



Can Mental Toughness and Sleep Quality predict Perceived Stress in Students?

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Can Mental Toughness and Sleep Quality Predict Perceived Stress in Students?**ABSTRACT**

The study aimed to explore the predictors of stress in students, as previous research has suggested this as an issue. Two possible predictor variables, Mental Toughness and Sleep Quality, were explored in relation to stress, this was done as a gap in the literature was identified. An opportunity sample of 56 students completed an online questionnaire which measured these 3 variables. Correlational analysis in the form of Pearson's product moment, and a multiple regression analysis was carried out in order to analyse the data. The results showed that neither mental toughness nor sleep quality were significant predictors of perceived stress in students.

Therefore, the hypotheses of this study "Mental toughness will be a significant predictor of perceived stress in students" and "Sleep quality will be a significant predictor of perceived stress in students" were rejected as no significant relationship was found.

Based on the findings of this study, future research should investigate using a larger sample, focusing on how other factors could also be predictor variables of stress, and measuring these alongside the variables used in this study.

KEY WORDS:	MENTAL TOUGHNESS	SLEEP QUALITY	PERCEIVED STRESS	MTQ48	PSQI
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Introduction

As students journey through education, they often come across many obstacles, one of these being stress. Stress has been defined as “a real or interpreted threat to the physiological or psychological integrity of an individual that results in physiological and/or behaviour responses” (McEwen, 2007:508). Stress is shown to be a big problem for students, as more than 26,000 students were reported to have dropped out of university before they even reached their second year (Havergal, 2016). Bennett (2003), found that stress was deeply correlated with poor academic performance, and Andersson et al (2009), suggested that it is important that we address the problem of stress at the start of university studies, by introducing stress-reducing activities. This is because the start of university is linked to increased stress levels. The American college health association (ACHA) reported that students suggested stress was the most common health problem they experienced (Ahern and Norris, 2011), and Robotham and Julian (2006) found that stress can have devastating effects on a student’s well-being and can even cause physical and mental illnesses, including depression and anxiety. With this in mind, surely, if we can better understand the predictors of stress, then we can use this information in order to help reduce stress for students. This research intends to explore two of the potential predictors of stress, Mental Toughness and Sleep Quality, in order to add to the current knowledge base of what affects stress, and in turn to possibly assist in learning how we can use these concepts in order to give people a higher tolerance for stress.

Ideas of mental toughness have been around for a long time, however in recent years, significant advancements have been made. Mental Toughness has been defined as “An unshakeable perseverance and conviction towards some goal despite pressure or adversity” (Middleton et al, 2005:60). When thinking about mental toughness, there are four components which are considered important, these are: control, commitment, challenge and confidence. Control refers to an ability to deal with several things at the same time, but continue to be influential and not controlled (Clough et al, 2015). Commitment is about goal setting and striving to achieve these goals even when faced with difficulties (Clough et al, 2007). Challenge refers to being able to see obstacles as learning opportunities in order to continue thriving in a continuously changing world (Clough et al, 2015). Finally, confidence refers to the ability to believe in oneself despite hindrances and to remain un-intimidated by others (Clough et al, 2007). All of these components are featured in the measurement of Mental Toughness, and there are two different ways of measuring this concept. The first way produces four separate scores, one for each component, plus an overall score. However, for a general measure of Mental Toughness, the second method which only produces the overall score is necessary.

Mental Toughness has mainly been applied to the area of sport, focusing on how mental toughness affects performance, for example, the 2001 study by Fourie and Potgeiter. In the area of elite sport, mental toughness has been considered to be one of the most important psychological characteristics in terms of success, but there has been little time spent studying the concept (Crust, 2007). It has been suggested that further development of what it actually means to be mentally tough, and educating young people on how to improve their mental toughness could be a beneficial beginning for preventative measures (Gerber et al, 2013). From reviewing

previous literature in this area, it became apparent that there has been a lack of conceptual clarity regarding the definition of mental toughness (Connoughton et al, 2010), and in order to fully understand this concept, focusing solely on the effect of mental toughness on sport is not enough. This narrow focus on elite athletes has made mental toughness research rather limited, and research would benefit from a shift in focus towards mental toughness in relation to an individual's potential in other aspects of their lives (Crust, 2008). One issue that could be argued is that mental toughness can be interpreted differently depending on situational constraints and so a clear cross-cultural and cross-discipline definition is needed (Fawcett, 2011).

Mental toughness has not yet been widely explored in terms of its relationship with other concepts, for example stress. Mental toughness as a concept is inherently useful, particularly when trying to better understand stress. It essentially gives an explanation as to why two people in the same situation will deal with stressors completely differently (Clough & Strycharczyk, 2012). The promotion of factors which foster resilience such as mental toughness can help young people cope with stress, as studies have found that mentally tough individuals have a tendency to view their world as controllable and to consider issues as natural changes, thus allowing them to have a higher tolerance for stress (Clough et al, 2002; Gerber et al, 2013). The small pool of current research exploring the relationship between mental toughness and stress includes a study carried out by Kaiseler et al (2009). This study found that mental toughness influenced both self-reported stress and the individual's perceptions of control over stressful events. Higher levels of mental toughness were associated with less stress and more control, these findings were concordant with the findings of Clough et al's (2002) study. There have also been some suggestions of a link between mental toughness and sleep efficiency, a study carried out by Brand et al (2014) found that adolescents with higher mental toughness scores had better sleep, and it appears that this relationship works both ways, so improving sleep should increase an individual's score on mental toughness.

When measuring sleep quality, there are several components which need to be considered. These include subjective sleep quality, which measures how the individual would rate their own sleep quality, and habitual sleep efficiency, which provides an efficiency score based on how many hours of sleep the participant gets and how much time they spend in bed. The measure used in this study takes all of these components into account but combines the scores for each of these sections to create an overall sleep quality score. In terms of research around the topic of the effect of sleep on stress, it has become apparent that there is a real lack thereof, which unfortunately leaves us somewhat in the dark about these effects. There are several studies exploring the relationship between these two factors including the work of Akerstedt (1987) on psychosocial stress and impaired sleep and Haynes et al (1981) on the effects of pre-sleep stress on sleep-onset insomnia. However, most of the research focuses on how stress affects sleep. Other studies have also looked at the effect of other factors on both sleep and stress, for example the impact of mindful-based stress reduction (Carlson & Garland, 2005), and dysfunctional beliefs about stress and sleep in patients with fibromyalgia (Theadom & Cropley, 2008). Schneider (1977) also found that stress is an essential component in the problem of insomnia. One issue in looking at the relationship between sleep and stress is that lots of other factors can influence sleep quality. Sleep disturbance was shown to be more frequent in children of Indian descent than in white children, and it was also more common in children whose mother had reached no further than primary school education (Rona et al, 1998). Therefore sociocultural factors can act as very

important risk factors for disturbed sleep (Rona et al, 1998). Another study by Stepanski and Wyatt (2003), found that components of sleep hygiene were related to poor sleep. The results suggested that naps were disadvantageous for nocturnal sleep and that in people who smoke, withdrawal is associated with sleep fragmentation. It was also noted that an observed side effect of patch nicotine replacement was insomnia (Stepanski & Wyatt, 2003).

Most of the arguments that there is a connection between sleep and stress result from clinical observations. One of the frequent findings is that patients with insomnia experience problems at work, with family and in general life. Scores on personality inventories of sufferers of insomnia also indicate the tendency to internalize stress, which leads to sleep interference, continuing the cycle (Akerstedt, 1987). Huang et al (2011) carried out a study to evaluate whether poor sleep is associated with stress status and they found that sleep quality and stressful status were closely related. A meta-analysis by Pilcher and Huffcutt (1996) found that sleep deprivation has a profound effect on functioning, from these findings it is not difficult to interpret that a lack of functioning would severely diminish capability to cope with stress. Schneider (1977) also found that reduced sleep is stressful for waking behaviour.

However, when exploring stress, it must be acknowledged that one of the biggest issues associated with the measurement of stress is that there is no definitive measure. All data comes from self-report measures and so if a participant says they are stressed, we assume they are, when in fact we cannot prove this (Clough & Strycharczyk, 2012). Questionnaires may also only give the researcher superficial information, and the data retrieved can be more descriptive than explanatory (Munn & Drever, 1990). It must also be addressed that while several studies have indicated a relationship between mental toughness and stress and sleep quality and stress, that there are other factors which could affect these relationships. A study by Abouserie (1994) found that exams and exam results were the most common causes for stress in students, the next most common was revising for exams. The results from this study also showed that 77.6% of students were in the moderate stress category and that 10.4% were in the serious stress category. This research also noted a significant difference between males and females, suggesting that females experience higher levels of stress (Abouserie, 1994). A significant positive relationship was also found between locus of control and academic stress (Abouserie, 1994). Significant negative correlations were also found between self-esteem and both life and academic stress, suggesting that individuals with higher self-esteem experience less stress than those with low self-esteem (Abouserie, 1994). Darlotis et al (2016), also acknowledged that some of the most common stressors in a young person's life are centred around interpersonal conflicts with friends, family and teachers. Procrastination was also found to have an effect on stress, Tice and Baumeister (1997) found that procrastination was linked to low stress levels at the beginning of a school term, but was then linked to higher stress levels towards the end of term. While stress seems to be a complex concept with many possible contributing factors, a lot of the research does suggest both mental toughness and sleep quality will have a significant correlation with perceived stress.

The presence of the research discussed linking Mental Toughness, Sleep Quality and Perceived Stress enabled the researcher to develop two testable hypotheses. These hypotheses are:

1. Mental Toughness will be a significant predictor of perceived stress in students

2. Sleep Quality will be a significant predictor of perceived stress in students

The first hypothesis was formed based on the works of academics such as Kaiseler et al (2009) who reported that mental toughness influenced the self-reported stress of participants. Also, taken into consideration was the work of Clough et al (2002), who found that higher mental toughness was associated with less stress. The second hypothesis was formed based on the work of scholars such as Schneider (1977) and Huang et al (2011), who both found that sleep had an effect on stress in some way. The findings of Pilcher and Huffcutt (1996), which suggested that sleep has a profound effect on functioning were also taken into consideration.

Method

Design

The current study used a quantitative correlational design and used an online self-administered questionnaire survey, which was comprised of three separate questionnaires. This design was utilised as the study was investigating if there was a relationship between two predictor variables and a criterion variable. The two predictor variables used were Mental Toughness and Sleep Quality, and the criterion variable was Perceived Stress. This design was also chosen as the data was gathered in the form of questionnaires. Questionnaires were used, as predictor variables of perceived stress could not necessarily be obtained using qualitative methods such as interviews. Using questionnaires is a widely-accepted measure and this allowed the researcher to gain data in number form, and enabled the researcher to carry out statistical analysis. In order to look at whether mental toughness and sleep quality were predictors of stress, a singular numerical score for each variable was needed. A questionnaire study was the most appropriate as this method allows us to gain these single numerical scores in a reasonably non-invasive way, and questionnaires allow the researcher to gain large amounts of data in a relatively time and cost-effective manner. It has also been suggested that using questionnaires and particularly self-administered questionnaires with no investigator present can encourage honesty and openness from participants (Mitchell & Jolley, 1996). Suggestions have also been made that questionnaire studies are more objective and scientific than other methods, and so the results from this study could be used to create new theories, build on existing theories or to test new hypotheses in the future (Mitchell & Jolley, 1996).

Participants

This study recruited 56 participants who were current students, age, ethnicity and gender were not recorded, in order to keep the survey as anonymous as possible. However, the advertisement used specifically stated that participants must be over the age of 18 to take part. The researcher did not reach their target for number of participants, as it was suggested by Cohen (1992) that a minimum of 67 participants was required for the study to work effectively. Brace et al (2006) however, suggested that for a study utilising correlational analysis and multiple regression to work effectively, a minimum of 100 participants was needed. This led the researcher to aim for 120 participants, but due to low response rate and many participants only partially completing the online survey, this target was not met. One possible reason for low response rate could be the lack of payment for participation, as it was suggested by Yu and Cooper (1983) that incentives such as money increase the response rate for questionnaires.

Materials

In this study, three questionnaires were utilised to gather data. These questionnaires were the MTQ48 (Clough et al, 2002), the Pittsburgh Sleep Quality Index (Buysse et al, 1989) and the Perceived Stress Scale (Cohen et al, 1983). The MTQ48 was acquired from one of the original authors Professor Peter Clough, with permission for use in this study. This questionnaire consisted of 48 items which were answered using a 5 point Likert scale (5= Strongly Agree, 4= Agree, 3= Neither Agree nor Disagree, 2= Disagree and 1= Strongly Disagree). This scale measured participants for four different components: Challenge, Commitment, Control and Confidence. An example of a question measuring challenge was “Challenges usually bring out the best in me”. An item that measured the participant’s level of commitment was “I usually find something to motivate me”. For control, there were two separate types of control taken into consideration, Emotion control and Life control. One of the items used to measure life control was “I generally feel in control”. An item used to measure emotion control was “I generally find it hard to relax”. Confidence again measured two separate types of confidence, Confidence in abilities and Interpersonal confidence. Confidence in abilities was measured using questions such as “I generally feel that I am a worthwhile person”. Interpersonal confidence was measured using items such as “I usually speak my mind when I have something to say”. Some questions were positively worded and others were negatively worded and so some of the scores had to be reversed. Once the scores had been reversed a high score for any of the questions indicated a higher level of mental toughness. As reported by Gerber et al (2013), each of the components of the MTQ48 are suggested to be fairly reliable. Challenge had a Cronbach’s alpha score of .74, Commitment had a score of .84, Control (emotion) had a score of .89, Control (life) had a score of .69, Confidence (interpersonal) had a score of .87, Confidence (abilities) had a score of .82 and overall mental toughness had a score of .94. The scores for each component were worked out using a separate equation for each. The participant’s score for Challenge was worked out using $(q4+(6-q6)+(6-q14)+q23+q30+q40+q44+q48)/8$. The equation used to work out the score for Commitment was $(q1+q7+(6-q11)+q19+(6-q22)+q25+(6-q29)+(6-q35)+q39+(6-q42)+(6-q47))/11$. The score for Control was worked out using $((6-q21)+(6-q26)+(6-q27)+q31+q34+(6-q37)+q45+q2+q5+(6-q9)+q12+(6-q15)+(6-q33)+(6-q41))/14$. The equation used to work out Confidence was $(q3+q8+(6-q10)+q13+q16+(6-q18)+q24+(6-q32)+(6-q36)+q17+q20+(6-q28)+q38+q43+(6-q46))/15$. In order to get the overall score for mental toughness the equation used was $(q4 + (6-q6)+(6-q14)+q23+q30+q40+q44+q48+q1+q7+(6-q11)+q19+(6-q22)+q25+(6-q29)+(6-q35)+q39+(6-q42)+(6-q47)+(6-q21)+(6-q26)+(6-q27)+q31+q34+(6-q37)+q45+q2+q5+(6-q9)+q12+(6-q15)+(6-q33)+(6-q41)+q3+q8+(6-q10)+q13+q16+(6-q18)+q24+(6-q32)+(6-q36)+q17+q20+(6-q28)+q38+q43+(6-q46))/48$.” (see appendix 10 for questions)

The second questionnaire used, the Pittsburgh Sleep Quality Index, was accessed online and used with permission from the author (appendix 6). This questionnaire was comprised of 10 questions, two of which had several parts. Some of the questions prompted a written response such as “During the past month, when have you usually gone to bed at night?”. Other questions used a 4-point scale, depending on the question, the scales were slightly different, for example some

questions such as “During the past month, how often have you had trouble sleeping because you couldn’t get to sleep within 30 minutes?”, used a scale of 0=Not during the past month, 1= Less than once a week, 2= Once or twice a week, 3=Three or more times a week. Other questions such as “During the past month, how would you rate your sleep quality overall?”, were measured using a scale of 0= Very good, 1= Fairly good, 2= Fairly bad, 4= Very bad. There were also questions such as “During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?” which was measured using a scale of 0= No problem at all, 1= Only a very slight problem, 2= Somewhat of a problem, 3= A very big problem. This scale typically measures 7 components in order to produce an overall sleep quality score, however in this study, Question 7 (Component 6) “During the past month, how often have you taken medicine to help you sleep?”, was removed due to ethical issues. The components measured in this study were: Subjective sleep quality, Sleep latency, Sleep duration, Habitual sleep efficiency, Sleep disturbances and Daytime dysfunction.

Subjective sleep quality was measured by question 6 (see appendix 9), and the score the participants received from 0-3 was recorded as their component 1 score. All scores for the 6 components were then added together to create a global (overall) sleep quality score. The combined scores of the components was reported to have had a Cronbach’s alpha score of .83, suggesting that this measure is reliable (Buysse et al, 1988). Sleep Latency was measured by examining question 2 (appendix 9), the researcher then assigned each participant a score based on their answer (<15 minutes= 0, 16-30 minutes= 1, 31-60 minutes= 2, >60 minutes =3). After this step question 5a (appendix 9) was examined, and the scores from both of these questions were added together. Then the researcher assigned each participant a score based on the sum of the two previous scores (0=0, 1-2=2, 3-4=3, 5-6=4), this score then became the participant’s component 2 score. Sleep duration was measured by examining question 4 (appendix 9) and each participant was then assigned a score by the researcher based on their answer (>7 hours=0, 6-7 hours=1, 5-6 hours=2, <5 hours=3). This became the score for component 3.

Habitual sleep efficiency was measured by dividing the answer to question 3 (see appendix 9) by the answer to question 1 (appendix 9), this gave a score for number of hours spent in bed. The next step was to divide the answer to question 4 (appendix 9) by the number of hours spent in bed and then times that number by 100, this gave a percentage for habitual sleep efficiency. Each participant was then given a score based on what their percentage was (>85%=0, 75-84%=1, 65-74%=2, <65%=3) and this became the score for component 4. Sleep disturbances was measured by adding together the scores from question 5b to 5j (appendix 9), the researcher then assigned each participant a score based on the sum of these scores (0=0, 1-9=1, 10-18=2, 19-27=3). This score then became the score for component 5. As discussed earlier, component 6 was missed out and so daytime dysfunction (component 7) became the new component 6. This was measured by adding up the score the participant gave for questions 8 and 9 (appendix 9), and then assigning a score based on the sum of the two previous scores (0=0, 1-2=2, 3-4=3, 5-6=3).

The third measure used, the Perceived Stress Scale (Cohen et al, 1983), was accessed online and was listed as a public domain questionnaire (Conser & Nelson, 2006) (appendix 7), and so was used free of charge and permission. This questionnaire consisted of 14 items, which were answered using a 5-point Likert scale (0=Never, 1=Almost never, 2=Sometimes, 3=Fairly often, 4=Very often). As reported by Cohen et al (1983), the Cronbach’s alpha reliability score for the

perceived stress scale was between .84 and .86, suggesting that this measure is reliable. This scale produced one overall score for Perceived stress by adding together the scores from questions 1-14 (appendix 8).

Procedure

The online questionnaire used in this study was created using the website Qualtrics (Qualtrics, Provo UT). This was made up of an information sheet (appendix 2), a consent form (appendix 3), the Perceived stress scale (Cohen et al, 1983), the Pittsburgh sleep quality index (Buysse et al, 1989), the MTQ48 (Clough et al, 2002), and a debrief sheet (appendix 4). Qualtrics provides a link to the study, which can be distributed to social media. The link from this study was placed on Twitter and Instagram, with an invitation letter (appendix 5) advertising the title of the study “Can Mental Toughness and Sleep Quality predict Perceived Stress in Students?” and that all participants had to be over the age of 18 and be current students.

Once the participants had decided they wanted to take part and that they met the necessary requirements they followed the online link which took the participants straight to the information sheet. This information sheet described the study more in depth in order to ensure that participants fully understood what they were taking part in, and notified the participants of their right to withdraw at any time during the study, with details on how to do so. Once the participants had read the information sheet, they clicked next and were directed to a consent form. This sheet was made up of 3 questions which the participants answered by checking a box. Once the participants had filled in the consent form, they began answering the first questionnaire, the Perceived Stress Scale (Cohen et al, 1983). They filled in this scale by indicating their responses by checking boxes to answer each of the statements using the 5-point Likert scale. Once the first questionnaire was complete the participants moved on to the second questionnaire, the Pittsburgh Sleep quality index (Buysse et al, 1989). They filled in this scale by ticking boxes to indicate their answers for each of the questions. Once the participants had finished the second questionnaire they moved on to the third questionnaire, the MTQ48 (Clough et al, 2002). This again was completed by ticking the relevant boxes to indicate their response to each statement. Once all the questionnaires were completed the participants were taken to a debrief screen which thanked them for taking part and informed them of the cut-off date for when they could request their results to be removed and how they could get in touch with the researcher should they wish to receive a copy of the results. The participants also created an anonymous code which they would have quoted to the researcher through email should they have wished to have their data removed from the study.

Results

A reliability analysis was conducted first in order to determine the internal consistency (Cronbach’s Alpha) for each of the three scales used. The results from these can be seen in table 1.

Table 1. Cronbach’s Alpha scores for the Perceived Stress Scale, the MTQ48 and the Pittsburgh Sleep Quality Index.

Variable	Cronbach’s Alpha
Perceived Stress Scale	.600
Mental Toughness Questionnaire 48	.491
Pittsburgh Sleep Quality Index	.813

As mentioned in the materials section of the method, other studies have reported high internal consistency for each of these scales. However, this study shows a low internal consistency for the Perceived Stress Scale, with a Cronbach's alpha score of .600. A low internal consistency was also observed for the MTQ48 with a Cronbach's alpha score of .491. Both the perceived stress scale and the MTQ48 failed to meet the minimum acceptable level of 0.70 (Kline, 1999). The Pittsburgh Sleep Quality Index however, was found to have high internal consistency with .813.

Table 2. Mean and Standard Deviation of each variable.

	Mean (n=56)	Standard Deviation (n=56)
Perceived Stress Scale	32.88	2.97
Mental Toughness Questionnaire 48	3.09	.61
Pittsburgh Sleep Quality Index	7.93	3.72

The mean for the perceived stress scale was 32.88 with a standard deviation of 2.97. The mean for the MTQ48 was 3.09 with a standard deviation of .61. The mean for the Pittsburgh sleep quality index was 7.93 with a standard deviation of 3.72.

A Pearson correlation analysis was then carried out in order to explore the relationship between the predictor variables, Mental toughness and sleep quality, and the criterion variable, Perceived stress. Previously, in the proposal for this research it was suggested that a Spearman's Rho correlation analysis would be carried out as all of the variables were not parametric, however they are all parametric and so Pearson's product moment was carried out. The results can be seen in table 3.

Table 3. Correlations and Significance Values for Pearson correlational analysis.

		Perceived Stress	Mental Toughness	Sleep Quality
Pearson Correlation	Perceived Stress	1	-0.11	.18
	Mental Toughness	-.11	1	-.58**
	Sleep Quality	.18	-.58**	1
Sig.	Perceived Stress		.42	.196
	Mental Toughness	.42		.000
	Sleep Quality	.196	.000	

The results from the Pearson correlation showed that Perceived Stress had a weak negative correlation with mental toughness ($r = -0.11$) which was not significant at the 95% confidence interval. Perceived stress had a weak positive correlation with sleep quality ($r = 0.18$) which was not significant at the 95% confidence interval. Mental toughness and sleep quality were found to have a strong negative correlation

($r = -0.58$, $p < 0.05$) (Pallant, 2010) which was significant at the 95% confidence interval.

Table 4. Model summary for predictor variables in accounting for the variance in perceived stress.

Model	R	R ²	Adjusted R ²	Standard error of estimate
1	.18	.03	-.01	2.98

The multiple regression model was found to be not significant ($f = 0.84$, $p = 0.44$). The relationship between the variables was weak ($r = 0.18$) and the model only accounted for 1% (Adjusted R² = -0.01) of the variance in perceived stress.

A multiple regression analysis was then carried out in order to explore to what extent mental toughness and sleep quality could predict perceived stress. Regression was chosen as when all variables in a study are quantitative, regression analysis is often the most appropriate (Christensen et al, 2015). The results can be seen in table 5.

Table 5. Regression coefficients for each variable.

Variable	B	Std. Error	Beta	T	Sig.
Perceived Stress	31.99	3.28	-	9.74	-
Mental Toughness	-0.06	0.13	.17	1.01	.32
Sleep Quality	0.14	0.82	-0.12	-0.07	0.94

From the results of the multiple regression it can be assumed that there was little to no multicollinearity as the tolerance level for both scales was .659 which is above .2 and the VIF score was 1.52 which is lower than 10 (Statistics Solutions, 2016). From these results, it can be concluded that in relation to the first hypothesis "Mental Toughness will be a significant predictor of perceived stress in students", mental toughness was not a significant predictor of perceived stress in students. In relation to the second hypothesis "Sleep Quality will be a significant predictor of perceived stress in students", sleep quality was not a significant predictor of perceived stress in students. Both of these hypotheses were therefore rejected as neither of the predictor variables were significant predictors of the criterion variable.

Discussion

In the current study, it was found that mental toughness and sleep quality were not significant predictors of perceived stress in students. Because of these findings, the hypotheses "mental toughness will be a significant predictor of perceived stress in students" and "sleep quality will be a significant predictor of perceived stress in students" were not supported and as a result were rejected. This section of the report will discuss the findings of the study and try to explain them. It will then move on to providing some suggestions for future research.

A perhaps important acknowledgement to be made is that when looking at the effect of sleep quality on stress, it is not as simple as it may have initially seemed. There are several suggested factors which can affect sleep, such as sociocultural

factors, as discussed by Rona et al (1998). This research found that sleep disturbance was more common in children of Indian descent than in children of Caucasian descent, and was also more common in children whose mother reached no further than primary school education. Another study by Stepanski and Wyatt (2003) found that components of sleep hygiene were related to poor sleep. This study indicated that naps had a negative effect on nocturnal sleep and that nicotine withdrawal in smokers was associated with sleep fragmentation. With this in mind, it could be suggested that the use of the Pittsburgh sleep quality index in this study was fairly limited and that more thorough measures of the other factors which can contribute to poor sleep should be used in future research.

Stress is also a very complicated construct and, although lots of research has been conducted to better understand stress, it appears that there is no fundamental answer at this point in time as to what causes stress. Although there have been several studies indicating a link between both mental toughness and stress and sleep quality and stress, the research would suggest that other factors could be just as important. An example of this could be that the perceived stress scale does not specifically measure academic stress and general-life stress, it gives one overall score. Academic stress could be an important factor as it has been found that exams, exam results and exam revision were the most common causes for stress amongst students (Abouserie, 1994). This study also noted a significant positive relationship between locus of control and academic stress, suggesting that locus of control could be a concept worth adding into future research as a predictor of stress. A significant negative relationship was also found between self-esteem and both academic and life stress, suggesting that students with higher self-esteem experience lower levels of stress (Abouserie, 1994). This study utilised two separate scales the Academic Stress Questionnaire (ASQ) (Abouserie, 1994) and the Life stress questionnaire (LSQ) (Abouserie, 1994), perhaps the use of two scales measuring separate components of stress could have improved this study and this should be considered for future research.

Another factor found to affect stress in students was procrastination, procrastination was linked to low levels of stress at the beginning of term but higher levels of stress towards the end of term (Tice and Baumeister, 1997). The presence of this research could indicate that perhaps the current study did not find a positive relationship between either of the predictor variables and the criterion variable, because it didn't fully take into consideration the other factors which can affect stress and therefore did not put controls in place to limit the effect of these factors. Future research should include more controls in order to ensure that they are solely measuring specific predictor variables of stress, and not any other possible factors.

This study had some limitations, one of which could be using questionnaires, as if a participant indicates that they are stressed, we assume that they are when in actual fact we cannot prove this (Clough & Strycharczyk, 2012). Questionnaires may also only provide descriptive information rather than an explanation, meaning we may know that someone is experiencing stress, but we don't necessarily know the reasons why. This leaves the data rather limited (Munn & Drever, 1990). The data gained from questionnaires can also be superficial, as with no researcher present to explain the meanings of questions and to probe for deeper responses, all the researcher really has to go on is ticked boxes or a very brief written response (Munn & Drever, 1990). Another difficulty with questionnaires which was experienced in the data collection for this research is incorrectly or partially filled out questionnaires, which lowered the number of questionnaires that could be used (Beiske, 2002).

Another potential limitation of this study was the small sample size. As discussed previously, Cohen (1992) suggested a minimum of 67 participants was needed in order for the study to work effectively, and Brace et al (1996) suggested that a minimum of 100 participants were needed when correlational analysis and a multiple regression were being carried out. As the sample size for this study was 56, it is below both of the suggested amounts, and this could mean that the study did not work effectively. The limited data means that the results cannot be considered representative of the population, in order for generalizability to occur a much larger sample size would be needed, and this should be considered for future research.

When considering the sample, the mean score for the Perceived stress scale was 32.88 (out of 56), which appears to be a moderate size score, however there was a fairly large standard deviation of 2.97, suggesting that although this was the mean, participants scored very differently on this scale. There is not a specific measure of what is considered a high score on the perceived stress scale, what is considered high depends on the findings of a particular study. Because of this it is very difficult to compare these results to the findings of other studies, however this does corroborate the findings of Abouserie (1994) who found that the majority of students were in the moderate stress category.

When considering the sample with regards to sleep quality, the mean score for the Pittsburgh sleep quality index was 7.93 (out of 18) and so appears to be a fairly low score, however, the standard deviation was large (3.72) and so this suggests that the results were fairly spread out. At this point it may be useful to note that a weak positive correlation was found between perceived stress and sleep quality ($r = 0.18$) and although this relationship was not significant, it could suggest that those who have poorer sleep quality could experience more stress. Therefore, future research should look into using samples of people specifically with poor sleep quality to investigate this further. Although this suggestion has been given, the relationship found was very small and as it was a correlational relationship, cause and effect should not be assumed.

When looking at the sample in terms of mental toughness, the mean score on the MTQ48 was 3.09 (out of 5), which again can be considered fairly moderate. The standard deviation was small (0.61) suggesting that the scores for mental toughness were all relatively similar. When looking at these results in comparison to other findings, the mean score for this research was lower than the findings of other studies for example, Clough et al (2007). A weak negative relationship was found between mental toughness and perceived stress ($r = -0.11$), and although this relationship was not found to be significant, these findings could suggest that those who scored low on mental toughness experience more stress. This suggests that future research should focus on samples of people with low mental toughness scores in order to explore this relationship more thoroughly. However, this relationship was weak and as the relationship was correlational, cause and effect should not be assumed. A strong negative correlation was also found between mental toughness and sleep quality which was significant at the 95% confidence interval, and although this is not what the research intended to investigate, it could be an interesting relationship to be considered and built upon in future research.

To summarise, the present study intended to explore whether mental toughness and sleep quality could predict perceived stress in students. The hypotheses for this study were “mental toughness will be a significant predictor of perceived stress in students” and “sleep quality will be a significant predictor of perceived stress in students”. However, once the study was completed and the data

was analysed using a multiple regression, it was found that neither mental toughness nor sleep quality were significant predictors of perceived stress. The results from this study could offer a new perspective on the relationship between mental toughness, sleep quality and perceived stress, however this research must be built upon and improved in future research. Specifically, future research could further explore the predictors of stress by taking some of the other possible predictors of stress discussed earlier into consideration alongside the current variables. Future research could also possibly benefit from further exploring the relationship between mental toughness and sleep quality.

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