pain. In these analyses, anxiety, depression and interference with academic functioning were used as outcome variables while pain (group [acute/chronic], intensity, frequency and duration) and disability were entered as predictors in the first and second step respectively. In order to examine how much additional variance in the outcome variables is explained by perceived social support (while controlling for pain and disability), this variable was entered in the third step.

**Exploring and preparing the pain sample for the regression analysis***.*In order to understand if participants with chronic pain, acute pain or both types of pain should be included in the above regression analyses, we planned to compare them on the regression outcome variables. Hence, in addition to comparing them on measures of depression and anxiety (with ANOVA analyses described above), we also planned to conduct a *t*- test to compare them on interference of pain with academic functioning. Significant differences between participants with acute and chronic pain on these outcome variables would indicate that the groups should be analysed separately. In case of non-significant differences, all participants with pain would be included and pain group (acute vs. chronic pain) would be used as an additional binary predictor. Next, since students across all four years of undergraduate degree as well as postgraduate students were recruited, correlational analyses were planned to examine if participants’ year of study and age were significantly correlated with the regression outcome variables. Significant correlations would indicate that year of study and/or age should be entered in the regression model as additional predictors. Finally, the majority of participants with pain were females (71%). In order to decide whether to still include sex as a control variable in the regression analyses, we planned to conduct *t* tests to examine if female and male participants differ in their pain intensity and frequency levels.

The required minimal sample size in a regression analysis with six predictors (to test both the overall model fit and individual predictors) is 110 participants ([19](#_ENREF_19)). We also planned to assess the following assumptions of regression: a) multicollinearity, where the tolerance values should be above 0.2, the variance inflation factors (VIF) should be below 10, and the correlations between the predictors should be below .9; b) outliers, where the number of outlying scores should be below 5%; c) homoscedasticity, where the scatterplots should appear randomly distributed; d) normal distribution of residuals, where the histograms should look normally distributed ([19](#_ENREF_19)). All analyses were conducted using SPSS version 23 (IBM 2013).

**Participants**

Three hundred and seventy seven participants were recruited to participate in the study. The inclusion criteria were that participants were enrolled at university and studying for either undergraduate or postgraduate degree and were able to read Mandarin Chinese. Participants who were not enrolled in a Chinese university and those with incomplete questionnaires were excluded. The final sample had 311 participants, 198 with pain (102 with acute pain, 96 with chronic pain) and 113 without pain. They were all Chinese nationals. For further sample demographics please see Table 1. The study received ethical approval from the university research ethics committee.

**Materials and Procedure**

All participants were recruited online between January and June 2016. They were recruited via social network sites such as Facebook and WeChat (Chinese multi-purpose social media application). The survey was in Mandarin Chinese and participants completed it electronically using Sojump (Changsha Ranxing Information Technology Co). We invited university students who experience pain to take part in the study. We also recruited a comparable number of students without pain as a control group. The survey began with a set of demographic questions including age, sex, nationality, relationship status, university, country of enrolment, course and year of study.

**Pain.** Pain was assessed by asking participants if they have pain: ‘Do you have pain (either frequently or infrequently)’. Participants who responded with a yes were asked about their pain location, pain duration (0–3, 3–6, 6–12 months, 1–2, 2–3, 4–5, 5+, 10+ years), pain frequency over the past three months (on a numerical scale 0 - ‘never’ to 10 - ‘always’) and pain intensity over the past week and on average over the past three months, on a numerical scale 0 – 10, e.g. ‘In the past three months, on average, how bad was your pain on a scale 0 - 10, where 0 is ‘no pain’ and 10 is ‘pain as bad as could be’. Items were taken and adapted from the Brief Pain Inventory and the Orebro Pain Questionnaire ([20](#_ENREF_20), [21](#_ENREF_21)). The Chinese version of the Brief Pain Inventory showed good reliability and validity ([22](#_ENREF_22)). To avoid inclusion of multiple and similar predictors, pain intensity over the past three months was used in all regression analyses, in addition to pain duration and pain frequency.

**Interference with academic progress.** School or academic functioning encompasses a number of aspects such as attendance, absenteeism, performance (e.g., grades) and participation in extracurricular activities. However, comprehensive measures of academic functioning are lacking and often fail to clarify if reduced functioning is due to pain or some other reason (13). For the purpose of this study, we developed three simple self-report questions which specifically ask how pain interferes with students’ attendance, studying/revision for their coursework/exams and overall academic progress (academic performance over time): ‘Pain interferes with my class attendance’, ‘Pain interferes with my coursework and exam revision’ and ‘Pain interferes with my overall academic progress’. The questions were piloted with three university students who were asked to examine the questions for relevance and clarity. Each question was measured on a scale from 0 ‘no interference’ to 10 ‘a lot of interference’. Cronbach’s alpha was .932, demonstrating excellent reliability, therefore the mean score was calculated for the three questions and used in the analysis, with higher scores indicating greater interference of pain with academic functioning.

The survey also included the following published questionnaires. The Mandarin Chinese version of all questionnaires were already available and used in the study:

**Pain disability.** The Pain Disability Index (PDI) ([23](#_ENREF_23)) was used to measure pain disability. It assesses the degree to which pain interferes with seven areas of functioning (family/home, responsibilities, recreation, social activity, occupation, sexual behaviour, self-care and life support activity). Each item is scored on a scale 0 ‘no disability’ to 10 ‘worst disability’. Scores are added to give the total disability score, with higher scores indicating higher disability. The scale was shown to have good psychometric properties ([24](#_ENREF_24)). Cronbach’s alpha in our sample was .874, showing that the scale had good reliability.

**Depression and anxiety.** The Hospital Anxiety and Depression Scale (HADS) ([25](#_ENREF_25)) was used to measure depression and anxiety. This is a widely used screening measure of depression and anxiety in medical populations, including pain populations. HADS has seven anxiety and seven depression items. Scores range from 0 to 21 for each scale with higher scores indicating greater likelihood of depression or anxiety. The Chinese version of the HADS showed satisfactory psychometric properties as a screening instrument in adolescent ([26](#_ENREF_26)). Cronbach’s alpha for anxiety in our sample was .764; similar results were found when the analysis was run separately on participants with and without pain (.771 and .717 respectively). These values indicate that the anxiety scale had acceptable reliability. Cronbach’s alpha for depression was .755; similar results were found when the analysis was run separately on participants with pain (.792), indicating that the scale had acceptable reliability in both cases, while in the sample without pain the scale had questionable reliability (.642).

**Perceived social support.** The Multidimensional Scale of Perceived Social Support ([13](#_ENREF_13)) was used to measure perceived social support. This scale consists of 12 items measured on a scale from 1 ‘very strongly disagree’ to 7 ‘very strongly agree’. The scale has three subscales relating specifically to support from either family, friends or a significant other (described as a ‘special person’ in the scale). Mean total is calculated with higher scores indicating higher social support. The Chinese version of the Multidimensional Scale of Perceived Social Support is a reliable and valid tool for assessing social support in physical health conditions ([27](#_ENREF_27)) and in university samples ([28](#_ENREF_28)).

Cronbach’s alpha was .942; similar results were found when we ran analysis on participants with and without pain (.934 and .954 respectively). All values indicate excellent scale reliability. In addition to calculating the scale internal consistency statistics, we also examined correlations between the three subscales. All three subscales correlated highly with each other and with the overall perceived social support score (see Table 3). Thus, to avoid inclusion of multiple predictors in the regression analyses we only used the mean score for overall perceived social support.

**Missing data.** Sixty six participants were excluded from the study. Most of these participants left large sections of the questionnaire incomplete (a common issue with online data collection). Due to this, we were unable to make comparisons between participants who were included and those who were excluded from the analyses.

 **Results**

**Comparisons between participants with and without pain**

For ANOVA main effects, effect sizes and descriptive statistics please see Table 2. Post hoc tests were conducted to break down significant main effects. Levene’s test result for depression was significant; therefore, Games-Howell post hoc test is reported in this analysis. Levene’s test results in all other analyses were non-significant; therefore, Bonferroni post hoc tests are reported in these analyses. Significant differences were found between participants with chronic pain and participants without pain on measures of depression (*p* = .017), anxiety (*p* < .001) and perceived social support (*p* = .012). Participants with chronic pain were more depressed, anxious and reported lower levels of perceived social support. No significant differences were found between participants with acute and chronic pain, and between participants with acute pain and those without pain. We also compared the three groups on the specific types of perceived social support (family, friends and significant other). Significant differences were found between participants with chronic pain and participants without pain on measures of perceived family (*p* = .003) and friends support (*p* = .040), but no significant difference was found for perceived significant other support. In line with previously reported findings, no significant differences were found between participants with acute and chronic pain, and between participants with acute pain and those without pain.

**Analyses of the pain sample**

**Pain sample characteristics and comparisons** **between participants with acute and chronic pain.** The most prevalent location of pain was neck (43.9%), followed by lower back (37.4%) and shoulder pain (37.4%), while many participants reported pain in more than one location. There were 51.5% participants with acute pain (pain lasting < 3 months) and 48.5% participants with chronic pain (pain lasting > 3 months). In the chronic pain group, 7.6% had pain lasting 3-6 months, 8.1% had pain lasting 6-12 months, 12.6% had pain lasting 1-2 years, 9.1% had pain lasting 2-3 years, 3.5% had pain lasting 4-5 years, 7.1% had pain lasting 5+ years, and .5% had pain lasting 10+ years. Participants’ disability, pain frequency and intensity scores are presented in Table 2.

We compared participants with acute pain and chronic pain on all three outcome variables. There were no significant differences between the two groups on depression, anxiety and interference of pain with academic functioning (see Table 2), hence both pain samples were included in the regression analysis and we used pain group (acute vs. chronic pain) as an additional binary predictor in all regression analyses. Furthermore, both year of study and age were not correlated with any of the outcome variables (see Table 3), hence these two variables were not used in the regression analyses as additional predictors. Finally, sex was not included in the regression analysis because, in addition to the majority of the pain sample being female, there were no significant differences between female and male participants in their pain intensity and frequency levels: pain frequency, *t*(86.64) == -.23, *p* = .822; pain intensity three months, *t*(87.47) = -.30, *p* = .764 (Levene’s test results were significant, thus ‘equal variances not assumed’ *t* tests are reported).

**Assumptions of regression.** First, we examined if assumptions of regression analysis were met. In all three regression analyses there was no multicollinearity between the predictor variables, based on tolerance (all values above the acceptable criteria 0.2), VIF (all values below the acceptable criteria of 10) and the correlations between the predictors (all below the acceptable limit of .9, see Table 3). Consequently, each makes a unique contribution to the predictive model. The number of outlying scores across the three regression analyses ranged between 2% and 5.5%, therefore either below or close to the acceptable criteria of 5% ([19](#_ENREF_19)). The assumptions of homoscedasticity and normal distribution of residuals were also checked. The scatterplots in all three regression analyses appeared approximately randomly distributed, which suggests that the assumption of homoscedasticity was met. The histograms depicting the distribution of standardised residuals also looked normal in all three regression analyses.

**Zero-order correlations.** Correlations between all continuous predictor variables and between predictor and outcome variables were significant in all three regression analyses (see Table 3).

**Pain, disability and perceived social support as predictors of anxiety***.* The first model (pain intensity, duration, frequency and pain group) was significant, *F*(4,193) = 4.78, *p* = .001, explaining 9% of the variability in anxiety. Adding disability in the second step significantly improved the prediction of the model, over and above the first model, *F*(1,192) = 5.08, *p* = .025, and it explained further 2.3% of the variability in anxiety. Adding perceived social support in the third step, significantly improved the prediction of the model over and above the second model, *F*(1,191) = 53.76, *p* < .001, and it explained further 19.5 % of the variability in anxiety. The overall model was also significant *F*(6,191) = 14.19, *p* < .001, explaining 30.8 % of the variability in anxiety. Although disability was a significant predictor in the second step, only perceived social support was a significant predictor of anxiety in the final step. Low levels of perceived social support predicted high levels of anxiety. Pain frequency, intensity, duration, pain group and disability were not significant predictors (see Table 4 for regression coefficients).

**Pain, disability and perceived social support as predictors of depression.**The first model (pain intensity, duration, frequency and pain group) was significant, *F*(4,193) = 3.42, *p* = .010 explaining 6.6 % of the variability in depression. Adding disability in the second step significantly improved the prediction of the model, over and above the first model, *F*(1,192) = 19.63, *p* < .001 and it explained further 8.7 % of the variability in depression. Adding perceived social support in the last step improved the prediction of the model, over and above the second model, *F*(1,191) = 56.67, *p* < .001, and it explained further 19.4% of the variability in depression. The overall model was also significant, *F*(6,191) = 16.89, *p* < .001, explaining 34.7 % of the variability in depression. Both disability and perceived social support were significant predictors of depression in the final model. High levels of disability and low levels of perceived social support predicted high levels of depression. Pain frequency, intensity, duration and pain group were not significant predictors (see Table 4 for regression coefficients).

**Pain, disability and perceived social support as predictors of interference with academic functioning.**The first model (pain intensity, duration, frequency and pain group) was significant, *F*(4,193) = 17.89, *p* < .001 explaining 27% of the variability in academic functioning. Adding disability in the next step significantly improved the prediction of the model, over and above the first model, *F*(1,192) = 69.85, *p* < .001 and it explained further 19.5 % of the variability in academic functioning. Adding perceived social support in the last step, did not significantly improve the prediction of the model, *F*(1,191) = 2.26, *p* = .135 and it explained only 0.6 % of the variability in interference with academic functioning. The overall model was significant, *F*(6,191) = 28.38, *p* < .001, explaining 47.1 % of the variability in interference with academic functioning. Both pain intensity and disability were significant predictors of interference with academic functioning in the final model. High levels of pain intensity and disability predicted high levels of interference with academic functioning. Pain frequency, duration, pain group and perceived social support were not significant predictors (see Table 4 for regression coefficients).

## Discussion

The main aim of the study was to examine the relationship between pain, disability, perceived social support, and psychological and academic functioning in university students. As predicted, participants with chronic pain reported higher levels of depression, anxiety and lower levels of perceived social support than participants without pain. However, no significant differences were found between participants with chronic and acute pain, and between participants with acute pain and those without pain. In the pain sample, zero order correlations between all continuous predictor and outcome variables were significant. Regression analyses revealed that after controlling for pain and disability, lower levels of perceived social support predicted higher levels of anxiety and depression. Higher levels of disability predicted higher levels of depression and interference with academic functioning. Pain intensity was also a significant positive predictor of interference with academic functioning.

Our comparisons between students with and without pain showed that students with chronic pain were more anxious, which is in line with past research showing that college students with chronic illnesses had higher anxiety levels than the control group ([9](#_ENREF_9), [29](#_ENREF_29), [30](#_ENREF_30)). Although in all three groups the average depression scores indicated only mild depression, participants with chronic pain also had higher levels of depression than participants with acute pain and participants without pain. This supports the well-researched and established relationship between depression and chronic pain (5).

In our analysis of the pain sample, academic functioning was predicted by both pain intensity and disability, but not by perceived social support. These findings are perhaps unsurprising, because having increased disability levels can make attending classes and doing the school work challenging. Also, when in pain it can be extremely hard to focus on and accomplish academic tasks, even when social support is available. This is supported by past research, for example in a sample of Swedish university students with musculoskeletal neck pain study demands were associated with pain at present ([31](#_ENREF_31)). However, our findings do not entirely support the evidence for the contributing role of social functioning in the relationship between pain and school functioning in adolescents ([17](#_ENREF_17)). However, we only focused on perceived social support and our target population was different to that examined by Simons et al. Higher education involves more independent learning than secondary education and as such it may be less reliant on support from others. Additionally, cultural factors could play a role in explaining the results as the perception of social support could be different for Chinese university students than for western university students.

Furthermore, in comparison to the Simons et al. study our measure of academic functioning was subjective and relatively narrow in scope. This is discussed in more detail later in the discussion.

Our results do suggest that perceived social support is related to better psychological functioning in students with pain. This supports findings from studies with adults, in both pain ([32](#_ENREF_32)) and non-pain samples ([13](#_ENREF_13)). We also found that students with (chronic) pain reported lower levels of perceived social support than students without (chronic) pain, in particular family and friends support. Once at university, many students become removed from their established support network and can find managing pain on their own and forming a new support network challenging. Further research should examine factors impacting on the perceived lack of social support. For example, stigma associated with being young and having chronic pain could be one such factor. There is evidence that many university students choose not to disclose their disability or chronic illness to university disability services due the fear of being stigmatised ([33](#_ENREF_33)).

An advantage of this study is that it focused on a common yet little researched health problem among university students. It also made comparisons between students with and without pain. However, presence and duration of pain was identified via self-report; no medical records were checked to confirm participants’ diagnosis. Another potential limitation is that in our regression models we included both participants with acute and chronic pain. However, in order to control for this, we conducted some preliminary analyses to ensure that these two subgroups were not different on the outcome measures of depression, anxiety and academic functioning. And, we also included pain group (acute vs. chronic pain) as a predictor in all regression analyses.

 With regards to the materials used in the study, we used self-report measures, thus social desirability could have played a role in the reported levels of perceived social support, academic functioning as well as mood and pain. A further limitation of the study is that our measure of academic functioning was subjective. Many studies use objective measures of academic functioning and attainment such as students’ grades ([18](#_ENREF_18)), however this is more difficult to implement in online surveys. On the other hand, using subjective measures of academic functioning has its advantages. For example, subjective measures can enable an insight into students’ perceptions of their academic functioning and progress and how pain might interfere with those. For improved assessment of academic functioning, a more comprehensive assessment is also needed. For example, our measure could be improved by including questions about students’ engagement in extracurricular activities (13). An advantage of our measure is that it specifically focused on pain interference with academic functioning as many existing measures do not assess if reduced academic functioning is due to pain or other reason (13).

The study was cross sectional and based on self-report measures, hence no causal relationship can be inferred. Future research should examine the existing relationships using longitudinal designs. This would enable an understanding of the role of social support as a potential mediator of the relationship between pain and psychological and academic functioning in university students. Finally, all participants were Chinese nationals studying at Chinese universities and recruited online. This reduces the generalizability of our results, although the prevalence of chronic pain in adolescents in China (2) is comparable to the prevalence rates in other countries such as the United States (3).

The study findings provide potential implications for educational settings and practices. They indicate that identifying appropriate support mechanisms for university students with pain is a priority. Many universities do not have a system in place for identifying students with chronic medical conditions ([34](#_ENREF_34)). This could be due to the lack of knowledge and awareness that chronic pain is common among adolescents and young adults. Additionally, many universities do not have a system in place for providing appropriate support to students with pain. Our findings indicate that social support plays an important role in university students’ psychological functioning; hence, universities should try to identify and develop appropriate support and interventions at both individual (such as peer support schemes) and institutional level. However, while social support may be helpful for reducing psychological distress related to pain, this is unlikely to improve academic function, which was related to disability and pain intensity in our study. Therefore, university support services should also consider how to help students manage their pain better.

 In conclusion, the study findings show that pain, disability and perceived social support are associated with psychological and academic functioning in university students with pain. The findings warrant further investigation of these relationships. Further longitudinal research would enable a better understanding of potential mediators of these relationships. It would also enable the development of interventions that might help minimise the impact of pain on university students.

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