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# Correlation between BMI and mental health among young students at Curtin University, Western Australia

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## Abbreviations

BMI	Body Mass Index
BMI combined	BMI variable, in which the categories overweight and obesity are combined into one category
DASS-21	Depression Anxiety Stress Scale (21 questions included)
EDS	Everyday Discrimination Scale
QoL	Quality of Life
SF-8	Health survey, which measures quality of life with eight questions
USHWS	University Student Health and Wellbeing Survey
WHO	World Health Organization

## Abstract

University is an important stage of life for young people, as the risk behaviours they develop during this time are likely to continue throughout the rest of their lives. The transition to university and studying can produce more or other risk factors for students compared to non-students. Due to these different risk factors, students need special health promotion and prevention programs. Mental health is essential for healthy wellbeing in general and is influenced by different factors. Students have been shown to have worse mental health compared to the general population. The prevalence of overweight and obesity has increased worldwide in the last few decades and will increase further in the future; Australia is no exception. Studies have shown that students are at a higher risk developing overweight or obesity during university compared to non-students. Being underweight can also have negative effects on someone's health.

The purpose of this thesis was to find out if a correlation between BMI and mental health among young students at Curtin University, Western Australia exists. Mental health was investigated using different scales (DASS, EDS, SF-8) and other questions regarding mental health. BMI was calculated based on self-reported weight and height. Data was collected through the University Student Health and Wellbeing Survey (USHWS). Before calculations were conducted, a systematic literature review was undertaken.

286 cases were included in the calculations. The age range was between 18 and 25 ( $\bar{x}$  = 20.75, SD = 1.74) and the BMI range was between 15 and 37 ( $\bar{x}$  = 22.52, SD = 3.55). 70.1% of students reported to be female. An everyday discrimination (EDS) score of 2.08 was calculated. 61.1% of students reported good or very good mental health. With the DASS, a mean depression rate is calculated at 11.99, a mean anxiety rate at 9.72 and a mean stress rate at 13.65. Some of the EDS and DASS questions were calculated with chi-square to have a relationship to BMI, with a Cramer V showing small or very small relations; one strength being moderate. To point out is the relationship between depression and BMI categories, which show a significant moderate relation ( $\chi^2$  = 110.829,  $p$  = <0.001) (Cramer V = 0.371,  $p$  <0.001). All significant correlations were seen to be small or very small. The correlations between BMI and EDS, DASS, QoL and perceived mental health indicate that with a lower BMI the mental health factors are better. The results are comparable with most of the studies found in the systematic literature review, especially with the studies conducted in Western society.

The reader should keep in mind that calculations were only conducted with the mentioned parts of mental health. Results of other studies can be difficult to compare because of factors like age group, time frame. Calculations based on self-reported weight and height and BMI as a measurement can be limited. There was a high number of non-responders in the survey.

## Zusammenfassung

Die Zeit an der Universität gilt als eine wichtige Zeitspanne im Leben, da das in dieser Zeit entwickelte Risikoverhalten mit hoher Wahrscheinlichkeit im Laufe des Lebens fortgeführt wird. Der Übergang an eine Universität und das Studieren können im Vergleich von Studierenden zu nicht Studierenden andere oder mehr Risikofaktoren beinhalten. Auf Grund dieser unterschiedlichen Risikofaktoren benötigen Studierende speziell angepasste Präventions- und Gesundheitsförderungsprogramme. Die psychische Gesundheit ist für die Gesundheit im Allgemeinen essenziell. Studien haben gezeigt, dass Studierende im Gegensatz zur allgemeinen Bevölkerung eine schlechtere psychische Verfassung besitzen. Die Prävalenz von Übergewicht und Adipositas ist in den letzten Jahrzehnten gestiegen und wird auch in Zukunft weiter steigen; Australien ist keine Ausnahme. Studien haben gezeigt, dass Studierende im Vergleich zu nicht Studierenden ein höheres Risiko besitzen Übergewicht oder Adipositas während des Studiums zu entwickeln. Untergewichtige Personen können aufgrund ihres Gewichts ebenso wie übergewichtige oder adipöse Individuen negative Folgen davon tragen.

Ziel dieser Arbeit war es herauszufinden, ob es eine Korrelation zwischen dem Body Mass Index (BMI) und der psychischen Gesundheit bei jungen Studierenden an der Curtin University, Western Australia gibt. Die psychische Gesundheit wurde anhand verschiedener Skalen (DASS, EDS, SF-8) und anderen Fragen der psychischen Gesundheit betreffend untersucht. Der BMI wurde anhand der selbst angegebenen Werte von Gewicht und Größe errechnet. Die Daten wurden durch die University Student Health and Wellbeing Survey (USHWS) erhoben. Nach einer systematischen Literaturrecherche wurden die Berechnungen durchgeführt.

286 Fälle konnten für die Berechnungen berücksichtigt werden. Das Alter lag zwischen 18 und 25 ( $\bar{x}$ = 20.75, SD= 1.74) und der BMI zwischen 15 und 37 ( $\bar{x}$ = 22.52, SD= 3.55). 70.1 % der Studierenden sind weiblich. Es wurde ein Wert von 2.08 zur täglichen Diskriminierung ermittelt. 61.1 % der Studierenden gab an eine gute oder sehr gute psychische Gesundheit zu besitzen. Es wurde ein durchschnittlicher Wert von 11.99 bezüglich der Depression ermittelt, 9.72 bezüglich des Angstgefühls und 13.65 bezüglich des Stresses. Einige der Fragen der EDS und DASS zeigten einen Zusammenhang zum BMI, welche mit Hilfe des Chi-Quadrats ermittelt wurden. Der Cramer V hat dabei kleine oder sehr kleine Zusammenhänge aufgezeigt. Ein Zusammenhang zeigte eine mittlere Stärke, welcher zwischen Depression und BMI besteht ( $\chi^2$ = 110.829,  $p$ = <0.001) (Cramer V= 0.371,  $p$  <0.001). Alle signifikanten Korrelationen zeigen einen kleinen oder sehr kleinen Zusammenhang. Die Korrelationen zwischen dem BMI und EDS, DASS, QoL und wahrgenommener psychischer Gesundheit deuten an, dass mit einem kleinen BMI die Faktoren bezüglich der psychischen Gesundheit besser sind. Die Ergebnisse sind mit den meisten Studien vergleichbar, welche in der systematischen Literaturrecherche ermittelt wurden.

Den Lesern sollte bewusst sein, dass die Berechnungen ausschließlich mit den genannten Faktoren der psychischen Gesundheit durchgeführt wurden. Der Vergleich zu anderen Studien kann aufgrund verschiedener Faktoren schwierig sein. Berechnungen auf Grundlage von selbst angegebener Größe und Gewicht und der BMI als Messinstrument kann limitierend sein. Eine hohe Anzahl von Studierenden nahm nicht an der Umfrage teil.

# 1. Introduction to BMI And Mental Health

In 2008, there were 3 million young people between the ages of 15 and 24 living in Australia, which represented 14% of the total population (Australian Institute of Health and Welfare, 2010). This age is important to investigate, because individuals' risk behaviours at this age will probably be continued over life (Australian Institute of Health and Welfare, 2016; Steptoe et al., 2002), which is why this period in life can be seen as a significant one (Australian Institute of Health and Welfare, 2016). Especially the transition from school to university is important because of the changes and new challenges students face (Australian Bureau of Statistics, 2013c). This transition has shown to be stressful for students (Bennett, Greene, & Schwartz-Barcott, 2013), as they might need to leave their childhood home and move to another city or town for their studies (Australian Bureau of Statistics, 2013c). Due to new environmental factors, students change different aspects of their life (Racette, Deusinger, Strube, Highstein, & Deusinger, 2005). Students do not live necessarily an unhealthier lifestyle compared to non-students the same age. Even though they can be at increased risk (Australian Bureau of Statistics, 2013c), because lifestyle factors and diet change during that time are associated with weight change (Mozaffarian, Hao, Rimm, Willett, & Hu, 2011). At the same time, the prevalence of mental disorders have found to be increased between the age of 18 and 29 compared to other age groups (Kessler et al., 2005). Being overweight and obese early in life can also be seen as a 'critical period' because the risk of being overweight or obese later in adulthood is increased (Guo, Wu, Chumlea, & Roche, 2002). A study has shown that students gain more weight during their studies than the general population (Mihalopoulos, Auinger, & Klein, 2008). To teach young adults early how to live a healthy life can improve their quality of life. This will be more socially and economically effective with young adults than later in adulthood (Australian Institute of Health and Welfare, 2016).

Good mental health is important for being healthy in general (World Health Organization, 2016), which is why a mental disorder can have a major impact on someone's health (World Health Organization, 2017a). A high increase of 178% of government expenditure on mental health between 1992-93 and 2010-11 is reported (Department of Health and Ageing, 2013), which might show an increase in mental health issues. In China, students' mental health has also shown to be not as good as in the general population (Wong, Cheung, Chan, Ma, & Tang, 2006). The most common worries for students are studying or work problems (Stewart-Brown et al., 2000).

Worldwide the prevalence of overweight and obesity has tripled in the last four decades and will continue to increase in future (World Health Organization, 2017b). Over the last two decades the prevalence of overweight and obesity has doubled in Australia, which makes this country to one of the countries with the most overweight and obese people of the developed nations worldwide (Department of Health, 2009). Being overweight and the prevalence of obesity increased from 56.3% in 1995 to 61.2% in 2007-08 (Australian Bureau of Statistics, 2013d). In 2011-12, 1.7% of Australian adults were underweight, 35.5% normal weight, 35.3% overweight and 27.5% obese (Australian Bureau of Statistics, 2013a). Most recently, the Australian government has reported that in 2014-15, 28% Australian adults were obese, which is an 19% increase from 1995 (Australian Institute of Health

and Welfare, 2017). Due to an increase in overweight and obesity, a great number of 22,700 weight loss surgery were reported in 2014-15, compared to 9,300 back in 2005-06 (Australian Institute of Health and Welfare, 2017). Overweight and obesity can have a positive or negative effect on mental health (Australian Bureau of Statistics, 2008).

Obesity is preventable (World Health Organization, 2000). The individual cannot be blamed alone for being obese. For prevention and management of obesity, all sectors of society need to be integrated (World Health Organization, 2000). The true consequences of the increasing prevalence of overweight and obesity will probably be noticed only in future (World Health Organization, 2000). For having a healthy weight, individuals need to follow a healthy nutrition and be physically active (Department of Health, 2009). Universities offer a good setting for disease prevention, especially overweight and obesity prevention (Steptoe et al., 2002).

This thesis target is to investigate if a correlation between BMI and mental health among young students at Curtin University exists. Data was analysed from the University Student Health and Wellbeing Survey (USHWS). BMI was calculated with self-reported weight and height and mental health was reported with the Depression Anxiety Stress Scale (DASS-21) (Lovibond & Lovibond, 1995), Everyday Discrimination Scale (EDS) (Williams et al., 2008), SF-8 (Ware, Kosinski, & Dewey, 2001) and further questions regarding mental health, which are discussed in detail in the method section (pp. 28).

In this thesis, first the results of the systematic literature review are given, which includes background information on BMI and mental health. These topics provide further information on detailed subgroups. Furthermore, methods are explained, which are separated in the literature review, University Student Health and Wellbeing Survey (USHWS) and analysis part. In the next section, results are presented, these are discussed and compared to results of other studies. Then limitations of this thesis are discussed and a conclusion is formulated.

## 2. Background Information to Weight And Mental Health

Worldwide the prevalence of overweight and obesity tripled in the last four decades and is still rising (World Health Organization, 2017b). Also in Australia the prevalence of overweight and obesity has increased (Australian Bureau of Statistics, 2013d). Students in university change their health behaviour and will be likely to retain these later in life (Steptoe et al., 2002). Concerning is, that one study found that students do not have a healthy lifestyle (Al-Naggar, Bobryshev, & Mohd Noor, 2013), which is influenced by sociodemographic factors (Al-Naggar et al., 2013). Although, it is said that students do not live necessarily an unhealthier lifestyle compared to non-students the same age (Australian Bureau of Statistics, 2013c). For mental health illnesses, university students are a very high-risk population (Stallman, 2010). Severe body image concerns among female students are known to be present (El Ansari, Dibba, & Stock, 2014), which is developed by high social pressure regarding their body image (Thome & Espelage, 2004).



Differences in psychological and behavioural characteristics in students exist (Greene et al., 2011). Students of different academic areas might have different health lifestyle behaviour, which is why it is important to investigate different areas separately (Thome & Espelage, 2004). It has been shown that a difference exist in psychological distress and study fields (Bayram & Bilgel, 2008; Leahy et al., 2010).

In this section, background information regarding BMI and mental health are given.

## 2.1. Aspects of Weight and BMI

Body Mass Index (BMI) is a common way to define if a person's weight is within a normal weight range or not. If the body weight is between the underweight and overweight category, it is defined as normal. BMI is classified as kilograms divided by the square of height in meters ( $\frac{kg}{m^2}$ ). The categories are defined as underweight, normal weight, overweight and obesity, divided in <18.5, 18.5-24.99, 25.0-29.99, >30.00 respectively (Australian Bureau of Statistics, 2013d; World Health Organization, 2017b).

Classification	BMI range
Underweight	<18.5
Normal weight	18.5-24.99
Overweight	25.00-29.99
Obesity	>30.00

(World Health Organization, 2017b)

Individuals in the normal weight range have the best mental (Scott, McGee, Wells, & Oakley Browne, 2008) and physical health (W. J. Brown, Mishra, Kenardy, & Dobson, 2000). Additionally, a BMI under 25 shows lower morbidity rates in general (W. J. Brown et al., 2000).

BMI is influenced by different determinants, which need to be kept under consideration while working with BMI. One study points out the importance to include socioeconomic status while looking at BMI and mental health (Hu, Wu, Chou, & Huang, 2012), also other lifestyle variables seem to be important, such as smoking and physical exercise (Maynard, Rohrer, & Fulton, 2015), although a Polish study have found no significant correlation with these variables (Pawlińska-Chmara, Wronka, Suliga, & Broczek, 2007). Studies have shown different results regarding the association between BMI and gender. Some studies from all around the world have found a relationship between them (Hu et al., 2012; Nojomi & Najamabadi, 2006; Phelan et al., 2015; Provencher et al., 2009), but other studies conducted in North America have not found an association between BMI and gender (Anderson, Shapiro, & Lundgren, 2003; Lazarevich, Irigoyen-Camacho, Velazquez-Alva, & Salinas-Avila, 2015). The same is shown regarding age, as one study has shown an association between increased BMI and increased age (Hawker, 2012; Nojomi & Najamabadi, 2006) while another has not (Anderson et al., 2003). Also factors like emotional eating (Lazarevich, Irigoyen Camacho, Velázquez-Alva, & Zepeda Zepeda, 2016) or place of residents (Nojomi & Najamabadi, 2006) can influence BMI. Substance use disorder has shown to be not related to BMI in

one study (Scott, McGee, et al., 2008). Emotional disorders have been shown to increase with an BMI in either extreme (Scott, McGee, et al., 2008).

## **Overweight & Obesity**

In Australia in 1995, 56.3% citizens were overweight and obese, which increased up to 61.2% in 2007-08. Young adults in Australia age 18-24 have shown a 36.4% prevalence of overweight and obesity in 2011-12 (Australian Bureau of Statistics, 2013b). Not only the prevalence of obesity increases in adulthood, also the prevalence of extreme obesity has risen for people with an BMI of 35 and over in 1995 from 5.0% up to 9.6% in 2011-12 (Australian Bureau of Statistics, 2013b). In 2011-12 in Australia, 1.7% of adults were underweight, 35.5 % normal weight, 35.3% overweight and 27.5% obese (Australian Bureau of Statistics, 2013a). Overweight and obesity catches attention and has been investigated all around the world (Brener, Eaton, Lowry, & McManus, 2004; W. J. Brown et al., 2000; Lazarevich, Irigoyen-Camacho, & Velazquez-Alva Mdel, 2013; Peltzer et al., 2014; Şanlıer, Türközü, & Toka, 2016; Sirang et al., 2013), which shows the awareness regarding the serious consequences obesity can include.

Obesity is an accumulation of abnormal and excessive fat which can have an impact on a person's health (Australian Bureau of Statistics, 2013d; Australian Institute of Health and Welfare, 2017; World Health Organization, 2017b). Overweight and obesity is the result of a diet characterized by a too high energy intake and inadequate physical activity, which is more common nowadays due to the modern environment (Department of Health, 2009). Obesity has different consequences which can be fatal or non-fatal (World Health Organization, 2000). The risks for non-communicable diseases increases with an increased BMI (World Health Organization, 2000, 2017b), as well as morbidity and mortality (Poirier et al., 2006). Because of overweight and obesity, long term conditions such as cardiovascular disease, high blood pressure and type 2 diabetes can occur (Australian Bureau of Statistics, 2013a, 2013b, 2013d; Australian Institute of Health and Welfare, 2017; Department of Health, 2009; Guh et al., 2009; Poirier et al., 2006; World Health Organization, 2017b). Other health risks can occur regarding psychological wellbeing (Australian Institute of Health and Welfare, 2010).

In the paper by Pengpid & Peltzer, after a literature review they have divided the associations of overweight and obesity into (1) sociodemographic factors, (2) social factors, (3) dietary behaviour, (4) health risk behaviour and mental health risk (2014). Age plays an important role as overweight and obese adults have a significant higher BMI than overweight or obese children or adolescents (Guo et al., 2002). Looking at gender, men have a higher prevalence of overweight than women (Peltzer et al., 2014; World Health Organization, 2000) although women have higher obesity prevalence's (World Health Organization, 2000). Also culture differences play an important role in overweight and obesity (Pawlińska-Chmara et al., 2007). Different health risk behaviours are increased with overweight and obesity as coping strategies especially for students like tobacco use (Pengpid & Peltzer, 2014; Scott, Bruffaerts, et al., 2008) or drugs and alcohol use (Phelan et al., 2015).

Being thin is seen as something positive in the Western society, which leads to negative attitudes towards overweight or obese individuals (R. M. Puhl & Latner, 2007). Mental health problems are more common among

overweight and obese adults than for normal weight individuals (Hu et al., 2012), especially in the highest level of obesity (Hopman et al., 2007). One study from the U.S. has shown an association between poor self-rated health and higher BMI (Maynard et al., 2015), however another study from the U.S. cannot support this statement (Rohrer, Cole, & Schulze, 2012). Overweight and obese individuals in the U.S. report significant lower academic achievement, perceived themselves as being less attractive (Odlaug et al., 2015), perceived more stigma (Phelan et al., 2015) and females reported less social support and more loneliness (Phelan et al., 2015). In contrast to the statement before, other researchers report better mental health among overweight or obese students than those with normal weight in Turkey (Nur, Kibik, Kılıç, & Sümer, 2017) and specifically for men in Switzerland (Dey, Gmel, & Mohler-Kuo, 2013). Overweight and obese individuals have been shown to have lower Quality of Life (QoL) scores (Nur et al., 2017). No relation has been found between overweight and obesity and mental QoL in Taiwan (Huang, Frangakis, & Wu, 2006). In a study from the Caribbean, Latin America, Africa and Asia (22 countries included), obese and overweight men have been shown to be associated with younger age (16-19 years), coming from a higher income country, dietary behaviour, health risk behaviour and childhood abuse. For females, obesity and overweight has been shown to be associated with older age (22 years or more), coming from a higher income country, frequent organized religious activity, dietary behaviour, poor mental health (post-traumatic stress disorder symptoms) and childhood abuse (Peltzer et al., 2014).

All in all it can be said that obesity is preventable (World Health Organization, 2000) and should be taught through practising a healthy lifestyle which includes a well-balanced diet and regular physical activity (Department of Health, 2009). The focus for changing weight should be on behaviour change rather than weight loss (Department of Health, 2009).

### **Underweight**

Especially for females, social pressure for being thin is present (Sarlio-Lahteenkorva, Silventoinen, Jousilahti, Hu, & Tuomilehto, 2004). Importantly, being underweight can have negative effects on a person's health as well as being overweight or obese (Australian Bureau of Statistics, 2013d). Thin individuals have shown to have higher mortality rates than people of normal weight (Sarlio-Lahteenkorva et al., 2004). A BMI under 20 has shown to be significant associated with irregular periods for women (W. J. Brown et al., 2000). The prevalence of underweight individuals in university can be higher than for overweight ones (Pawlińska-Chmara et al., 2007), which is why it is highly important to consider underweight students as well while looking at the university setting.

Underweight has a negative effect on a persons' mental health (Herva et al., 2006; Zhao et al., 2009), QoL (Hopman et al., 2007) and perceived health (Sarlio-Lahteenkorva et al., 2004). For underweight individuals, differences exist in socioeconomic status (Pawlińska-Chmara et al., 2007), age, sex and smoking behaviour, as thin people are more commonly younger, female and smokers (Sarlio-Lahteenkorva et al., 2004). In Thailand, underweight in males has been associated with living off campus, having a high income background and short sleep duration. Underweight in females has been associated with low physical activity and not trying to lose

weight (Pengpid & Peltzer, 2015). In that study, no association has been found between being underweight and poor mental health (Pengpid & Peltzer, 2015).

### **Perceived Weight**

Self-perceived weight is more important than measured BMI (Brenner et al., 2004). If a body weight is dissonant to the individual's perception of his or her body weight, this is defined as misperception of weight (Jáuregui-Lobera, Bolaños-Ríos, Santiago-Fernández, Garrido-Casals, & Sánchez, 2011). It is important to understand that discrepancies between perceived and actual weight status do exist (Andrade, Raffaelli, Teran-Garcia, Jerman, & Garcia, 2012). Perceived body weight has a higher influence on the mood than actual body weight. Female students with normal body weight with an inflated body weight perception have been shown to be significantly more likely to feel depressed than overweight female students with an accurate body weight perception (Harring, Montgomery, & Hardin, 2010). Many individuals misperceive their weight (Andrade et al., 2012; Brenner et al., 2004; El Ansari, Clausen, Mabhala, & Stock, 2010; Harring et al., 2010; Himmelstein, Belsky, & Tomiyama, 2015; Jáuregui-Lobera et al., 2011; Kjaerbye-Thygesen, Munk, Ottesen, & Kruger Kjaer, 2004; Pengpid & Peltzer, 2014; Sirang et al., 2013; Talamayan, Springer, Kelder, Gorospe, & Joye, 2006). Studies have shown prevalence's of body weight misperception between 33.7% in Pakistan (Sirang et al., 2013) and 36.9 % in Mexico (Andrade et al., 2012) in adults.

Differences are known between gender, as females misperceive their weight as too high more often (Andrade et al., 2012; El Ansari et al., 2010; Harring et al., 2010; Jáuregui-Lobera et al., 2011), age, as older individuals tend to perceive themselves heavier (Andrade et al., 2012; El Ansari et al., 2010; Kjaerbye-Thygesen et al., 2004) and BMI categories, as more obese people misperceive their weight as underweight ones (Andrade et al., 2012). In Mexico, 39.8% of overweight people perceived their weight correctly and 57.7 % reported to be normal weight. In obese people, 9.5% perceived themselves as obese and 75.1% perceived themselves as overweight (Andrade et al., 2012). In Pakistan, underweight females have shown to be the most satisfied ones with their weight. This could be dangerous because they will not be likely to change their weight to a normal weight range (Sirang et al., 2013). Women perceive themselves as being more overweight and males were more likely to perceive themselves as being less overweight than they actually were (Andrade et al., 2012; Harring et al., 2010).

A study has shown that a significant amount of students with normal weight misperceived themselves as overweight (Talamayan et al., 2006). In the U.S., only half of those who perceived themselves as heavy actually met the BMI criterion for overweight (Himmelstein et al., 2015). Regarding that, also in the U.S. 35.8% of normal weight students tried to lose weight, from which 11.9% of students tried at least one unhealthy weight control behaviour (Talamayan et al., 2006). Normal weight individuals are at risk of unhealthy weight control behaviours if they misperceive their weight (Talamayan et al., 2006). In contrast, if people do not consider themselves as overweight or obese they will not change their eating behaviour because they do not notice the importance (Brenner et al., 2004). Risk factors for body weight misperception are early risky lifestyle behaviours, eating disorders, poor physical form and self-rated health (Kjaerbye-Thygesen et al., 2004).

## **'Freshman 15'**

The term 'Freshman 15' was introduced first in 1985 and experienced much attention since then, especially since the 1990s. 'Freshman 15' describes the belief that students gain 15 lbs (6.8 kg) within the first year at university. Studies have shown that most students gain weight in their first year at university although most of those did not gain 6.8 kg (Anderson et al., 2003; Boyce & Kuijjer, 2015; C. Brown, 2008; Desai, Miller, Staples, & Bravender, 2008; Mihalopoulos et al., 2008; Pliner & Saunders, 2008; Provencher et al., 2009; R. Vella-Zarb & Elgar, 2009; R. A. Vella-Zarb & Elgar, 2010). Weight changes in freshman year reported in studies vary between 0.89 kg in Canada (R. A. Vella-Zarb & Elgar, 2010), 1.53 kg in the U.K. (Serlachius, Hamer, & Wardle, 2007) and 0.77 kg for females and 1.68kg for males in the U.S. (Anderson et al., 2003). In a review, a mean weight change of 1.75 kg has been found, with a range from 0.73 kg to 3.99 kg (R. Vella-Zarb & Elgar, 2009). The prevalence of overweight and obesity in students has doubled in the first year at college in one study in the U.S. (Anderson et al., 2003). Of students in their first year of studies, 5% in the U.S. (Mihalopoulos et al., 2008) and 8.8% in Canada (Provencher et al., 2009) gained the actual 'Freshman 15'. In one study, 55% of students gained weight, 12% lost weight and 33% remained stable (Serlachius et al., 2007). Students baseline weight has shown to be highly influencing if students gain, lose or maintain their body weight. Students with a low BMI at start of university were more likely to lose weight than students with a high BMI (Boyce & Kuijjer, 2015). Slight differences have been noticed as more women than men report weight gain (Butler, Black, Blue, & Gretebeck, 2004; Serlachius et al., 2007). Although freshman year is a critical period for weight gain (Anderson et al., 2003), even after freshman year students gain weight (Gores, 2008; R. Vella-Zarb & Elgar, 2009). Some students report weight increase in the first two years (Racette et al., 2005) and others found a weight increase over the full study period of four years (Girz et al., 2013). Over the full period of studying in Canada, 62.2% of female and 65.5% of male students gained weight (Girz et al., 2013).

In the first year at university, students are in a new setting and experiencing new challenges. This transition can be significant because students expand their knowledge, interact with new people and broaden their horizon (Australian Bureau of Statistics, 2013c). Environmental factors, such as accommodation, might be more important than psychological factors, such as stress, for weight gain in freshman year (R. A. Vella-Zarb & Elgar, 2010). Type of accommodation is significant associated with BMI (Pliner & Saunders, 2008), which means not only the transition from school to university makes students vulnerable for weight gain but especially moving out of home (Pliner & Saunders, 2008; R. A. Vella-Zarb & Elgar, 2010). In Canada, students living at home gained 1.2 kg during freshman year and those living in residence gained 4.1 kg (Pliner & Saunders, 2008). Another study in Canada reported weight gain for students living on campus at 1.65 kg (R. A. Vella-Zarb & Elgar, 2010). It is known that students in Australia might need to leave their childhood home and move to another city or town for studying (Australian Bureau of Statistics, 2013c). As mentioned before, it has been reported that stress might be not as influencing as environmental factors in weight changes in freshman year, because first year students have shown to be not as stressed as students in higher study years (Stallman, 2010). Beside these factors, psychosocial factors determine if students gain weight or not (Provencher et al., 2009). Due to lifestyle changes, such as decreases in physical activity and increases in calorie intake during the first year at university, most

female students gain weight (Butler et al., 2004). Most commonly students report poor eating habits and a decrease in physical activity due to lack of time (Silliman, Rodas-Fortier, & Neyman, 2004). Although, students have not necessarily an unhealthier lifestyle than people the same age who are not studying (Australian Bureau of Statistics, 2013c). Other challenges for students could be faced if students need to work while studying (Australian Bureau of Statistics, 2013c).

The theory of the 'Freshman 15' is a concern because of the fact that students mostly do not gain as much weight as the expected 6.8 kg but students might be scared to do so. Students are probably concerned about their weight unnecessarily, which can lead to eating disorders (C. Brown, 2008).

### **Weight Regulation in Young Adults**

The period of studying can be seen as critical, because if students have an unfavourable health behaviour and are overweight or obese, the risk of being overweight and obese is increased in adulthood more easily (Guo et al., 2002; Racette et al., 2005). Being dissatisfied with the own body weight might be developed early in life already. Early risky lifestyle behaviours, such as early alcohol consumption or early intercourse, increase the risk for being dissatisfied with the own body weight. Current risk factors have not shown to influence this relationship in the study conducted in Denmark (Kjaerbye-Thygesen et al., 2004). Living a healthy lifestyle is important for weight maintenance (Sarlio-Lahteenkorva et al., 2004).

### **Weight Loss**

30% of underweight, 70% of normal weight and 92% of overweight individuals would like to be slimmer (Pawlińska-Chmara et al., 2007). Body image misperception can lead to unhealthy weight loss practices, independent of women's actual weight (Liechty, 2010). Practising weight loss methods are likely to be conducted over a longer time in non-overweight females (Liechty, 2010). Unhealthy weight loss practice is associated with depression (Davila et al., 2014) and stress (Serlachius et al., 2007). Because weight loss decreases health risks of obesity for diabetes and cardiovascular disease, weight loss for overweight or obese individuals is important (Poirier et al., 2006). Importantly, weight loss can be a risk for overweight or obese individuals, highly depending on the weight loss strategy. Therefore, weight loss expectations should be discussed with a health professional beforehand to avoid unrealistic weight loss targets (Poirier et al., 2006). A behavioural change is more important than the actual weight loss for body weight reduction (Department of Health, 2009).

## **2.2. Factors of Mental Health**

Mental health is an essential part of being healthy in general. It is important to point out that mental health is not only the absence of a mental disease (World Health Organization, 2016). It is influenced by different socioeconomic, biological and environmental factors (Hu et al., 2012; World Health Organization, 2016). Mental health is defined as

“a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community.” (World Health Organization, 2016).

A mental disorder has a major impact on a persons' health and can normally be described as a combination of abnormal thoughts, behaviour, emotions, perceptions and relationships (World Health Organization, 2017a). Risk factors for poor mental health are work-related stressors, gender discrimination, unhealthy lifestyle and more (World Health Organization, 2016). Mental disorders include a range of diagnosed illnesses including: depression, schizophrenia, dementia, intellectual disabilities and bipolar effective disorder, which are preventable through different strategies (World Health Organization, 2017a).

University students are a very high-risk population for mental illnesses (Stallman, 2010; Wong et al., 2006), as they are four times more likely to be psychologically distressed than non-student peers (Leahy et al., 2010). Psychiatric disorders are common in young adults (Blanco et al., 2008), about 19.2% of students have serious mental health issues (Stallman, 2010). 26% of younger people (age 16-24) experienced a 12-month mental disorder, which is the highest prevalence compared to all other age groups (Australian Bureau of Statistics, 2008). Also looking at 12-month mood disorder specifically, young adults have shown to have the highest prevalence compared to other age ranges in adulthood (Scott, McGee, et al., 2008). Another study has found significant differences between psychological distress among younger and older students, as younger students age 18-34 reported significant higher psychological distress than older ones (Stallman, 2010). In total, 45% of Australian adults have a lifetime mental disorder and 20% a 12-month mental disorder (Australian Bureau of Statistics, 2008). Individuals with suicidal thoughts commonly (72%) have a 12-month mental disorder (Australian Bureau of Statistics, 2008). The prevalence of mental disorders has highly increased between the age of 18 to 29 (Kessler et al., 2005), which is why it is important to pay high attention towards individuals in this age group. First onset for mental disorders in the U.S. appears in youth, which is why it is important that mental disorders are prevented and mental health is promoted at a young age (Kessler et al., 2005).

Sociodemographic (Scott, McGee, et al., 2008) and socioeconomic (Australian Bureau of Statistics, 2008; Eisenberg, Gollust, Golberstein, & Hefner, 2007) characteristics are important factors for students' mental health. Both factors are significantly different between students and non-student peers (Cvetkovski, Reavley, & Jorm, 2012). Gender (Hu et al., 2012; Scott, McGee, et al., 2008; Staiano, Marker, Martin, & Katzmarzyk, 2016; Stallman, 2010) or the sexual orientation (Eisenberg et al., 2007) can be risk factors for mental health problems. In Taiwan, associations between BMI and mental health problems have been found among women, but not men (Hu et al., 2012). Mental disorders are more often experienced in the first or second year at university (Bayram & Bilgel, 2008) or by students who are experiencing financial struggles (Cvetkovski et al., 2012). Researchers have found that current smokers had twice the prevalence for a 12-month mental disorders compared to never smokers (Australian Bureau of Statistics, 2008). Students experience less mental disorders if living with someone else, belonging to a social organisation (Mahmoud, Staten, Hall, & Lennie, 2012) or reporting to have enough

amount of pocket money (Nur et al., 2017). 25-50% of students report that financial concerns were effecting their academic work (Stewart-Brown et al., 2000). The prevalence of mental disorders differs by different factors among overweight or obesity and alcohol or drug consumption (Australian Bureau of Statistics, 2008). Those can be physical activity (Australian Bureau of Statistics, 2008; Staiano et al., 2016), study subject (Bayram & Bilgel, 2008), year of study (Bayram & Bilgel, 2008), financial stress or living situation (Stallman, 2010). Gender also influences the presence of mental health. The odds of overweight males for being diagnosed with a lifetime psychiatric disorder were 156% higher than for males with normal body weight (OR= 2.56) (Odlaug et al., 2015). A study conducted in Denmark reported even better mental health for obese males than individuals with normal weight or underweight (Dey et al., 2013). Most commonly, students worry about study or work (Stewart-Brown et al., 2000). No big differences in international and domestic students have been shown (Khawaja & Dempsey, 2008; Stallman, 2010), although international students are more vulnerable due to less social support (Khawaja & Dempsey, 2008). One study has found significant differences in moderate distress and stress in students and non-students, but not in high distress (Cvetkovski et al., 2012). Over 80% of students reported at least one form of distress. Experiencing more forms of distress increases the risk for suicidal ideation or dropping out of school (Dyrbye et al., 2011).

In Australia, \$6.9 billion was spent on mental health programs and services in 2010-11 in particular (Department of Health and Ageing, 2013). Western Australia has the highest expenditure on general adult mental health services in Australia with \$233 in 2010-11, with the national average being \$184 (Department of Health and Ageing, 2013). An increase of 178% of government expenditure on mental health has been noticed between 1992-93 and 2010-11 (Department of Health and Ageing, 2013). Young adults commonly want to handle their mental health problems on their own, which is probably the reason why they do not consider to seek out for help (Rickwood, Deane, & Wilson, 2007). In one study researchers have found that 18.45% of students received treatment for any disorder in the past year (Blanco et al., 2008). In another study, 11% of students reported that they have been diagnosed or treated for a mental health problem, with females being more likely than males (Leahy et al., 2010). Within students who reported frequent binge drinking combined with other mental health problems, 67% recognised that they need help in the previous year and 38% actually had been to a mental health service (Cranford, Eisenberg, & Serras, 2009). Young men are even less likely to seek professional help for mental problems than females (Rickwood et al., 2007). Students mostly do not seek for help regarding mental health issues, which might show that students except psychological distress as part of studying (Stallman, 2010). Some students are concerned about their own mental health status when actually experiencing psychological distress, which might indicate a sensitivity regarding their own mental health (Leahy et al., 2010). Most commonly, young adults start to seek out help from parents, friends, educational environment and general practice (Rickwood et al., 2007). For mental health services it is essential to be accessible. Better access of primary mental health care services led to an increase of using these services in young adult age. This was achieved through the Better Access Initiative in 2006 in Australia (Department of Health and Ageing, 2013).



## Depression

Depression is a common mental disorder with about 300 million people being affected by it worldwide. It is a mental disorder in which people are sad, lose their interest or pleasure, have feelings of guilt or low self-worth or have a disturbed sleep or appetite (World Health Organization, 2017a). Depressed people might experience loss of interest in normal situations or emotional instability (Souza, Paro, Morales, Pinto Rde, & da Silva, 2012). These characteristics can lead to problems to cope with daily life and can lead to suicide in extreme cases (Goebert et al., 2009; World Health Organization, 2017a). People screened as depressed seem to have a four times higher risk (OR= 4.05) to attempt suicide (Dyrbye et al., 2011). Depression can be seen as a serious concern in undergraduate students as students have a higher prevalence to become depressed compared to the general population (Ibrahim, Kelly, Adams, & Glazebrook, 2013). Depression is more common in students during their later years of studying (Mahmoud et al., 2012). Most common risks for leaving university are feeling burned out (OR= 2.40) and depression (OR= 2.19) (Dyrbye et al., 2011).

Overweight and obese individuals show higher prevalence's in depression than ones within the normal- or underweight range (Fowler-brown, Ngo, & Wee, 2012; Luppino, de Wit, Bouvy, & et al., 2010; Odlaug et al., 2015; Scott, Bruffaerts, et al., 2008; Zhao et al., 2009), which is also supported by a study conducted in Australia (Ball, Burton, & Brown, 2009). Depression and obesity can have an impact on each other in both directions. In a systematic review researcher have found, that obese individuals had a 55% higher risk of developing depression. Also depressed individuals had a 58% increased risk to become obese compared to not depressed people (Luppino et al., 2010). This statement is supported by a study in which obesity at age 14 was associated with depressive symptoms in young adulthood (OR= females 1.64, males 1.97) (Herva et al., 2006). Obesity at age 27 led to lower odds for depression at age 30 for men in another study (OR= 0.31) (McCarty et al., 2009). Adults who are overweight for at least 10 years are in higher risk of developing depression (Luppino et al., 2010). Through meta-analysis of longitudinal studies, researchers have found that individuals with depression during adolescents had a 2.5 higher risk to develop obesity in adulthood (Blaine, 2008). Another study found an association between depressive symptoms at age 14 and a higher BMI at age 20 (Zhu et al., 2017). In some studies an association has been shown between BMI and depression (Almeida, Savoy, & Boxer, 2011; Lazarevich et al., 2016). Especially a higher BMI was associated with a higher depression score (Lazarevich et al., 2016). In some studies, no significant associations between BMI and depression were reported (Arslan, Ayranci, Unsal, & Arslantas, 2009; Herva et al., 2006; Liu et al., 2007; Magallares et al., 2017; Şanlıer et al., 2016; Scott, McGee, et al., 2008). One study reported that BMI and depression are not significantly correlated after including gender as a confounder into the calculations (Şanlıer et al., 2016). Weight changes have been found associated with depression in an Australian study (Ball et al., 2009) as well as not associated in a Canadian population (Girz et al., 2013). Depressive symptoms did not seem to predict weight change (Fowler-brown et al., 2012) and are shown to be positive associated with body weight underestimating (Andrade et al., 2012). The association between depression and obesity has been shown to be more significant for women than men over time (McCarty et al., 2009).

Depression is determined by different factors, such as all sociodemographic factors (Arslan et al., 2009). The prevalence of depression varies by gender for example (Australian Bureau of Statistics, 2008; Blaine, 2008; Friedman et al., 2005; Ibrahim et al., 2013; Liu et al., 2007; Mikolajczyk, El Ansari, & Maxwell, 2009; Scott, Bruffaerts, et al., 2008; Zhao et al., 2009). Women have been shown to have depression more commonly than men (Girz et al., 2013; Scott, Bruffaerts, et al., 2008; World Health Organization, 2017a; Zhao et al., 2009; Zhu et al., 2017). Although some studies show no gender differences in depression (Bayram & Bilgel, 2008; Davila et al., 2014; Mahmoud et al., 2012). Other factors have shown to influence depression, like countries, cultures (Luppino et al., 2010; Mahmoud et al., 2012; Mikolajczyk et al., 2009) and psychosocial factors (Mahmoud et al., 2012). Diet is also an important factor for depression (Dipnall et al., 2017), with emotional eating as a possible outcome (Lazarevich et al., 2016). Individuals with depressive symptoms often have dysfunctional coping strategies and are prone to develop abnormal eating behaviours, accompanied by periods of overeating to reduce negative moods. Food is a natural reward in order to cope with negative emotions (Lazarevich et al., 2016). Satisfaction with education (Bayram & Bilgel, 2008) and life (Mahmoud et al., 2012) also influence depression, although one study has found no significant correlation between depression and satisfaction with life (Hawker, 2012). Religion has been found to decrease depression rates in the U.S. (Mahmoud et al., 2012). Age was not found to be significant associated with depression (Bayram & Bilgel, 2008). Stress (Bunevicius, Katkute, & Bunevicius, 2008; Gerber, Brand, Elliot, Holsboer-Trachsler, & Pühse, 2014), family depression history and alcohol consumption (Arslan et al., 2009) are important factors for students' prevalence of depression. An increase of physical activity decreases the risk of depressive symptoms (Ball et al., 2009; Suija et al., 2013; Tyson, Wilson, Crone, Brailsford, & Laws, 2010). No association between physical activity and depressive symptoms has been reported by another study (Hawker, 2012; Thome & Espelage, 2004). A significant correlation between depression and smoking has also been found (Arslan et al., 2009; Cranford et al., 2009; Liu et al., 2007). Individuals who smoke cigarettes have double the risk of having a major depression (OR= 2.2) (Cranford et al., 2009). Weight stigmatization (Friedman et al., 2005; Magallares et al., 2017) and discrimination (Magallares et al., 2017) are associated with an increased risk for depression. Measured depression rates in individuals perceiving stigma are in the mild to moderate (Friedman et al., 2005) or mild (R. M. Puhl & Brownell, 2006) clinical range.

High differences in measured depression prevalence's in undergraduate students are reported by a systematic review (Ibrahim et al., 2013). Studies reported prevalence's of depression among students from all around the world with 13.8% in the U.S. (Eisenberg et al., 2007), 20.9% in China (Wong et al., 2006), 21,7% in the U.S. (Goebert et al., 2009) and 21.8% in Turkey (Arslan et al., 2009). Separated by gender depression prevalence's are reported at 13.2% for males and 19.7% for females in the U.K. (El Ansari, Dibba, et al., 2014), 19% for males and 15.1% for females in India (Pengpid & Peltzer, 2014) and 30.2% for males and 26.6% for females in Thailand (Pengpid & Peltzer, 2015). In a systematic review by Ibrahim and colleagues, they have calculated a mean depression prevalence in undergraduate students at 30.6% (2013). Differences in study fields show that 14% of medical students and 13% of humanities students reported depression (Bunevicius et al., 2008). Another study found symptoms of depression in 46.5% of medical students (Dyrbye et al., 2011). In the systematic review by

Ibrahim and colleagues, medical students had a depression prevalence of 26% compared to 36% of those in other faculties (2013). At Curtin University, 1.9% of Curtin students reported severe depression and/or anxiety, 7.6% reported moderate levels of depression and/or anxiety, 28.5% reported mild levels of depression and/or anxiety, which means a total of any depression and/or anxiety prevalence of 38% (Hunt & Burns, 2017). It is suggested, that the prevalence of depression might be underestimated at universities (Ibrahim et al., 2013). Depression rates are reported to be the lowest in the fourth and last year, although suicidal tendencies is reported to be the highest at the same time (Goebert et al., 2009). In young adults in general, 11.7% of males and 17.4% of females reported depressive symptoms (Suija et al., 2013). In Australia, a 12-month prevalence of depressive episodes is reported at 4.1% for adults in general (Australian Bureau of Statistics, 2008).

## **Anxiety**

Another form of a mental disorder is anxiety. An anxiety disorder can be characterised by the feel of tension, distress or nervousness (Australian Bureau of Statistics, 2008). Onset of anxiety disorder has been reported at age eleven in the U.S. (Kessler et al., 2005) with the highest 12-month anxiety prevalence among young and middle aged people (Scott, McGee, et al., 2008). In university students, an anxiety prevalence has been reported at 4.2% in the U.S. (6.1 % females and 2.2% males) (Eisenberg et al., 2007), 3.4% females and 2% males in Mexico (Lazarevich et al., 2013), 41.2% in China (Wong et al., 2006), 43 % in medical students and 53% in humanities students in Lithuania (Bunevicius et al., 2008). Of students at Curtin University, 1.9% reported severe depression and/or anxiety, 7.6% report moderate levels of depression and/or anxiety, 28.5% report mild levels of depression and/or anxiety, which shows a total of any depression and/or anxiety prevalence of 38% (Hunt & Burns, 2017). One study has reported no difference in the prevalence of anxiety between college students and non-college peers, as both prevalence's have been high (Blanco et al., 2008). However, 30% to 60% of students reported limitations of work capacity due to anxiety (Stewart-Brown et al., 2000). For the general population in the U.S., the lifetime prevalence of anxiety has been calculated at 15.5% (Rosenberger, Henderson, Bell, & Grilo, 2007) and 12-month anxiety disorder at 14.4% in Australia (Australian Bureau of Statistics, 2008). Anxiety disorders need to be noticed early to treat this illness as soon as possible (Haller, Cramer, Lauche, Gass, & Dobos, 2014).

Several factors influence the prevalence of anxiety in different ways. Differences in the prevalence of anxiety has been shown in gender (Australian Bureau of Statistics, 2008; Bakhtiyari et al., 2013; Bayram & Bilgel, 2008; Eisenberg et al., 2007; Haller et al., 2014; Kessler et al., 2005; Mahmoud et al., 2012; Zhao et al., 2009). Mostly a higher prevalence in women compared to men is reported (Australian Bureau of Statistics, 2008; Eisenberg et al., 2007; Haller et al., 2014; Kessler et al., 2005; Mahmoud et al., 2012; Zhao et al., 2009). Two studies from Nigeria and Spain have not found a relationship between BMI and anxiety (Ejike, 2013; Magallares et al., 2017). However, a relationship between overweight/obesity and anxiety is reported by several studies (Garipey, Nitka, & Schmitz, 2010; Odlaug et al., 2015; Scott, Bruffaerts, et al., 2008; Scott, McGee, et al., 2008; Staiano et al., 2016; Zhao et al., 2009). In a systematic review by Garipey and colleagues, most of the studies have shown an increased risk for anxiety with moderate strength in obese adults compared to non-obese individuals (2010).

Age differences have been found between anxiety and obesity in one study (Scott, Bruffaerts, et al., 2008) but not significantly between only age and anxiety (Bayram & Bilgel, 2008). An increase in weight has found to be correlating with a higher anxiety score in men (Staiano et al., 2016). The association of obesity and anxiety disorder is influenced by biological, environmental or individual factors (Garipey et al., 2010). Another factor, which influences the relationship to anxiety has been shown to be physical activity, as increased physical activity is associated with decreased levels of anxiety (Thome & Espelage, 2004; Tyson et al., 2010). At the same time other studies have reported that no significant association has been found between physical activity and anxiety (Hawker, 2012; Staiano et al., 2016). Perceived weight discrimination is associated with anxiety disorder (Hatzenbuehler, Keyes, & Hasin, 2009; Magallares et al., 2017). Also cigarette smoking is significant positively associated with anxiety (Cranford et al., 2009), while religion and great satisfaction with life are negatively associated with anxiety (Mahmoud et al., 2012). Other aspects like psychosocial and culture factors (Mahmoud et al., 2012), processed food intake (Bakhtiyari et al., 2013) and satisfaction with education (Bayram & Bilgel, 2008) have an effect on anxiety. Different comorbidities among anxiety are common (Haller et al., 2014). Consequences of experiencing anxiety can include psychosocial functioning in daily life (Haller et al., 2014), a lower emotional stability and higher level of vulnerability to stress (Bunevicius et al., 2008).

## **Stress**

Stress is common in students who have a tight schedule at university, repeated examinations and lack of time for other activities apart from university (Deka et al., 2014). It has been shown that Malaysian students feel that they experience too much work and that they have difficulties with coping with them (Chan & Koh, 2007). A study which focused on medical students, stressors for pre-clinical students were the fear of failing, repeating the course and the need to get good marks. Clinical students were worried about passing the course and being good doctors (Chan & Koh, 2007). 60.3% of students reported coping with studies as the highest source of stress (Abdulghani, Alkanhal, Mahmoud, Ponnampuruma, & Alfaris, 2011) and 84.8% of students reported some level of financial stress, which increases the odds for psychological distress (Stallman, 2010). At this stage, it is not possible to say if stress, experienced during studying, is due to environmental or individual factors (Chan & Koh, 2007).

Because perceived stress of students will affect their academic performance and health in general, it is important to know the actual stress level (Abdulghani et al., 2011). Over the years of studying, students learn how to cope with academic stress (Abdulghani et al., 2011; Al-Daghri, Al-Othman, Albanyan, et al., 2014; Stallman, 2010). Students develop different coping strategies through a peer support system (Abdulghani et al., 2011). In another study, first year students are not as stressed as students in higher study years (Stallman, 2010). A review has shown an increase of students' stress in the last years. This trend is expected to rise further (Robotham, 2008). Although stress needs to be prevented, stress is also important to achieve the optimum academic performance because stress gives "spice to one's life" (Abdulghani et al., 2011). A stressful situation might be negative for one person but can be experienced positively by another individual (Robotham, 2008). Still, stress prevention interventions should be conducted in university from year one to support especially the first and second year

students. Students need to learn how to deal with stress before it reaches severe levels (Abdulghani et al., 2011). Clinical services need to be developed in universities to provide a good mental health service in that setting (Abdulghani et al., 2011).

Stress in students has been reported in different studies, with prevalence's of 26.5% in China (Wong et al., 2006), 44% in Saudi Arabia (Al-Daghri, Al-Othman, Al-Attas, et al., 2014), 52.9% in Australia (Papier, Ahmed, Lee, & Wiseman, 2015) and 63.8% in Saudi Arabia (Abdulghani et al., 2011). Studies which focused on medical students showed stress prevalence's of 48.6% in the U.S. (Dyrbye et al., 2011) and 49.6% in Malaysia (Chan & Koh, 2007). A significant association between stress level and year of studies has been shown. In first year at university, the highest stress prevalence of 78.7% has been seen. The prevalence of stress reduces over the years of studies and increases again in the last year (Abdulghani et al., 2011). It is important to compare study subjects because results for one study subject cannot be generalised for other subjects (Robotham, 2008).

A meta-analysis has shown that psychosocial stress is positively associated for developing obesity, although this relation is small (Wardle, Chida, Gibson, Whitaker, & Steptoe, 2011). Other studies have shown also an association between stress and obesity (Lazarevich et al., 2015; Odlaug et al., 2015) but another has not between stress and BMI (El Ansari, Suominen, & Berg-beckhoff, 2015). More studies have focused on the association between stress and weight change. Stress is reported to have an effect on weight change as in weight loss and gain (Boyce & Kuijer, 2015; Serlachius et al., 2007) and just weight gain (Lazarevich et al., 2015). Two studies in China and Canada have not found a significant relationship between weight change and stress (Liu et al., 2007; R. A. Vella-Zarb & Elgar, 2010). Beside weight, gender has been reported to influence stress as well (Abdulghani et al., 2011; Bayram & Bilgel, 2008; El Ansari, Oskrochi, & Haghgoo, 2014; El Ansari et al., 2015; Liu et al., 2007; Mahmoud et al., 2012; Mikolajczyk et al., 2009; Phelan et al., 2015). Most commonly, females have shown a higher prevalence of stress than males (Abdulghani et al., 2011; El Ansari et al., 2015; Mahmoud et al., 2012). No difference in perceived stress in gender is reported by one study conducted in Saudi Arabia (Al-Daghri, Al-Othman, Albanyan, et al., 2014). Although gender has shown to have a significant influence in stress, it is reported to be very small (Mahmoud et al., 2012). Differences in stress are observed between countries (El Ansari, Oskrochi, et al., 2014; Mikolajczyk et al., 2009), cultures (Mahmoud et al., 2012) and international and domestic students, as international students suffer more often from stress (Cvetkovski et al., 2012). Another study has discovered no difference between international and domestic students (Khawaja & Dempsey, 2008). Associations regarding stress were discovered with satisfaction with life (Mahmoud et al., 2012), satisfaction with education (Bayram & Bilgel, 2008), depressive symptoms (Gerber et al., 2014), metabolic risks (Al-Daghri, Al-Othman, Al-Attas, et al., 2014), psychosocial factors (Mikolajczyk et al., 2009) and ball sport activities (Gerber et al., 2014). Smoking was associated with stress in one study from China (Liu et al., 2007) and not in another one from Malaysia (Chan & Koh, 2007). Younger individuals perceive stress more often (Bayram & Bilgel, 2008; El Ansari, Oskrochi, et al., 2014), as older people have been shown to cope with stress better (Lazarevich et al., 2015). Because in the Western society thin is perceived as good, women might feel stressed to achieve a slim body, if they feel dissatisfied with their weight (Ball & Lee, 2002). Also those who experience weight discrimination are likely to report high perceived stress scores as well (Hatzenbuehler et al., 2009).

Individuals consume more unhealthy foods if feeling stressed (Bennett et al., 2013; El Ansari et al., 2015; Kandiah, Yake, Jones, & Meyer, 2006; Papier et al., 2015). 81% of student's have shown to experience a different appetite when feeling stressed. Lower variety of foods and more foods high in sugar and salt are consumed more, which is often a consequence of stress. The combination of an increase in appetite and unhealthy food choices when feeling stressed can be dangerous because this can lead to an unhealthy lifestyle and a higher morbidity rate (Kandiah et al., 2006). Especially with emotional eating, healthy food choices are harder to make if feeling stressed (Bennett et al., 2013).

## **Discrimination**

Weight discrimination is more common among individuals under 25 years compared to older people (Hatzenbuehler et al., 2009) and leads to weight self-stigma in obese people (Magallares et al., 2017). Weight discrimination has a significant impact on a persons' mental (Hatzenbuehler et al., 2009) and physical health (Sutin et al., 2016). 56% of overweight and obese people from the U.S., who reported weight discrimination, showed at least one mental disorder (Hatzenbuehler et al., 2009). 75% of obese participants have reported that they have experienced many stigmatized situations (Friedman et al., 2005). The influence of weight discrimination on mental health is independent on the actual body weight (Hatzenbuehler et al., 2009). If a woman with normal weight perceives herself as overweight, she will probably become overweight because of higher calorie-dense food after perceived weight stigmatization (Major, Hunger, Bunyan, & Miller, 2014). Individuals in the U.S. who experience weight discrimination reported feeling less attentive, less active, less confident, angry, frustrated, upset and jittery. Furthermore, people reported more daily stressors and experienced more physical symptoms (Sutin et al., 2016). Different coping strategies for weight stigma have been reported. It has been shown that individuals head off negative comments, use positive self-talk, cope through faith, eat more and seek social support (R. M. Puhl & Brownell, 2006).

Weight stigma can lead into a vicious circle because it can be a negative stressor which is a risk for overeating and weight gain. This makes it even more difficult to lose weight, because it can lead to more weight stigmatization and more weight gain (Almeida et al., 2011; Tomiyama, 2014). At the same time it is highly depending on the persons' perceived body weight. If people believe they are overweight, concerns regarding weight stigmatization increase (Major et al., 2014) and individuals have shown reactions to weight-stigmatizing (Himmelstein et al., 2015). As a consequence of a wrong body weight perception of normal weight people, increase of calorie-rich food consumption and decrease of the feeling of having the ability of controlling their diet has been shown. This shows that people, without being in the overweight or obese BMI categories, can also experience weight discrimination or stigmatisation (Major et al., 2014). In the U.S., weight discrimination has shown to lead to obesity over time (OR= 2.54) or remains obesity of obese people (OR= 3.2), while other types of discrimination were not related to become obese or remaining obesity (Sutin & Terracciano, 2013).

Overweight and obese students report more perceived weight stigmatization than normal weight students (Phelan et al., 2015). Also, obese individuals experience weight discrimination even more often than overweight individuals (Hatzenbuehler et al., 2009; Sutin & Terracciano, 2017). A higher BMI is associated with more

frequently weight stigmatization (R. M. Puhl & Brownell, 2006; V. & S., 2008), which is also shown between lower obese BMI and higher obese BMI, as individuals in the higher obese range experience discrimination more often (Friedman et al., 2005). Individuals who participate in weight loss treatment often have experienced weight stigmatization (Friedman et al., 2005). Stress of weight discrimination leads to weight gain more often rather than weight loss. This is why weight discrimination cannot be seen as a motivation for weight loss (Sutin & Terracciano, 2013). The experience of weight stigmatization increases risk behaviours which maintain or increase lifestyle factors for obesity potentially (R. Puhl & Suh, 2015). BMI change and weight discrimination have shown to be independent to each other (Sutin et al., 2016).

Discrimination can be experienced in all age groups (R. Puhl & Suh, 2015) and has been reported more commonly by women (Hatzenbuehler et al., 2009). Stigma can lead to verbal teasing, physical bullying and relational victimization (R. M. Puhl & Latner, 2007) and is caused most commonly by children and strangers or situations in which others stare at the victims (V. & S., 2008). Teasing and psychological functioning have been associated (Rosenberger et al., 2007) and the teasing history has a strong association with current functioning (Rosenberger et al., 2007). These developed negative beliefs about themselves due to stigmatization lead to an increased risk of developing psychological consequences (Friedman et al., 2005), such as depression (Friedman et al., 2005; Magallares et al., 2017; Phelan et al., 2015; R. M. Puhl & Latner, 2007), anxiety (Friedman et al., 2005; Hatzenbuehler et al., 2009; Magallares et al., 2017; Phelan et al., 2015) and stress (Hatzenbuehler et al., 2009; Phelan et al., 2015; Sutin et al., 2016). It has been further reported to be associated with overall health (Phelan et al., 2015). Furthermore, weight stigmatization influences body satisfaction (Almeida et al., 2011; R. M. Puhl & Latner, 2007), self-esteem and peer relationships (R. M. Puhl & Latner, 2007). Another study has no association reported between stigmatizing and psychological functioning (R. M. Puhl & Brownell, 2006). Studies have shown exercise avoidance due to weight stigmatization (R. M. Puhl & Latner, 2007; Sutin & Terracciano, 2017; V. & S., 2008), which can be explained by the fact that individuals feel embarrassed or shamed doing physical exercise in public (V. & S., 2008). It has been described that weight stigmatization is a risk factor for binge eating (Almeida et al., 2011; Rosenberger et al., 2007; Sutin & Terracciano, 2017). Weight discrimination is associated in a study from the U.S. with more risky health behaviours, such as sexual behaviour, smoking and drug use (Sutin & Terracciano, 2017).

### **Quality of Life**

Quality of Life (QoL) is important for university students in particular (Messina et al., 2016) and has shown to be low in students (Messina et al., 2016; Stewart-Brown et al., 2000). Over the years of studying, students report lower QoL (Souza et al., 2012). Because QoL is mostly investigated in the general adult population, more research needs to be done in younger adult populations (Jenkins, Hoste, Meyer, & Blissett, 2011).

QoL has shown to be associated with body image perception (El Ansari et al., 2010), psychological distress (Deka et al., 2014), mental health (Odlaug et al., 2015), stigma (R. Puhl & Suh, 2015), place of residency, pocket money and smoking status (Nur et al., 2017). Culture differences are also important to consider (Huang et al., 2006). During studying, feeling distressed influences perceived QoL (Deka et al., 2014). Gender differences have also

been reported (Messina et al., 2016; Stewart-Brown et al., 2000), as females report lower scores in most of the QoL dimensions in Brazil (Souza et al., 2012). Individuals with depression have shown lower QoL in all dimensions (Arslan et al., 2009; Souza et al., 2012). An association has been reported between QoL and BMI (Nur et al., 2017). Australian adults have shown to have higher QoL scores with a BMI within the healthy weight range. With an increasing BMI, the QoL scores have shown to decrease (Renzaho, Wooden, & Houg, 2010), which is supported by another study from Canada (Hopman et al., 2007). Other researchers have shown an association between reduced physical QoL scores and overweight/obesity (Dey et al., 2013), no association between overweight/obesity and mental QoL (Huang et al., 2006) and an association between underweight and reduced mental QoL scores (Dey et al., 2013). Although it is mentioned that low weight alone is unlikely to lead to a lower QoL on its own (Jenkins, Hoste, Conley, Meyer, & Blissett, 2011). Sociodemographic factors have been associated with BMI and QoL (Dey et al., 2013). Several health-risk behaviours need to be included while investigating BMI and QoL, such as physical activity and daily cigarette smoking (Dey et al., 2013). Eating disorders can also have a great impact on a students' QoL (Jenkins, Hoste, Conley, et al., 2011).

### **Food, Physical Activity And Smoking Behaviour And Its Importance Regarding Mental Health**

Beside the discussed factors, different variables influence mental health. Diet is associated with weight change (Mozaffarian et al., 2011) and is an important risk factor for depression (Dipnall et al., 2017). Food consumption influence mental health, as students with a higher intake of vegetables and fruit are more likely to have better mental health and safer lifestyle behaviours in general (Adams & Colner, 2008). Although, 51% of students rate their "healthiness" of eating behaviour as poor or fair (Silliman et al., 2004). Students have shown to eat less than the recommended amount for vegetables, fruit, grains, dairy, meat, fish and beans in freshman year (Butler et al., 2004), as they decrease fruit and vegetable consumption with start of studies (Pliner & Saunders, 2008) and increase calorie intake through unhealthy foods (Butler et al., 2004), which is why it can be said that students dietary behaviours mostly not met recommendations during studying (Racette et al., 2005). 5.5% of students have not reached the recommended fruit and vegetable intake (Greene et al., 2011), which is influenced by sociodemographic variables (Adams & Colner, 2008). If feeling stressed, an increase of appetite and unhealthy food choices can be a dangerous combination for developing an unhealthy lifestyle. This combination can lead to a higher morbidity (Kandiah et al., 2006). It has been reported that individuals eat more sweets while feeling stressed (Liu et al., 2007; Mikolajczyk et al., 2009). More students tend to eat more in stressful periods, only some students eat less (Epel et al., 2004). Stress has shown to lead to more unhealthy food choices (Liu et al., 2007), which can lead to negative health outcomes (Epel et al., 2004). Eating behaviour has been reported to be also influenced by social and psychological factors (Ganasegeran et al., 2012), as well as gender and countries (Mikolajczyk et al., 2009). An unhealthy eating behaviour can lead to poor mental health (Lazarevich et al., 2013). Overeating can be caused by weight stigma (R. Puhl & Suh, 2015) and can lead to obesity (Pedram et al., 2013). For students, reasons for poor eating habits have been reported to be lack of time (40%), lack of money (22%), taste preferences (15%) and other reasons (Silliman et al., 2004). Another study has reported that about half of the students (48.5%) have eaten because they felt lonely, 53.8% ate until their stomach hurt, 53% have eaten because they feel upset or nervous, 59.1% felt bored, 62.1% felt completely out of control regarding food and



80.3% felt happy (Ganasegeran et al., 2012). Overweight students report significantly more often they feel that food controls their lives than normal weight individuals (Desai et al., 2008). Half of the students with an eating disorder try to get help (Eisenberg, Nicklett, Roeder, & Kirz, 2011).

Students should learn healthy eating habits to improve their lifestyle behaviours (Ganasegeran et al., 2012). As an example, in a Malaysian study most of the students have reported healthy eating habits, although some exceptions existed (Ganasegeran et al., 2012). Overweight and obese students (Desai et al., 2008) or females who perceive stress (Ball & Lee, 2002) are more likely to report a disordered eating habit. Of undergraduate students in the States, 13.5% of females and 3.6% of males have shown to have eating disorder symptoms (Eisenberg et al., 2011). The prevalence of eating disorder behaviour has no difference in study years (Girz et al., 2013). The lifetime prevalence of eating disorders is reported at 13.4% (Rosenberger et al., 2007). Disordered eating is predicted by weight dissatisfaction over time (Ball & Lee, 2002) and is significantly associated with major depression, panic disorder, anxiety disorder and suicidal thoughts (Eisenberg et al., 2011). People who have been teased have reported significant higher eating disorder concerns (Rosenberger et al., 2007). Emotional eating can lead to a negative feeling after food consumption (Bennett et al., 2013). The risk of binge eating has reported to be increased with weight stigmatization (R. Puhl & Suh, 2015) and higher BMI (Almeida et al., 2011). Binge eating disorder is defined as recurrent binge eating, in which people eat large amounts of food and use weight control behaviours, such as purging (Gearhardt et al., 2012). Binging episodes were feared more often by overweight than normal weight individuals (Desai et al., 2008). 56.8% of individuals with binge eating behaviour also meet the criteria for food addiction (Gearhardt et al., 2012).

Food addiction is a critical eating behaviour (Gearhardt et al., 2012), which can be associated with different mental problems (Gearhardt et al., 2012; Imperatori et al., 2014). Food addicted individuals weigh on average 11.7 kg more than non-food addicted people (Pedram et al., 2013) and consume higher amounts of foods which are high in fat and sugar (Gearhardt et al., 2012). In adults, 33.9% of overweight and obese people have met the criteria for food addiction (Imperatori et al., 2014). Another study reports a prevalence of 1.6% in under- and normal weight people and 7.7% in overweight and obese individuals regarding food addiction (Pedram et al., 2013). The prevalence of food addiction increases with BMI (Pedram et al., 2013; Şanlıer et al., 2016) and is more common in females (Pedram et al., 2013). Another study reported that no differences exist between food addiction and age, gender, race and education (Gearhardt et al., 2012). Food addiction has been shown to be associated with depression (Gearhardt et al., 2012; Imperatori et al., 2014) and other disorders (Imperatori et al., 2014). Furthermore, people addicted to food have shown to have lower emotional dysregulations (Gearhardt et al., 2012).

Physical activity has shown to have an important role in mental health (Gerber & Puhse, 2009) and weight gain (Mozaffarian et al., 2011). Students did not meet physical activity recommendations during studying (Racette et al., 2005), as in one study 53.7% of Malaysian students reported physical inactivity (Al-Naggar et al., 2013). Overweight students report more often physical inactivity than normal weight students (Desai et al., 2008).

Another study have found that 54.2% of students report high level of physical activity (Greene et al., 2011). Self-reported physical exercise decrease with start at university (Silliman et al., 2004).

High physical activity has been shown to be associated with low levels of depression and anxiety (Tyson et al., 2010), although in one study no significant association between exercise and depression has been seen (Thome & Espelage, 2004). In any way, it is suggested that depression and anxiety rates probably will not increase because of lack of exercise. It will be rather the case that with increased depression and anxiety rates, individuals are not likely to do exercise (Tyson et al., 2010). In a review it has been found that exercise and stress influence each other, which can have an effect in both directions (Gerber & Puhse, 2009). Exercise can be seen as a stress-management strategy but not all exercise practices have the same effect. Aerobic exercise and weight lifting might have not described a positive effect on stress because they are done individually or a group (Gerber & Puhse, 2009). Athlete students have been shown to have higher depression, anxiety and stress scores. This might indicate, that too much sport can increase stress levels as well (Demirel, 2016).

Women and men exercise for different reasons. Exercise in females is highly complex, because it can have negative and positive effects. Males have stronger positive reasons for doing exercise compared to females (Thome & Espelage, 2004). Being teased regarding their weight while doing physical activity might influence people's behaviour towards physical activity in general. This will lead to less physical activity (R. Puhl & Suh, 2015). Often individuals feel embarrassed or shamed doing physical exercise in public due to weight stigmatization (V. & S., 2008). Other reasons for exercise barriers have been reported to be most commonly lack of time, followed by lack of motivation and willpower (Silliman et al., 2004). 82.0% of students at Curtin University have reported to participate in university sports and 65.7% in community sports. Significant differences in students who participate in university or community sport and level of drinking have been reported, as students who are involved in university sport report more often hazardous drinking (Hunt & Burns, 2017). Alcohol use behaviour might also influence BMI (Cranford et al., 2009; McCarty et al., 2009; Mozaffarian et al., 2011), although this will not be discussed further in this thesis.

Smoking influences physical activity and general health (Messina et al., 2016). One study has reported no association between smoking and mental health specifically (Messina et al., 2016), although another one has (Cranford et al., 2009). Cigarette smoking students have shown an unhealthy lifestyle, which is why cigarette smoking can be taken as a marker for unhealthy lifestyle (Rohrer et al., 2012). A high prevalence of tobacco smoking in Australian students has been reported for both sexes (Smith & Leggat, 2007). Students have shown to start smoking at 20.8 years on average (Smith & Leggat, 2007), which shows the need for smoking prevention at this age group. Year of study has showed a significant difference in smoking as well (Smith & Leggat, 2007). One study has reported an association between overweight/obesity and smoking (Dey et al., 2013), although others have not towards BMI (Pengpid & Peltzer, 2015) or weight change (Mozaffarian et al., 2011). Smokers have shown to have significant different eating habits (Ganasegeran et al., 2012) and to be associated with major depression (OR= 2.2), panic disorder (OR= 2.8), generalized anxiety disorder (OR= 2.8) and males (OR= 1.4) (Cranford et al., 2009).

## **Suggestions For Practise**

Many different suggestions have been made how to use the presented research results for practise. Effective prevention of adult obesity needs to start already in childhood (World Health Organization, 2000). In particular for students, health promotion interventions are suggested in freshman year (Mihalopoulos et al., 2008). Different subgroups in student cohorts need to be addressed separately due to the different health behaviours (Greene et al., 2011). In general, interventions for students should focus on those living out of home (Pliner & Saunders, 2008) and include gender differences (Silliman et al., 2004). Different variables influence body image concerns among gender, which need to be taken into account when creating prevention programs (El Ansari, Dibba, et al., 2014). Special interventions should address students who are taking online-classes, as their educational environment and challenges differ compared to other university students (Maynard et al., 2015).

If no support is given, students' weight might increase during their studies and continue to increase beyond freshman year. Help should be provided by the nurse practitioners in all universities (Gores, 2008). Obesity prevention campaigns are common but mostly not evaluated, which needs to be changed because one needs to be sure that obese individuals are not stigmatised by these media campaigns. The focus should be to promote a healthy lifestyle rather than preventing obesity. Awareness regarding weight stigmatization needs to be raised in all professional and non-professional fields for effective obesity prevention and treatment (R. Puhl & Suh, 2015). University settings offer an ideal place for prevention and health promotion (Lazarevich et al., 2016). Healthy lifestyles need to be promoted (Butler et al., 2004; Department of Health, 2009; Racette et al., 2005), which includes a well-balanced diet and regular physical activities (Department of Health, 2009). Interventions need to include factors regarding someone's psychological problems and personality characteristics (Lazarevich et al., 2013). Also nutritional education, adequate emotion management and individuals vulnerable to depression need to be included (Lazarevich et al., 2016) and a behavioural change rather than weight loss should be the interventions' target (Department of Health, 2009). Programs should address students who want to lose weight as well as students who want to gain muscles, as both weight changes should be achieved in a healthy way (Harring et al., 2010). Not only individual factors should be included to reduce the prevalence of overweight and obesity. Environmental determinants and the community are highly important due to the fact that they can influence peoples' choice. Such can be highly influenced by population based policies and the food industry (World Health Organization, 2017b).

The first indications of mental disorders appear in the stages of early adolescence, which is why it is important to start prevention programs from a young age (Kessler et al., 2005). Early interventions and appropriate services are necessary to deal with mental disorders (Bayram & Bilgel, 2008). Mental health screening programs need to be established at universities to discover symptoms early and manage those, for example through psychiatric nurses, psychotherapists, social workers, academic advisors within the university health care system (Mahmoud et al., 2012). Individuals who have a high depression rate should be addressed by depression-related health education programs in particular (Arslan et al., 2009). Treatment and screening for depression in adolescents are important factors to consider to prevent obesity in later life (Blaine, 2008). Interventions at university should

focus on time and stress management skills (Bennett et al., 2013). Some interventions need to be created to address students', who are taking part in online-classes, special needs (Rohrer et al., 2012). Mental Health First Aid training is an example for increasing knowledge and skills regarding mental health first aid and raising the awareness of mental health problems. It has been shown that nursing students can benefit from this training, both personally as well as professionally (Burns et al., 2017). Health promotion interventions at university should focus on physical activity (Desai et al., 2008) or at least include physical activity in interventions (Silliman et al., 2004). Also eating habits should be discussed in those interventions (Silliman et al., 2004).

### 3. Method of Background Information And Calculations

This target of this thesis was to find out if a correlation between BMI and mental health among young students at Curtin University, Western Australia exists.

Mental health was investigated among the Depression Anxiety Stress Scale (DASS), Everyday Discrimination Scale (EDS), perceived mental health question and questions regarding students' quality of life (SF-8).

In this section, first the systematic literature review is described. Afterwards information about the University Student Health and Wellbeing Survey and its scales and questions are given. Lastly, data analysis is explained.

#### 3.1. Literature Review for Background Information

First, a short literature review was undertaken to have a first overview look on BMI and mental health (the different scales included). Followed by the short literature review, a systematic literature review was undertaken to get more detailed information about the topics found in the short review. Information found in the short review were used to create the search strategy for the systematic literature review (see table 01).

The systematic literature review was conducted in accordance to the PRISMA guidelines. This includes the systematic approach of the literature review and the use of the flow diagram for confirmability of included studies and sources (Moher, Liberati, Tetzlaff, & Altman, 2009).

Time frame for the systematic search was from the 21<sup>st</sup> of September until the 28<sup>th</sup> of September 2017. Additionally hand and citation search was conducted from the 28<sup>th</sup> of September until the 31<sup>st</sup> of October 2017. The systematic search was carried out in ProQuest and included the first 4,000 articles given by relevance in ProQuest.

Studies were included once they had fulfilled the following criteria: (1) were published in English; (2) were published between 2000 and 2017; (3) were accessible in full length; (4) included mental health or related words, like depression, stress, anxiety or quality of life and (5) included BMI or related words, like body size, body shape or weight. Studies were excluded once they did not match the inclusion criteria or focused on other age groups than young adults (<18 or >25) or adults, discussed issues not related to BMI or mental health.

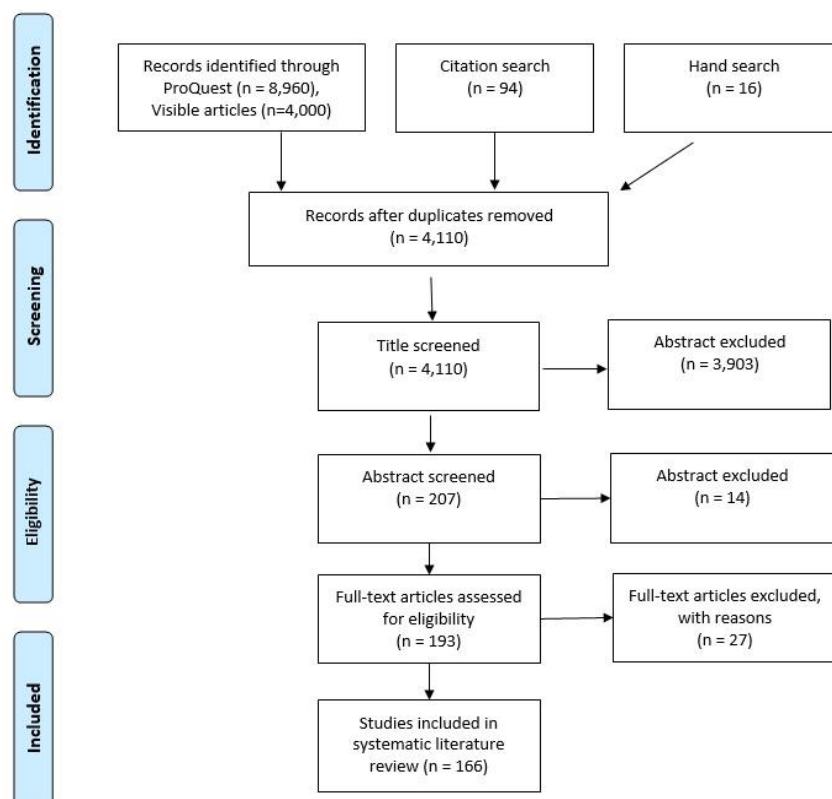
Table 1. Search terms used in the systematic literature review

Database	ProQuest
Search Terms	(1) Student* OR "Young adult*" OR "Universit* student*"
	(2) AND "Mental health" OR Depression OR Stress OR "Depressive symptoms" OR Anxiety OR QoL OR "Quality of Life"
	(3) AND BMI OR "Body Mass Index" OR Weight OR "Body size" OR "Body shape" OR "Body figure"

Through the search terms, 8,960 articles were identified in ProQuest of which the first 4,000 were viewed. First, the head line of articles were viewed, if the head line was suitable based on the include criteria, the abstract was read, followed by a first overview look of the study. The whole article was read in detail if the study matched the inclusion criteria. In the end, 50 of these articles were included in this thesis. Added to these were 94 articles through additional citation search and 16 articles and internet pages through hand search. In total, 166 references have been used in this thesis. Included articles and web pages were exported to EndNote X7.7.

The result of the systematic literature review can be found in the background information, chapter 1 – 2.2 (pp. 6-14). More information can be found in diagram 1.

Diagram 01. Flow Diagram based on Moher et al., 2009



### 3.2. University Student Health and Wellbeing Survey (USHWS)

The data used for calculations in this thesis is provided by the University Student Health and Wellbeing Survey (USHWS), which was conducted in 2014. Approximately 20 minutes were needed to fill out the survey. A random sample of 5,400 students enrolled at Curtin University (Bentley campus) received the survey. The students had a six week period for participation. Students who did not participate initially, received two emails which served as reminders. This survey covered students' overall health, as well as alcohol and cigarette smoking, mental health, sexual health, physical activity, nutrition and sun protection strategies. Participation had no influence on students' academic achievements but they had the possibility to give their e-mail address with the chance to win a \$100 voucher for Curtin University services. This survey has been approved by the Curtin University Human Research Ethics Committee (Approval Number RDHS-272-15).

#### **Depression Anxiety Stress Scale**

The Depression Anxiety Stress Scale (DASS-21) is a shorter form of the original 42-item DASS. The DASS-21 includes the factors with the highest loadings of the original DASS. Scores need to be multiplied by 2 to calculate the final score for the DASS-21. The DASS-42 was invented to capture depression and anxiety. Stress was decided to be included after pre-tests. The DASS-21 is a scale, which measures depression, anxiety and stress through seven questions for each issue. Answers are given on a 4-point Likert scale covering the last week, with being 0= did not apply to me at all and 3= applied to me very much, or most of the time. Coefficient alpha for the first sample was reported for depression, anxiety and stress, at 0.91, 0.84 and 0.90 respectively. Higher scores for each dimension show higher severe symptoms for that issue. Dimensions have been categorised as normal, moderate, severe and extremely severe for each issue. The particular calculated score can be classified in these categories. The first part is separated in normal, mild, moderate, severe and extremely severe depression, which is categorised in 0-9, 10-13, 14-20, 21-27, >27 respectively. Anxiety is divided with the same categories, separated in 0-7, 8-9, 10-14, 15-19, >19 respectively. Stress is also divided in the same categories, separated in 0-14, 15-18, 19-25, 26-33, >33 respectively (see table 2) (Lovibond & Lovibond, 1995).

The DASS-21 is used as a common measurement, which has been proven to be adequate reliable and valid in different subjects of study (Camacho, Cordero, & Perkins, 2016; Crawford & Henry, 2003; Husain, Sajjad, & Atiq, 2016; Migliorini, New, & Tonge, 2009; Migliorini, Sinclair, Brown, Tonge, & New, 2016; Norton, 2007; Tan, Zaidi, Azmi, Omar, & Khong, 2014; Tran, Tran, & Fisher, 2013) and specifically for students (Papier et al., 2015). Cronbach's alpha is reported at 0.95 (Migliorini et al., 2016), 0.927 (Migliorini et al., 2009) and 0.88 (Tran et al., 2013) for overall DASS-21.

Table 02. Definition for DASS categories from Lovibond Manuel

Severity	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

### Everyday Discrimination Scale

The Everyday Discrimination Scale (EDS) was invented by Williams and colleagues in year 1997. This scale asks for peoples' daily perceived discrimination. Through the frequencies of perceived discrimination along the nine item scale, everyday discrimination is measured. Questions are for example "You are treated with less courtesy than other people", "You receive poorer service than other people at restaurants or stores" and "People act as if they think you are not smart". Answers can be given on the four-point scale with zero indicating 'never experienced this discrimination' and three indicating 'experienced often' (Williams, Yan, Jackson, & Anderson, 1997). The scale, which is used in this survey, is the updated version, in which Williams and colleagues added the 10<sup>th</sup> question "You have been followed around in shops", with a Chronbach's alpha of 0.91 overall (Williams et al., 2008).

### SF-8 Scale

The SF-8 is a short form of the SF-36 Health Survey and consists out of eight items. Each question represent one domain of the SF-36 survey and represents a persons' quality of life. In total, all questions are divided into two parts, the Mental (MCS) and Physical Component Summary (PCS). These are asked through more specific questions regarding General Health (GH), Physical Function (PF), Role Physical (RP), Bodily Pain (BP), Vitality (VT), Social Functioning (SF), Mental Health (MH), and Role Emotional (RE). The range of the summary scores varies from 0 to 100, with a higher score showing better quality of life (Ware et al., 2001). The SF-8 has been successfully used in different areas of studies (Hopman et al., 2007; Maca et al., 2013; Miyoshi, Fukuhara, Kataoka, & Hagino, 2016; Renzaho et al., 2010; Turner-Bowker, Bayliss, Ware, & Kosinski, 2003) and students (Dyrbye et al., 2011). This scale has been used to investigate students QoL as well (Stewart-Brown et al., 2000).

### Further questions

Apart from the discussed scales, other questions have been asked regarding students' mental health in the USHWS. Questions regarding perceived mental health, stress factors and reaction of anxiety or depression have been asked. The students have also been asked who they would contact when they experience mental health problems.

## **BMI**

BMI is a common way of defining if a person is within the normal weight range (Australian Bureau of Statistics, 2013d; Department of Health, 2009; Nevill et al., 2010; World Health Organization, 2000, 2017b), which has been shown to be a robust and simple measurement (Nevill et al., 2010). BMI is defined as a person's weight in kilograms divided by the square of the height in meters ( $\frac{kg}{m^2}$ ) (World Health Organization, 2000, 2017b). Beside BMI, other measurements could be used, such as waist circumference and waist-hip ratio (World Health Organization, 2000).

### **3.3. Description of Calculations**

5400 students received the USHWS, of which 525 (9.72%) students responded. In the end 286 students (5.29% of all students and 54.48% of all responders) were included in the calculations, as those students provided their date of birth (age), height and weight (BMI). In the following calculations, data was included if the BMI was able to be calculated and the age was between 18 and <25. BMI was calculated based on self-reported weight and height. BMI categories were created using the WHO recommendation (<18.5; 18.5-25.99; 26-29.99; >30). Due to low numbers in the overweight or obese category, a combined category was created (BMI overweight and obesity combined into one category). Age was calculated using the given date of birth ('What year were you born?'). A p value less than 0.05 was considered significant.

Before starting the data analysis, variables were checked. Four variables needed correction as they would have falsified the results.

Results of the scale DASS were separated for each section; depression, anxiety and stress. Categories were created (normal, mild, moderate, severe and extremely severe) based on recommendations. The EDS answers were given on a four-point scale (never, once, two/three times, four/more items). The final variable is calculated by dividing the summed up answers by 10. A higher result indicates a higher perceived everyday discrimination. The next question 'How would you rate your own mental health?' has five possible answers, of which two were combined for calculations (very poor and poor) due to low answers in a different variable. Frequencies of other stress questions were calculated, but not further integrated in the calculations. All calculations were conducted with three different BMI categories (BMI continuous, BMI with four and three categories). All variables of DASS, EDS and other questions can be found in quality of life. Quality of life was asked through the SF-8, in order to have an overview statement of the data and to compare correlations to the results of other scales. Questions were looked at individually. For calculating correlations, Pearson Correlation was used for 'BMI' and Spearman Correlation was used for 'BMI combined' and 'BMI categories'. The coding definitions and all the scale questions can be found in the appendix.



## 4. Results

In the following section, the results of the 286 (N) surveyed students are presented. Of all the results, only the significant results are shown. If requested, all calculations can be viewed. The results can be found in tables enclosed in this thesis.

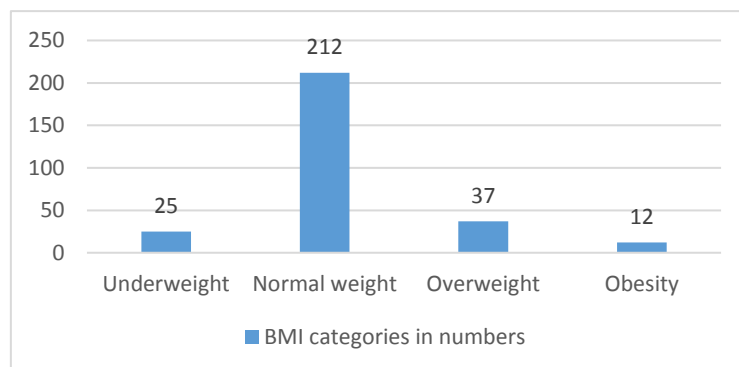
### 4.1. Descriptive Statistic of BMI And Scales

#### BMI, Age And Gender

The mean of BMI is calculated at 22.52, which is within the normal weight range. The standard variation is calculated at 3.553. The calculated median and mode are 22.18 and 21 respectively. Students' BMI ranged between 15 and 37. Students categorised BMI with four categories (BMI categories) has a mode of 2 and a median of 2, which is all within the normal weight range. In the variable 'BMI combined', a median and mode is calculated at 2 and 2 respectively, which means that the case in the middle of all cases and the most reported BMI in the 'BMI combined' variable are both reported to be normal weight (see diagram 2, p. 33). It can be said that on average, all results indicate a healthy BMI of the students included in this thesis (see table 3, p. 50). 25 students are underweight (8.7%), 212 students have normal weight (74.1%), 37 students are overweight (12.9%) and 12 students are obese (4.2%) (see table 4, p. 50). Students aged between the age of 18 and <25 are included in this thesis, with a mean of 20.75, a median of 21.00, a mode of 20 and a standard deviation of 1.74 years. Students' age ranged between 18 and 24 (Table 3). 25 students are 18 years old (8.7%), 52 are 19 years old (18.2%), 62 are 20 years old (21.7%), 57 are 21 years old (19.9%), 36 are 22 years old (12.6%), 28 are 23 years old (9.8%) and 26 are 24 years old (9.1%) (see table 5, p. 50).

Gender distribution was also viewed. 77 students reported to be male (27.1%), 199 students' reported to be female (70.1%), 3 reported to be genderqueer (1.1%) and 5 students selected other. Two students did not answer this question. Due to small numbers beside female or male variable, no cases have been excluded based on this variable (see table 6, p. 50).

Diagram 02. Frequency Distribution of BMI Categories



## **EDS and perceived mental health**

275 people answered all questions regarding their everyday discrimination, which means that 11 people did not answer all the questions. The end result of this scale can be between 0 and 10, a higher number indicating a higher everyday discrimination. In this thesis, students reported a mean everyday discrimination of 2.08 (SD= 2.442), median of one and mode being zero, with a range of zero to ten. A score of zero is indicating no everyday discrimination and ten very high everyday discrimination. Calculated median of EDS is 1 and mode 0 (see table 7, p. 51). 114 students have an end result of 0 (41.5%), 34 have a result of 1 (12.4%), 29 have a result of 2 (10.5%), 31 have a result of 3 (11.3%), 18 have a result of 4 (6.5%), 17 have a result of 5 (6.2%), 10 have a result of 6 (3.6%), 13 have a 7 (4.7%), 4 have a 8 (1.5%), 4 have a 9 (1.5%) and one student has a result of 10 (0.4%) (see table 9, 51).

Students' perceived mental health with all categories has a mean of 2.6 (SD= 1.025), a median of 3 and a mode of 3. Students' perceived mental health with four items has a mean of 2.62 (SD= 0.979), a median of 3 and a mode of 3. This means that on average, students rated their own mental health as good. This is shown for both perceived mental health variables, with four and five categories. No big differences can be found between the perceived mental health variables. 278 students answered this question (see table 7). 6 students reported to have very poor mental health (2.2%), 43 students reported to have poor mental health (15.5%), 59 reported to have neither poor nor good mental health (21.2%), 119 have good mental health (42.8%) and 51 have very good mental health (18.3%) (see table 8, p. 51).

In the USHWS, the question 'If any of the above events have occurred to you, what do you think was the MAIN reason for this/these experiences?' was asked after the EDS. 68 students answered 'The way you look' (28.5%), 51 students answered 'Your gender' (21.3%), 17 answered 'Your race' (21.3%), 13 answered 'Your education or income level' (5.4%), 11 answered 'Your ancestry or national origins' (4.6%), 9 students answered 'Your height or weight' (3.8%), 9 answered 'Your shade of skin colour' (3.8%), 7 answered 'Your religion' (2.9%), 3 answered 'Your sexual orientation' (1.3%), 1 answered 'A physical disability' (0.4%) and 50 chose the category 'Other' (20.9%) (see table 10, p. 52).

## **DASS**

All sections of the DASS are presented independently. 268 students answered all the DASS questions, which means there were 18 students who did not answer these questions. Depression was calculated to have a mean of 11.99 (SD= 10.652), a median of 10 and a mode of 0. Anxiety was shown to have a mean of 9.72 (SD= 8.612), a median of 8 and a mode of 2. Stress was calculated with a mean of 13.65 (SD= 9.404), a median of 12 and a mode of 6. This shows depression to be in the mild area, anxiety in the moderate section and the mean of stress can be found in the normal area (see table 11, p. 52). Detailed information on frequencies regarding depression, anxiety and stress can be found in tables 12 (p. 53), 13 (p. 53) and 14 (p. 54).

## 4.2. Calculations of Chi-Square, Cramer V And Correlations

In the following section, Chi-Square, Cramer V, Pearson or Spearman correlation are presented. Those calculations show the relationship between BMI and scales.

### EDS

Out of ten questions of the EDS scale, three were shown to have a significant relationship to some or all of the BMI variables. The question 'You have been called names or insulted' has a relationship to 'BMI categories' ( $\chi^2= 8.929$ ,  $p= 0.030$ ). After calculating Cramer V, the relation was shown to be small (Cramer V= 0.180,  $p= 0.030$ ). The question 'You have been threatened or harassed' has a small relationship to 'BMI combined' ( $\chi^2= 13.872$ ,  $p= 0.001$ ) (Cramer V= 0.225,  $p= 0.001$ ) and 'BMI categories' ( $\chi^2= 15.665$ ,  $p= 0.001$ ) (Cramer V= 0.239,  $p= 0.001$ ). The other question 'You have been followed around in shops' was significantly related to 'BMI combined' ( $\chi^2= 13.275$ ,  $p= 0.001$ ) (Cramer V= 0.220,  $p= 0.001$ ), and 'BMI categories' ( $\chi^2= 14.590$ ,  $p= 0.002$ ) (Cramer V= 0.230,  $p= 0.002$ ) (see table 15, p. 54).

All significant correlations between questions of the EDS scale and BMI variables were calculated to be below  $r= 0.17$ , which indicates the higher the BMI the more often are those situations of everyday discrimination experienced. 'You have been followed around in shops' was very small positive correlating with 'BMI' ( $r= 0.128$ ,  $p= 0.034$ ). 'You have been threatened or harassed' was also very small positive correlating with 'BMI combined' ( $r= 0.161$ ,  $p= 0.008$ ) and 'BMI categories' ( $r= 0.169$ ,  $p= 0.005$ ) (see table 16, p. 55).

### DASS

Out of the 21 questions of the DASS, two questions were related to some BMI variables. The question 'I found it difficult to relax' has a significant small relationship to 'BMI combined' ( $\chi^2= 12.994$ ,  $p= 0.043$ ) (Cramer V= 0.153,  $p= 0.043$ ). 'I was unable to become enthusiastic about anything' was significantly small related to 'BMI combined' ( $\chi^2= 16.304$ ,  $p= 0.012$ ) (Cramer V= 0.174,  $p= 0.012$ ) and 'BMI categories' ( $\chi^2= 17.603$ ,  $p= 0.040$ ) (Cramer V= 0.148,  $p= 0.040$ ). In the summed up end results, only depression has a relationship to BMI variables. 'DASS Depression' was significantly moderate related to 'BMI combined' ( $\chi^2= 73.535$ ,  $p= 0.002$ ) (Cramer V= 0.37,  $p= 0.002$ ) and 'BMI categories' ( $\chi^2= 110.829$ ,  $p= <0.001$ ) (Cramer V= 0.371,  $p < 0.001$ ) (see table 17, p. 55).

Out of the 21 question, 'BMI' was significantly correlating with ten questions and 'BMI combined' and 'BMI categories' were significantly correlating with six questions. The results indicate that the higher the BMI the more often are depression, anxiety and stress experienced. The variable 'BMI' was significantly very small or small positive correlating with the questions 'I couldn't seem to experience any positive feeling at all' ( $r= 0.13$ ,  $p= 0.033$ ), 'I felt that I was using a lot of nervous energy' ( $r= 0.126$ ,  $p= 0.039$ ), 'I was worried about situations in which I might panic and make a fool of myself' ( $r= 0.140$ ,  $p= 0.022$ ), 'I felt that I had nothing to look forward to' ( $r= 0.157$ ,  $p= 0.01$ ), 'I found myself getting agitated' ( $r= 0.127$ ,  $p= 0.047$ ), 'I found it difficult to relax' ( $r= 0.132$ ,  $p= 0.03$ ), 'I felt I was close to panic' ( $r= 0.185$ ,  $p= 0.002$ ), 'I was unable to become enthusiastic about anything'

( $r=0.167$ ,  $p=0.006$ ), 'I felt that I was rather touchy' ( $r=0.127$ ,  $p=0.038$ ) and 'I was aware of the action of my heart in the absence of physical exertion' ( $r=0.127$ ,  $p=0.038$ ). 'BMI combined' was significant very small positive correlating with the questions 'I felt that I had nothing to look forward to' ( $r=0.125$ ,  $p=0.040$ ), 'I found it difficult to relax' ( $r=0.128$ ,  $p=0.036$ ), 'I felt I was close to panic' ( $r=0.154$ ,  $p=0.012$ ), 'I was unable to become enthusiastic about anything' ( $r=0.153$ ,  $p=0.012$ ), 'I felt I wasn't worth much as a person' ( $r=0.126$ ,  $p=0.040$ ) and 'I was aware of the action of my heart in the absence of physical exertion' ( $r=0.147$ ,  $p=0.016$ ). 'BMI categories' was significant very small positive correlating with the questions 'I felt that I had nothing to look forward to' ( $r=0.132$ ,  $p=0.031$ ), 'I found it difficult to relax' ( $r=0.127$ ,  $p=0.038$ ), 'I felt I was close to panic' ( $r=0.159$ ,  $p=0.009$ ), 'I was unable to become enthusiastic about anything' ( $r=0.152$ ,  $p=0.013$ ), 'I felt I wasn't worth much as a person' ( $r=0.128$ ,  $p=0.036$ ) and 'I was aware of the action of my heart in the absence of physical exertion' ( $r=0.154$ ,  $p=0.018$ ) (see table 18, p. 56). All BMI variables were correlating with all or some end DASS categories. 'BMI' was very small positive correlating with depression ( $r=0.133$ ,  $p=0.030$ ), anxiety ( $r=0.161$ ,  $p=0.008$ ) and stress ( $r=0.137$ ,  $p=0.025$ ). 'BMI combined' was significant very small positive correlating with depression ( $r=0.121$ ,  $p=0.049$ ) and anxiety ( $r=0.121$ ,  $p=0.048$ ). 'BMI categories' was significant very small positive correlating with depression ( $r=0.123$ ,  $p=0.044$ ) and anxiety ( $r=0.123$ ,  $p=0.044$ ) (see table 19, p. 57).

### **Perceived Mental Health**

None of the variables were significant while calculating Chi-Square and Cramer V. Perceived mental health was negative correlating with BMI variables, which indicates the lower the BMI the better perceived mental health or the higher the BMI the worse perceived mental health. Only the 'BMI' variable was significant correlating with the mental health questions. 'BMI' was significant small negative correlating with the question 'How would you rate your own mental health' ( $r=-0.123$ ,  $p=0.040$ ) and the same question with four items ( $r=-0.128$ ,  $p=0.032$ ) (see table 20, p. 57).

### **Quality of Life**

Out of the eight questions of the SF-8, three were related to 'BMI categories' and one question was connected to 'BMI combined'. The question 'Overall, how would you rate your health during the past 4 weeks?' has a significant small relationship to 'BMI combined' ( $\chi^2=19.067$ ,  $p=0.039$ ) (Cramer V= 0.183,  $p=0.039$ ). The same question was also significant small related to 'BMI categories' ( $\chi^2=26.644$ ,  $p=0.032$ ) (Cramer V= 0.176,  $p=0.032$ ). The question 'During the past 4 weeks, how much did physical health problems limit your physical activities (such as walking or climbing stairs)?' was significant small related to 'BMI categories' ( $\chi^2=29.788$ ,  $p=0.003$ ) (Cramer V= 0.186,  $p=0.003$ ). The question 'During the past 4 weeks, how much energy did you have?' was calculated to have a significant small relationship to 'BMI categories' ( $\chi^2=26.522$ ,  $p=0.009$ ) (Cramer V= 0.176,  $p=0.009$ ) (see table 21, p. 58).

Two questions of the SF-8 are correlating with 'BMI'. All questions were small positive correlating with BMI variables, which indicates the higher the BMI the lower the quality of life. The question 'Overall, how would you rate your health during the past 4 weeks?' was significant small positive correlating with 'BMI' ( $r=0.178$ ,

$p=0.003$ ). 'BMI' was also significant small positive correlating with the question 'During the past 4 weeks, how much difficulty did you have doing your daily work, both at home and away from home, because of your physical health?' ( $r=0.134$ ,  $p=0.023$ ) (see table 22, p. 58).

All correlations with the EDS scale were below 0.170, with the DASS below 0.162, with perceived mental health higher -0.128 and with the SF-8 below 0.179. This showed that all correlations were small or very small.

The non-significant results of the scales calculating Cramer V and the correlations showed comparable strength compared to the significant results. This means that a higher sample size will probably not show other effects. Although the same calculation calculating Cramer V with a bigger sample would have smaller cells being lower than five, which would show if the results in this study are really true. A bigger sample size is recommendable.

## 5. Discussion

The purpose of this thesis was to find out if correlations between BMI and mental health exists. The results show that correlations do exist. Based on the calculations it can be said that the lower the BMI, the more often factors of mental health are better. The thesis and its results are discussed in this section.

Readers should be aware of the fact that everyday discrimination, depression, anxiety, stress, perceived mental health and quality of life are included in this thesis. Those factors were calculated to investigate the relationship between them and BMI. Mental health includes many more factors than those just mentioned. It needs to be clear that those results are not covering all mental health but parts. Those scales give an idea about the relation between BMI and mental health factors, but to have a more general statement about mental health, more scales and questions would need to be included.

The response rate of the USHWS was reported at 9.72% in total and 5.29% for cases included in this thesis, out of all the contacted students. The response rate could have been higher, especially for included cases in this thesis. Non-responders did not receive a questionnaire to ask basic information and the reason for their no response. As the reason for the high number of non-responders is not clear, this could be important information. In the USHWS, the gender distribution of 27.1% male and 70.1% female showed a high difference. Next time there should be more of a focus on the difference between responders and non-responders and a higher response of male participants.

Gender might be a great confounder in this study. It is important to investigate this topic with other calculations, which include gender as a confounder. The next study should include regressions.

Among the included students, there was a prevalence of being underweight at 8.7%, being normal weight of 74.1%, being overweight at 12.9% and obesity at 4.2%. The Australian government reported comparable but in general higher prevalence's of overweight and obesity, as 5.8% of young adults (18-24 years) were underweight, 56.2% being within the normal weight range, 22.1% being overweight and 7.0% being obese (Australian Bureau

of Statistics, 2004-05). In the USHWS, the prevalence of underweight students is slightly higher, more students are within the normal weight range and less students are overweight or obese (see table 23, p. 59).

## **DASS**

Students at Curtin University showed DASS rates of 11.99, 9.72 and 13.65 for depression, anxiety and stress respectively. Compared to other studies, student depression at Curtin University was higher, anxiety was comparable and stress was comparable to one study, but lower compared to another (Wong et al., 2006 and Demirel, 2016) (see table 24, p. 59). Differences in depression rates might vary because of the different time frames asked for depression (Arslan et al., 2009).

## **EDS**

Students reported a mean everyday discrimination of 2.08 in the USHWS. With a higher number indicating a higher everyday discrimination between zero and ten, 2.08 can be found in the lower section. Although no classifications exist saying what number means that a low or high everyday discrimination exist. This number could be used in the next study, to compare the everyday discrimination scores to see with they have changed. No studies investigating students' everyday discrimination with the EDS have been found to compare results with. The significant answers were the last questions of the scale. All questions showed the same respond rate, which indicates that the order of the question probably have not biased.

## **Perceived Mental Health**

82.3% of students reported their mental health as very good, good or neither poor nor good. 17.7% of students reported their mental health as poor or very poor. According to a survey conducted by the Australian government, young adults age between 15 and 24, 93.3% were reported to have excellent, very good and good health and 6.7% were reported to have fair and poor health (Australian Bureau of Statistics, 2004-05). The question asked in the USHWS regarding students' mental health and by the Australian government regarding health in general, that could be seen as an indicator that students either reported lower mental health because of the sample, the difference in the application of the legend on the five point scale or because of the difference between asked health versus mental health. If the difference is because of the difference between health and mental health, this would mean that more people describe their physical and mental health better when combined, compared to just their mental health on its own.

## **SF-8**

Like the DASS and EDS variables, the SF-8 questions 'Overall, how would you rate your health during the past 4 weeks?', 'During the past 4 weeks, how much did physical health problems limit your physical activities (such as walking or climbing stairs)?' and 'During the past 4 weeks, how much energy did you have?' also showed relationships to 'BMI combined' and 'BMI categories'. Two questions were correlating with BMI variables. The

questions regarding QoL can support the statement of the DASS and EDS that a lower BMI has better scores for depression, anxiety, stress and everyday discrimination. This is because with a lower BMI, students responded more positively about their QoL. The SF-8 affirmed the results of the other scales that a correlation between BMI and mental health variables exist.

## **Calculations**

In this thesis, Chi-Square, Cramer V and Pearson and Spearman correlations were calculated. This means that no confounder was included in the calculations. It would have been interesting to see if their inclusion would have made a difference. The next step would be to include different confounder, as it is suggested that different factors have a high impact on the relation between BMI and mental health. This is shortly discussed in the systematic research review (see section food, physical activity and smoking behaviour, page 25). To address these factors, multivariate regressions should be conducted.

Further research should also include underweight students. Compared to numbers provided by the government, a higher prevalence of underweight students in this sample existed, which is why this category should not be excluded. More cohort studies should also be conducted to investigate the connection between year of studies and stress (Abdulghani et al., 2011) for example or other mental health variables and how those change over the years (Robotham, 2008).

## **6. Limitations of This Thesis**

This thesis has limitations, which the reader needs to keep in mind. Those limitations are discussed in the following section.

After finishing the systematic literature review, no further literature search was conducted. This means that studies published after the 28<sup>th</sup> of September 2017 are not included in this thesis. The results could have been interesting, although due to the time frame this was not able to be done.

Studies with different methods were included. It must be recognised that some results might be difficult to compare, because studies have used different age groups, time period of data collection, measured versus self-reported weight and height and other factors (World Health Organization, 2000). The male/female ratio of the USHWS also might have diversified the results because no calculations with a confounders were conducted.

Self-reported weight can be a limitation because people might under or overestimate their height and body weight. Because self-reported weight is probably underestimated and self-reported height overestimated, this would lead to an underestimated calculated BMI (Ezzati, Martin, Skjold, Vander Hoorn, & Murray, 2006; Krul, Daanen, & Choi, 2011). A review on freshman year weight change has shown that studies relying on self-report weight report significant higher weight gain than studies in which the weight was measured (R. Vella-Zarb & Elgar, 2009). Weight underestimation is less common among younger individuals although self-reported height

is overestimated (Krul et al., 2011). Self-reported weight and height is more accurate than self-perception of body weight classification. It is recommended to use measured weight and height, but if this is not possible, the use of self-reported weight and height is a reliable alternative (Ali, Minor, & Amialchuk, 2013).

In this thesis, a gain in body weight is seen as a bigger amount of body fat. This could however be due to different reasons, such as more muscle mass or growth in height of the student. Although one study reported no relevant growth in students at university but an increase of body weight (Racette et al, 2005).

BMI can be seen as a robust and simple measurement to identify unhealthy body weights for the general population (Nevill et al., 2010). BMI does not differ between fat and muscle mass, which is why a high BMI does not necessarily mean high fat (World Health Organization, 2000). It needs to be kept in mind that BMI does not show the proportion of weight due to fat or muscle. This is why BMI can be less accurate for some people, such as body builders or weight lifters, high-performance athletes, pregnant women, the elderly, people with a physical disability, people with eating disorders, people under 18 years and extremely obese people (Department of Health, 2009). Athletes are at risk of being calculated as overweight or obese due to their muscle weight, which also depends on the type of sport (Nevill et al., 2010).

This thesis investigated students of all years of study together. It would have also been interesting to see if there are differences between mental health, BMI and year of study. The transition to university should also be investigated separately.

In addition, no information exists about the non-responders of the USHWS. The number of non-responders is high, which is why it would be interesting to investigate the difference in the sample between responders and non-responders and why non-responder chose not to answer. Other studies also support the need to investigate non-responders (Eisenberg et al., 2007).

A sample size of >300 is suggested, which the included cases of the USWHS did not reach. The sample should also be randomly selected (Ibrahim et al., 2013). Due to small numbers in the sample size, many cells are <5 in chi-square calculations, which means that the requirements are not reached. These results might be wrong and need to be seen separately compared to results with a lower number of cells being less than five. With a bigger sample, the chances of having many cells below five is lower.

## 7. Conclusion

BMI and mental health are both important factors to consider for healthy wellbeing. BMI and mental health influence each other at the same time. A BMI not within the healthy weight range increases risk factors for mental health, while mental issues increase the risk of being an unhealthy weight. It can be said that BMI and mental health are important both individually and combined for general healthy wellbeing. This is especially true for students, whereby both factors play an important role during the transition to university and the study period.



Based on the results it can be said that young students at Curtin University with a higher BMI reported worse mental health and young students with a lower BMI answered more positively to questions regarding mental health. Worth pointing out is the connection between depression and 'BMI categories', which shows to have a significant moderate connection ( $\chi^2= 110.829$ ,  $p < 0.001$ ) (Cramer V= 0.371,  $p < 0.001$ ). University should be seen as a good setting for health promotion and prevention of overweight/obesity and mental issues for young students.

## References

- Abdulghani, H. M., AlKanhal, A. A., Mahmoud, E. S., Ponnampereuma, G. G., & Alfaris, E. A. (2011). Stress and its effects on medical students: a cross-sectional study at a college of medicine in Saudi Arabia. *J Health Popul Nutr*, 29(5), 516-522.
- Adams, T. B., & Colner, W. (2008). The association of multiple risk factors with fruit and vegetable intake among a nationwide sample of college students. *J Am Coll Health*, 56(4), 455-461. doi:10.3200/jach.56.44.455-464
- Al-Daghri, N. M., Al-Othman, A., Al-Attas, O. S., Alkharfy, K. M., Alokail, M. S., Albanyan, A., Sabico, S., & Chrousos, G. P. (2014). Stress and cardiometabolic manifestations among Saudi students entering universities: a cross-sectional observational study. *BMC Public Health*, 14, 391. doi:10.1186/1471-2458-14-391
- Al-Daghri, N. M., Al-Othman, A., Albanyan, A., Al-Attas, O. S., Alokail, M. S., Sabico, S., & Chrousos, G. P. (2014). Perceived Stress Scores among Saudi Students Entering Universities: A Prospective Study during the First Year of University Life. *International Journal of Environmental Research and Public Health*, 11(4), 3972-3981.
- Al-Naggar, R. A., Bobryshev, Y. V., & Mohd Noor, N. A. (2013). Lifestyle practice among Malaysian university students. *Asian Pac J Cancer Prev*, 14(3), 1895-1903.
- Ali, M. M., Minor, T., & Amialchuk, A. (2013). Estimating the Biases Associated with Self-Perceived, Self-Reported, and Measured BMI on Mental Health. *PLoS One*, 8(12), e81021. doi:10.1371/journal.pone.0081021
- Almeida, L., Savoy, S., & Boxer, P. (2011). The role of weight stigmatization in cumulative risk for binge eating. *Journal of Clinical Psychology*, 67(3), 278-292. doi:10.1002/jclp.20749
- Anderson, D. A., Shapiro, J. R., & Lundgren, J. D. (2003). The freshman year of college as a critical period for weight gain: An initial evaluation. *Eating Behaviors*, 4(4), 363-367. doi:10.1016/S1471-0153(03)00030-8
- Andrade, F. C. D., Raffaelli, M., Teran-Garcia, M., Jerman, J. A., & Garcia, C. A. (2012). Weight status misperception among Mexican young adults. *Body Image*, 9(1), 184-188. doi:10.1016/j.bodyim.2011.10.006
- Arslan, G., Ayranci, U., Unsal, A., & Arslantas, D. (2009). Prevalence of depression, its correlates among students, and its effect on health-related quality of life in a Turkish university. *Ups J Med Sci*, 114(3), 170-177. doi:10.1080/03009730903174339
- Australian Bureau of Statistics. (2004-05). *National Health Survey: Summary of Results*. Retrieved from Canberra: [http://www.ausstats.abs.gov.au/Ausstats/Subscriber.Nsf/0/3b1917236618a042ca25711f00185526/\\$File/43640\\_2004-05.Pdf](http://www.ausstats.abs.gov.au/Ausstats/Subscriber.Nsf/0/3b1917236618a042ca25711f00185526/$File/43640_2004-05.Pdf)
- Australian Bureau of Statistics. (2008, 22.10.2008). *National Survey of Mental Health and Wellbeing: Summary of Results, 2007*. Retrieved from <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4326.0Main%20Features32007?opendocument&tabname=Summary&prodno=4326.0&issue=2007&num=&view=>
- Australian Bureau of Statistics. (2013a, 07.06.2013). *Australian Health Survey: Updated Results, 2011-2012. Glossary*. Retrieved from <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4364.055.003Glossary402011-2012>
- Australian Bureau of Statistics. (2013b, 07.06.2013). *Australian Health Survey: Updated Results, 2011-2012. Overweight and Obesity*. Retrieved from <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/33C64022ABB5ECD5CA257B8200179437?opendocument>
- Australian Bureau of Statistics. (2013c, 25.07.2013). *Australian Social Trends, July 2013*. Retrieved from <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4102.0Main+Features20July+2013#endnotes>
- Australian Bureau of Statistics. (2013d, 07.06.2013). *Profiles of Health, Australia, 2011-13. Overweight and Obesity*. Retrieved from <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4338.0~2011-13~Main%20Features~Overweight%20and%20obesity~10007>
- Australian Institute of Health and Welfare. (2010). *Australia's health 2010. Australia's health series no 12. Cat. no. AUS 122*. Retrieved from Canberra: <https://www.aihw.gov.au/reports/imported/australias-health-2010/contents/table-of-contents>
- Australian Institute of Health and Welfare. (2016). *Australia's health 2016. Australia's health series no. 15*. Retrieved from Canberra: <https://www.aihw.gov.au/getmedia/9844cefb-7745-4dd8-9ee2-f4d1c3d6a727/19787-AH16.pdf.aspx?inline=true>
- Australian Institute of Health and Welfare. (2017, 31.07.2017). *Overweight & obesity*. Retrieved from <https://www.aihw.gov.au/reports-statistics/behaviours-risk-factors/overweight-obesity/overview>
- Bakhtiyari, M., Ehrampoush, E., Enayati, N., Joodi, G., Sadr, S., Delpisheh, A., Alihaydari, J., & Homayounfar, R. (2013). Anxiety as a consequence of modern dietary pattern in adults in Tehran—Iran. *Eating Behaviors*, 14(2), 107-112. doi:10.1016/j.eatbeh.2012.12.007
- Ball, K., Burton, N. W., & Brown, W. J. (2009). A Prospective Study of Overweight, Physical Activity, and Depressive Symptoms in Young Women. *Obesity*, 17(1), 66-71. doi:10.1038/oby.2008.497
- Ball, K., & Lee, C. (2002). Psychological stress, coping, and symptoms of disordered eating in a community sample of young Australian women. *International Journal of Eating Disorders*, 31(1), 71-81. doi:10.1002/eat.1113
- Bayram, N., & Bilgel, N. (2008). The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. *Soc Psychiatry Psychiatr Epidemiol*, 43(8), 667-672. doi:10.1007/s00127-008-0345-x

- Bennett, J., Greene, G., & Schwartz-Barcott, D. (2013). Perceptions of emotional eating behavior. A qualitative study of college students. *Appetite*, *60*(1), 187-192. doi:10.1016/j.appet.2012.09.023
- Blaine, B. (2008). Does depression cause obesity?: A meta-analysis of longitudinal studies of depression and weight control. *J Health Psychol*, *13*(8), 1190-1197. doi:10.1177/1359105308095977
- Blanco, C., Okuda, M., Wright, C., Hasin, D. S., Grant, B. F., Liu, S. M., & Olfson, M. (2008). Mental health of college students and their non-college-attending peers: results from the National Epidemiologic Study on Alcohol and Related Conditions. *Arch Gen Psychiatry*, *65*(12), 1429-1437. doi:10.1001/archpsyc.65.12.1429
- Boyce, J. A., & Kuijper, R. G. (2015). Perceived stress and freshman weight change: The moderating role of baseline body mass index. *Physiology & Behavior*, *139*(Supplement C), 491-496. doi:10.1016/j.physbeh.2014.12.011
- Brener, N. D., Eaton, D. K., Lowry, R., & McManus, T. (2004). The Association between Weight Perception and BMI among High School Students. *Obesity Research*, *12*(11), 1866-1874. doi:10.1038/oby.2004.232
- Brown, C. (2008). The information trail of the 'Freshman 15'-a systematic review of a health myth within the research and popular literature. *Health Info Libr J*, *25*(1), 1-12. doi:10.1111/j.1471-1842.2007.00762.x
- Brown, W. J., Mishra, G., Kenardy, J., & Dobson, A. (2000). Relationships between body mass index and well-being in young Australian women. *Int J Obes Relat Metab Disord*, *24*(10), 1360-1368.
- Bunevicius, A., Katkute, A., & Bunevicius, R. (2008). Symptoms of Anxiety and Depression in Medical Students and in Humanities Students: Relationship With Big-Five Personality Dimensions and Vulnerability To Stress. *International Journal of Social Psychiatry*, *54*(6), 494-501. doi:10.1177/0020764008090843
- Burns, S., Crawford, G., Hallett, J., Hunt, K., Chih, H. J., & Tilley, P. J. (2017). What's wrong with John? a randomised controlled trial of Mental Health First Aid (MHFA) training with nursing students. *BMC Psychiatry*, *17*(1), 111. doi:10.1186/s12888-017-1278-2
- Butler, S. M., Black, D. R., Blue, C. L., & Gretebeck, R. J. (2004). Change in Diet, Physical Activity, and Body Weight in Female College Freshman. *American Journal of Health Behavior*, *28*(1), 24-32. doi:10.5993/AJHB.28.1.3
- Camacho, A., Cordero, E. D., & Perkins, T. (2016). Psychometric Properties of the DASS-21 Among Latina/o College Students by the US-Mexico Border. *J Immigr Minor Health*, *18*(5), 1017-1023. doi:10.1007/s10903-016-0415-1
- Chan, G. C., & Koh, D. (2007). Understanding the psychosocial and physical work environment in a Singapore medical school. *Singapore Med J*, *48*(2), 166-171.
- Cranford, J. A., Eisenberg, D., & Serras, A. M. (2009). Substance use behaviors, mental health problems, and use of mental health services in a probability sample of college students. *Addictive Behaviors*, *34*(2), 134-145. doi:10.1016/j.addbeh.2008.09.004
- Crawford, J. R., & Henry, J. D. (2003). The Depression Anxiety Stress Scales (DASS): normative data and latent structure in a large non-clinical sample. *Br J Clin Psychol*, *42*(Pt 2), 111-131. doi:10.1348/014466503321903544
- Cvetkovski, S., Reavley, N. J., & Jorm, A. F. (2012). The prevalence and correlates of psychological distress in Australian tertiary students compared to their community peers. *Australian & New Zealand Journal of Psychiatry*, *46*(5), 457-467. doi:10.1177/0004867411435290
- Davila, E. P., Kolodziejczyk, J. K., Norman, G. J., Calfas, K., Huang, J. S., Rock, C. L., Griswold, W., Fowler, J. H., Marshall, S. J., Gupta, A., & Patrick, K. (2014). Relationships between depression, gender, and unhealthy weight loss practices among overweight or obese college students. *Eating Behaviors*, *15*(2), 271-274. doi:10.1016/j.eatbeh.2014.03.010
- Deka, N., Jangid, R. K., Deka, K., Choudhary, P. K., Kalita, B., & Buragohain, M. (2014). Psychological distress and quality of life amongst Medical Students of Assam Medical College, Dibrugarh, Assam. *Delhi Psychiatry Journal*, *17*(02), 317-322.
- Demirel, H. (2016). Have University Sport Students Higher Scores Depression, Anxiety and Psychological Stress? *International Journal of Environmental & Science Education*, *11*(16), 9422-9425.
- Department of Health. (2009, 26.05.2009). About Overweight and Obesity. Retrieved from <http://www.health.gov.au/internet/main/publishing.nsf/Content/health-publhlth-strateg-hlthwt-obesity.htm>
- Department of Health and Ageing. (2013). *National Mental Health Report 2013: tracking progress of mental health reform in Australia 1993-2011*. Retrieved from Canberra: [https://www.health.gov.au/internet/main/publishing.nsf/Content/B090F03865A7FAB9CA257C1B0079E198/\\$File/rep13.pdf](https://www.health.gov.au/internet/main/publishing.nsf/Content/B090F03865A7FAB9CA257C1B0079E198/$File/rep13.pdf)
- Desai, M. N., Miller, W. C., Staples, B., & Bravender, T. (2008). Risk factors associated with overweight and obesity in college students. *J Am Coll Health*, *57*(1), 109-114. doi:10.3200/jach.57.1.109-114
- Dey, M., Gmel, G., & Mohler-Kuo, M. (2013). Body mass index and health-related quality of life among young Swiss men. *BMC Public Health*, *13*, 1028. doi:10.1186/1471-2458-13-1028
- Dipnall, J. F., Pasco, J. A., Berk, M., Williams, L. J., Dodd, S., Jacka, F. N., & Meyer, D. (2017). Getting RID of the blues: Formulating a Risk Index for Depression (RID) using structural equation modeling. *Australian & New Zealand Journal of Psychiatry*, *0*(0), 1-13. doi:10.1177/0004867417726860
- Dyrbye, L. N., Harper, W., Durning, S. J., Moutier, C., Thomas, M. R., Massie, F. S., Eacker, A., Power, D. V., Szydlo, D. W., Sloan, J. A., & Shanafelt, T. D. (2011). Patterns of distress in US medical students. *Medical Teacher*, *33*(10), 834-839. doi:10.3109/0142159X.2010.531158
- Eisenberg, D., Gollust, S. E., Golberstein, E., & Hefner, J. L. (2007). Prevalence and correlates of depression, anxiety, and suicidality among university students. *American Journal of Orthopsychiatry*, *77*(4), 534-542. doi:10.1037/0002-9432.77.4.534

- Eisenberg, D., Nicklett, E. J., Roeder, K., & Kirz, N. E. (2011). Eating disorder symptoms among college students: prevalence, persistence, correlates, and treatment-seeking. *J Am Coll Health, 59*(8), 700-707. doi:10.1080/07448481.2010.546461
- Ejike, C. (2013). Association between anxiety and obesity: A study of a young-adult Nigerian population. *Journal of Neurosciences in Rural Practice, 4*, 13-18. doi:10.4103/0976-3147.116429
- El Ansari, W., Clausen, S. V., Mabhala, A., & Stock, C. (2010). How do I look? Body image perceptions among university students from England and Denmark. *Int J Environ Res Public Health, 7*(2), 583-595. doi:10.3390/ijerph7020583
- El Ansari, W., Dibba, E., & Stock, C. (2014). Body Image Concerns: Levels, Correlates and Gender Differences among Students in the United Kingdom. *Central European Journal of Public Health, 22*(2), 106-117.
- El Ansari, W., Oskrochi, R., & Haghgoo, G. (2014). Are Students' Symptoms and Health Complaints Associated with Perceived Stress at University? Perspectives from the United Kingdom and Egypt. *International Journal of Environmental Research and Public Health, 11*(10), 9981-10002.
- El Ansari, W., Suominen, S., & Berg-beckhoff, G. (2015). Mood and food at the University of Turku in Finland: nutritional correlates of perceived stress are most pronounced among overweight students. *International Journal of Public Health, 60*(6), 707-716. doi:10.1007/s00038-015-0717-4
- Epel, E., Jimenez, S., Brownell, K., Stroud, L., Stoney, C., & Niaura, R. (2004). Are stress eaters at risk for the metabolic syndrome? *Ann N Y Acad Sci, 1032*, 208-210. doi:10.1196/annals.1314.022
- Ezzati, M., Martin, H., Skjold, S., Vander Hoorn, S., & Murray, C. J. (2006). Trends in national and state-level obesity in the USA after correction for self-report bias: analysis of health surveys. *J R Soc Med, 99*(5), 250-257. doi:10.1258/jrsm.99.5.250
- Fowler-brown, A. G., Ngo, L. H., & Wee, C. C. (2012). The Relationship Between Symptoms of Depression and Body Weight in Younger Adults. *Obesity, 20*(9), 1922-1928. doi:10.1038/oby.2011.311
- Friedman, K. E., Reichmann, S. K., Costanzo, P. R., Zelli, A., Ashmore, J. A., & Musante, G. J. (2005). Weight Stigmatization and Ideological Beliefs: Relation to Psychological Functioning in Obese Adults. *Obesity Research, 13*(5), 907-916. doi:10.1038/oby.2005.105
- Ganasegeran, K., Al-Dubai, S. A., Qureshi, A. M., Al-Abed, A., AM, R., & Aljunid, S. M. (2012). Social and psychological factors affecting eating habits among university students in a Malaysian medical school: a cross-sectional study. *Nutr J, 11*(1), 48. doi:10.1186/1475-2891-11-48
- Garipey, G., Nitka, D., & Schmitz, N. (2010). The association between obesity and anxiety disorders in the population: a systematic review and meta-analysis. *Int J Obes (Lond), 34*(3), 407-419. doi:10.1038/ijo.2009.252
- Gearhardt, A. N., White, M. A., Masheb, R. M., Morgan, P. T., Crosby, R. D., & Grilo, C. M. (2012). An examination of the food addiction construct in obese patients with binge eating disorder. *Int J Eat Disord, 45*(5), 657-663. doi:10.1002/eat.20957
- Gerber, M., Brand, S., Elliot, C., Holsboer-Trachsler, E., & Pühse, U. (2014). Aerobic Exercise, Ball Sports, Dancing, and Weight Lifting as Moderators of the Relationship between Stress and Depressive Symptoms: An Exploratory Cross-Sectional Study with Swiss University Students. *Perceptual and Motor Skills, 119*(3), 679-697. doi:10.2466/06.PMS.119c26z4
- Gerber, M., & Puhse, U. (2009). Review article: do exercise and fitness protect against stress-induced health complaints? A review of the literature. *Scand J Public Health, 37*(8), 801-819. doi:10.1177/1403494809350522
- Girz, L., Polivy, J., Provencher, V., Wintre, M. G., Pratt, M. W., Mark Pancer, S., Birnie-Lefcovitch, S., & Adams, G. R. (2013). The four undergraduate years. Changes in weight, eating attitudes, and depression. *Appetite, 69*(Supplement C), 145-150. doi:10.1016/j.appet.2013.06.002
- Goebert, D., Thompson, D., Takeshita, J., Beach, C., Bryson, P., Ephgrave, K., Kent, A., Kunkel, M., Schechter, J., & Tate, J. (2009). Depressive symptoms in medical students and residents: a multischool study. *Acad Med, 84*(2), 236-241. doi:10.1097/ACM.0b013e31819391bb
- Gores, S. E. (2008). Addressing nutritional issues in the college-aged client: Strategies for the nurse practitioner. *Journal of the American Academy of Nurse Practitioners, 20*(1), 5-10. doi:10.1111/j.1745-7599.2007.00273.x
- Greene, G. W., Schembre, S. M., White, A. A., Hoerr, S. L., Lohse, B., Shoff, S., Horacek, T., Riebe, D., Patterson, J., Phillips, B. W., Kattelman, K. K., & Blissmer, B. (2011). Identifying Clusters of College Students at Elevated Health Risk Based on Eating and Exercise Behaviors and Psychosocial Determinants of Body Weight. *Journal of the American Dietetic Association, 111*(3), 394-400. doi:10.1016/j.jada.2010.11.011
- Guh, D. P., Zhang, W., Bansback, N., Amarsi, Z., Birmingham, C. L., & Anis, A. H. (2009). The incidence of co-morbidities related to obesity and overweight: a systematic review and meta-analysis. *BMC Public Health, 9*, 88. doi:10.1186/1471-2458-9-88
- Guo, S. S., Wu, W., Chumlea, W. C., & Roche, A. F. (2002). Predicting overweight and obesity in adulthood from body mass index values in childhood and adolescence. *The American Journal of Clinical Nutrition, 76*(3), 653-658.
- Haller, H., Cramer, H., Lauche, R., Gass, F., & Dobos, G. J. (2014). The prevalence and burden of subthreshold generalized anxiety disorder: a systematic review. *BMC Psychiatry, 14*, 128. doi:10.1186/1471-244x-14-128
- Harring, H. A., Montgomery, K., & Hardin, J. (2010). Perceptions of Body Weight, Weight Management Strategies, and Depressive Symptoms Among US College Students. *Journal of American College Health, 59*(1), 43-50.
- Hatzenbuehler, M. L., Keyes, K. M., & Hasin, D. S. (2009). Associations between perceived weight discrimination and the prevalence of psychiatric disorders in the general population. *Obesity (Silver Spring), 17*(11), 2033-2039. doi:10.1038/oby.2009.131

- Hawker, C. L. (2012). Physical activity and mental well-being in student nurses. *Nurse Education Today*, 32(3), 325-331. doi:10.1016/j.nedt.2011.07.013
- Herva, A., Laitinen, J., Miettunen, J., Veijola, J., Karvonen, J. T., Laksy, K., & Joukamaa, M. (2006). Obesity and depression: results from the longitudinal Northern Finland 1966 Birth Cohort Study. *Int J Obes (Lond)*, 30(3), 520-527. doi:10.1038/sj.ijo.0803174
- Himmelstein, M. S., Belsky, A. C. I., & Tomiyama, A. J. (2015). The Weight of Stigma: Cortisol Reactivity to Manipulated Weight Stigma. *Obesity*, 23(2), 368-374. doi:10.1002/oby.20959
- Hopman, W. M., Berger, C., Joseph, L., Barr, S. I., Gao, Y., Prior, J. C., Poliquin, S., Towheed, T., & Anastassiades, T. (2007). The association between body mass index and health-related quality of life: data from CaMos, a stratified population study. *Qual Life Res*, 16(10), 1595-1603. doi:10.1007/s11136-007-9273-6
- Hu, H.-Y., Wu, C.-Y., Chou, Y.-J., & Huang, N. (2012). Body mass index and mental health problems in general adults: Disparity in gender and socioeconomic status. *Journal of Psychosomatic Research*, 72(5), 393-398. doi:10.1016/j.jpsychores.2012.01.007
- Huang, I. C., Frangakis, C., & Wu, A. W. (2006). The relationship of excess body weight and health-related quality of life: evidence from a population study in Taiwan. *Int J Obes (Lond)*, 30(8), 1250-1259. doi:10.1038/sj.ijo.0803250
- Hunt, K., & Burns, S. (2017). Is There an Association between Social Connectedness, Social Identity, Alcohol Consumption and Mental Health among Young University Students? *Open Journal of Preventive Medicine*, Vol.07No.06, 16. doi:10.4236/ojpm.2017.76009
- Husain, W., Sajjad, R., & Atiq, U. R. (2016). *Depression, Anxiety and Stress Among Female and Male Polive Offivers*.
- Ibrahim, A. K., Kelly, S. J., Adams, C. E., & Glazebrook, C. (2013). A systematic review of studies of depression prevalence in university students. *Journal of Psychiatric Research*, 47(3), 391-400. doi:10.1016/j.jpsychires.2012.11.015
- Imperatori, C., Innamorati, M., Contardi, A., Continisio, M., Tamburello, S., Lamis, D. A., Tamburello, A., & Fabbriatore, M. (2014). The association among food addiction, binge eating severity and psychopathology in obese and overweight patients attending low-energy-diet therapy. *Comprehensive Psychiatry*, 55(6), 1358-1362. doi:10.1016/j.comppsy.2014.04.023
- Jáuregui-Lobera, I., Bolaños-Ríos, P., Santiago-Fernández, M. J., Garrido-Casals, O., & Sánchez, E. (2011). Perception of weight and psychological variables in a sample of Spanish adolescents. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, 4, 245-251. doi:10.2147/DMSO.S21009
- Jenkins, P. E., Hoste, R. R., Conley, C. S., Meyer, C., & Blissett, J. M. (2011). Is being underweight associated with impairments in quality of life in the absence of significant eating disorder pathology? *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, 16(1), e61-e64. doi:10.1007/bf03327523
- Jenkins, P. E., Hoste, R. R., Meyer, C., & Blissett, J. M. (2011). Eating disorders and quality of life: a review of the literature. *Clin Psychol Rev*, 31(1), 113-121. doi:10.1016/j.cpr.2010.08.003
- Kandiah, J., Yake, M., Jones, J., & Meyer, M. (2006). Stress influences appetite and comfort food preferences in college women. *Nutrition Research*, 26(3), 118-123. doi:10.1016/j.nutres.2005.11.010
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of dsm-iv disorders in the national comorbidity survey replication. *Archives of General Psychiatry*, 62(6), 593-602. doi:10.1001/archpsyc.62.6.593
- Khawaja, N. G., & Dempsey, J. (2008). A comparison of international and domestic tertiary students in Australia. *Australian Journal of Guidance and Counselling*, 18(1), 30-46. doi:DOI 10.1375/ajgc.18.1.30
- Kjaerbye-Thygesen, A., Munk, C., Ottesen, B., & Kruger Kjaer, S. (2004). Why do slim women consider themselves too heavy? A characterization of adult women considering their body weight as too heavy. *Int J Eat Disord*, 35(3), 275-285. doi:10.1002/eat.10274
- Krul, A. J., Daanen, H. A., & Choi, H. (2011). Self-reported and measured weight, height and body mass index (BMI) in Italy, the Netherlands and North America. *Eur J Public Health*, 21(4), 414-419. doi:10.1093/eurpub/ckp228
- Lazarevich, I., Irigoyen-Camacho, M. E., Velazquez-Alva, M. d. C., & Salinas-Avila, J. (2015). Psychometric characteristics of the Eating and Appraisal Due to Emotions and Stress Questionnaire and obesity in Mexican university students. *Nutr Hosp*, 31(6), 2437-2444. doi:10.3305/nh.2015.31.6.8960
- Lazarevich, I., Irigoyen-Camacho, M. E., & Velazquez-Alva Mdel, C. (2013). Obesity, eating behaviour and mental health among university students in Mexico City. *Nutr Hosp*, 28(6), 1892-1899. doi:10.3305/nutr.hosp.v28in06.6873
- Lazarevich, I., Irigoyen Camacho, M. E., Velázquez-Alva, M. d. C., & Zepeda Zepeda, M. (2016). Relationship among obesity, depression, and emotional eating in young adults. *Appetite*, 107(Supplement C), 639-644. doi:10.1016/j.appet.2016.09.011
- Leahy, C. M., Peterson, R. F., Wilson, I. G., Newbury, J. W., Tonkin, A. L., & Turnbull, D. (2010). Distress levels and self-reported treatment rates for medicine, law, psychology and mechanical engineering tertiary students: cross-sectional study. *Aust N Z J Psychiatry*, 44(7), 608-615. doi:10.3109/00048671003649052
- Liechty, J. M. (2010). Body Image Distortion and Three Types of Weight Loss Behaviors Among Nonoverweight Girls in the United States. *Journal of Adolescent Health*, 47(2), 176-182. doi:10.1016/j.jadohealth.2010.01.004
- Liu, C., Xie, B., Chou, C.-P., Koprowski, C., Zhou, D., Palmer, P., Sun, P., Guo, Q., Duan, L., Sun, X., & Anderson Johnson, C. (2007). Perceived stress, depression and food consumption frequency in the college students of China seven cities. *Physiology & Behavior*, 92(4), 748-754. doi:10.1016/j.physbeh.2007.05.068
- Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behav Res Ther*, 33(3), 335-343.

- Luppino, F. S., de Wit, L. M., Bouvy, P. F., & et al. (2010). Overweight, obesity, and depression: A systematic review and meta-analysis of longitudinal studies. *Archives of General Psychiatry*, 67(3), 220-229. doi:10.1001/archgenpsychiatry.2010.2
- Maca, S. M., Wagner, J., Weingessel, B., Vecsei-Marlovits, P. V., Gruber, K., & Schiesser, A. W. (2013). Acute anterior uveitis is associated with depression and reduction of general health. *Br J Ophthalmol*, 97(3), 333-337. doi:10.1136/bjophthalmol-2012-302304
- Magallares, A., Bolaños-Rios, P., Ruiz-Prieto, I., Benito de Valle, P., Irlas, J. A., & Jáuregui-Lobera, I. (2017). The Mediatonal Effect of Weight Stigma in the Relationship between Blatant and Subtle Discrimination and Depression and Anxiety. *The Spanish Journal of Psychology*, 20. doi:10.1017/sjp.2017.1
- Mahmoud, J. S. R., Staten, R. T., Hall, L. A., & Lennie, T. A. (2012). The Relationship among Young Adult College Students' Depression, Anxiety, Stress, Demographics, Life Satisfaction, and Coping Styles. *Issues in Mental Health Nursing*, 33(3), 149-156. doi:10.3109/01612840.2011.632708
- Major, B., Hunger, J. M., Bunyan, D. P., & Miller, C. T. (2014). The ironic effects of weight stigma. *Journal of Experimental Social Psychology*, 51(Supplement C), 74-80. doi:10.1016/j.jesp.2013.11.009
- Maynard, P. L., Rohrer, J. E., & Fulton, L. (2015). Health-Related Quality of Life Among Online University Students. *Journal of Primary Care & Community Health*, 6(1), 48-53. doi:10.1177/2150131914545517
- McCarty, C. A., Kosterman, R., Mason, W. A., McCauley, E., Hawkins, J. D., Herrenkohl, T. I., & Lengua, L. J. (2009). Longitudinal associations among depression, obesity and alcohol use disorders in young adulthood. *Gen Hosp Psychiatry*, 31(5), 442-450. doi:10.1016/j.genhosppsy.2009.05.013
- Messina, G., Quercioli, C., Troiano, G., Russo, C., Barbini, E., Nistico, F., & Nante, N. (2016). Italian medical students quality of life: years 2005-2015. *Ann Ig*, 28(4), 245-251. doi:10.7416/ai.2016.2103
- Migliorini, C., New, P. W., & Tonge, B. J. (2009). Comparison of depression, anxiety and stress in persons with traumatic and non-traumatic post-acute spinal cord injury. *Spinal Cord*, 47(11), 783-788. doi:10.1038/sc.2009.43
- Migliorini, C., Sinclair, A., Brown, D., Tonge, B., & New, P. (2016). A randomised control trial of an Internet-based cognitive behaviour treatment for mood disorder in adults with chronic spinal cord injury. *Spinal Cord*, 54(9), 695-701. doi:10.1038/sc.2015.221
- Mihalopoulos, N. L., Auinger, P., & Klein, J. D. (2008). The Freshman 15: is it real? *J Am Coll Health*, 56(5), 531-533. doi:10.3200/jach.56.5.531-534
- Mikolajczyk, R. T., El Ansari, W., & Maxwell, A. E. (2009). Food consumption frequency and perceived stress and depressive symptoms among students in three European countries. *Nutr J*, 8, 31. doi:10.1186/1475-2891-8-31
- Miyoshi, M., Fukuhara, T., Kataoka, H., & Hagino, H. (2016). Relationship between quality of life instruments and phonatory function in tracheoesophageal speech with voice prosthesis. *Int J Clin Oncol*, 21(2), 402-408. doi:10.1007/s10147-015-0886-4
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Ann Intern Med*, 151(4), 264-269, w264.
- Mozaffarian, D., Hao, T., Rimm, E. B., Willett, W. C., & Hu, F. B. (2011). Changes in diet and lifestyle and long-term weight gain in women and men. *N Engl J Med*, 364(25), 2392-2404. doi:10.1056/NEJMoa1014296
- Nevill, A. M., Winter, E. M., Ingham, S., Watts, A., Metsios, G. S., & Stewart, A. D. (2010). Adjusting athletes' body mass index to better reflect adiposity in epidemiological research. *J Sports Sci*, 28(9), 1009-1016. doi:10.1080/02640414.2010.487071
- Nojomi, M., & Najamabadi, S. (2006). Obesity among university students, Tehran, Iran. *Asia Pac J Clin Nutr*, 15(4), 516-520.
- Norton, P. J. (2007). Depression Anxiety and Stress Scales (DASS-21): psychometric analysis across four racial groups. *Anxiety Stress Coping*, 20(3), 253-265. doi:10.1080/10615800701309279
- Nur, N., Kibik, A., Kılıç, E., & Sümer, H. (2017). Health-related Quality of Life and Associated Factors Among Undergraduate University Students. *Oman Medical Journal*, 32(4), 329-334. doi:10.5001/omj.2017.62
- Odlaug, B. L., Lust, K., Wimmelmann, C. L., Chamberlain, S. R., Mortensen, E. L., Derbyshire, K., Christenson, G., & Grant, J. E. (2015). Prevalence and correlates of being overweight or obese in college. *Psychiatry Research*, 227(1), 58-64. doi:10.1016/j.psychres.2015.01.029
- Papier, K., Ahmed, F., Lee, P., & Wiseman, J. (2015). Stress and dietary behaviour among first-year university students in Australia: Sex differences. *Nutrition*, 31(2), 324-330. doi:10.1016/j.nut.2014.08.004
- Pawlińska-Chmara, R., Wronka, I., Suliga, E., & Broczek, K. (2007). Socio-economic factors and prevalence of underweight and overweight among female students in Poland. *HOMO - Journal of Comparative Human Biology*, 58(4), 309-318. doi:10.1016/j.jchb.2006.10.002
- Pedram, P., Wadden, D., Amini, P., Gulliver, W., Randell, E., Cahill, F., Vasdev, S., Goodridge, A., Carter, J. C., Zhai, G., Ji, Y., & Sun, G. (2013). Food addiction: its prevalence and significant association with obesity in the general population. *PLoS One*, 8(9), e74832. doi:10.1371/journal.pone.0074832
- Peltzer, K., Pengpid, S., Samuels, T., Özcan, N., Mantilla, C., Rahamefy, O., Wong, M., & Gasparishvili, A. (2014). Prevalence of Overweight/Obesity and Its Associated Factors among University Students from 22 Countries. *International Journal of Environmental Research and Public Health*, 11(7), 7425.
- Pengpid, S., & Peltzer, K. (2014). Prevalence of overweight/obesity and central obesity and its associated factors among a sample of university students in India. *Obesity Research & Clinical Practice*, 8(6), e558-e570. doi:10.1016/j.orcp.2013.12.003

- Pengpid, S., & Peltzer, K. (2015). Prevalence of overweight and underweight and its associated factors among male and female university students in Thailand. *HOMO - Journal of Comparative Human Biology*, 66(2), 176-186. doi:10.1016/j.jchb.2014.11.002
- Phelan, S. M., Burgess, D. J., Puhl, R., Dyrbye, L. N., Dovidio, J. F., Yeazel, M., Ridgeway, J. L., Nelson, D., Perry, S., Przedworski, J. M., Burke, S. E., Hardeman, R. R., & van Ryn, M. (2015). The Adverse Effect of Weight Stigma on the Well-Being of Medical Students with Overweight or Obesity: Findings from a National Survey. *Journal of General Internal Medicine*, 30(9), 1251-1258. doi:10.1007/s11606-015-3266-x
- Pliner, P., & Saunders, T. (2008). Vulnerability to freshman weight gain as a function of dietary restraint and residence. *Physiology & Behavior*, 93(1), 76-82. doi:10.1016/j.physbeh.2007.07.017
- Poirier, P., Giles, T. D., Bray, G. A., Hong, Y., Stern, J. S., Pi-Sunyer, F. X., & Eckel, R. H. (2006). Obesity and cardiovascular disease: pathophysiology, evaluation, and effect of weight loss: an update of the 1997 American Heart Association Scientific Statement on Obesity and Heart Disease from the Obesity Committee of the Council on Nutrition, Physical Activity, and Metabolism. *Circulation*, 113(6), 898-918. doi:10.1161/circulationaha.106.171016
- Provencher, V., Polivy, J., Wintre, M. G., Pratt, M. W., Pancer, S. M., Birnie-Lefcovitch, S., & Adams, G. R. (2009). Who gains or who loses weight? Psychosocial factors among first-year university students. *Physiology & Behavior*, 96(1), 135-141. doi:10.1016/j.physbeh.2008.09.011
- Puhl, R., & Suh, Y. (2015). Health Consequences of Weight Stigma: Implications for Obesity Prevention and Treatment. *Curr Obes Rep*, 4(2), 182-190. doi:10.1007/s13679-015-0153-z
- Puhl, R. M., & Brownell, K. D. (2006). Confronting and Coping with Weight Stigma: An Investigation of Overweight and Obese Adults. *Obesity*, 14(10), 1802-1815. doi:10.1038/oby.2006.208
- Puhl, R. M., & Latner, J. D. (2007). Stigma, obesity, and the health of the nation's children. *Psychol Bull*, 133(4), 557-580. doi:10.1037/0033-2909.133.4.557
- Racette, S. B., Deusinger, S. S., Strube, M. J., Highstein, G. R., & Deusinger, R. H. (2005). Weight Changes, Exercise, and Dietary Patterns During Freshman and Sophomore Years of College. *Journal of American College Health*, 53(6), 245-251. doi:10.3200/JACH.53.6.245-251
- Renzaho, A., Wooden, M., & Houn, B. (2010). Associations between body mass index and health-related quality of life among Australian adults. *Qual Life Res*, 19(4), 515-520. doi:10.1007/s11136-010-9610-z
- Rickwood, D. J., Deane, F. P., & Wilson, C. J. (2007). When and how do young people seek professional help for mental health problems? *Med J Aust*, 187(7 Suppl), S35-39.
- Robotham, D. (2008). Stress among higher education students: towards a research agenda. *Higher Education*, 56(6), 735-746. doi:10.1007/s10734-008-9137-1
- Rohrer, J. E., Cole, L. J., & Schulze, F. W. (2012). Cigarettes and self-rated health among online university students. *J Immigr Minor Health*, 14(3), 502-505. doi:10.1007/s10903-011-9564-4
- Rosenberger, P. H., Henderson, K. E., Bell, R. L., & Grilo, C. M. (2007). Associations of weight-based teasing history and current eating disorder features and psychological functioning in bariatric surgery patients. *Obesity Surgery*, 17(4), 470-477. doi:10.1007/s11695-007-9082-6
- Şanlıer, N., Türközü, D., & Toka, O. (2016). Body Image, Food Addiction, Depression, and Body Mass Index in University Students. *Ecology of Food and Nutrition*, 55(6), 491-507. doi:10.1080/03670244.2016.1219951
- Sarlio-Lahteenkorva, S., Silventoinen, K., Jousilahti, P., Hu, G., & Tuomilehto, J. (2004). The association between thinness and socio-economic disadvantage, health indicators, and adverse health behaviour: a study of 28[thinsp]000 Finnish men and women. *Int J Obes Relat Metab Disord*, 28(4), 568-573.
- Scott, K. M., Bruffaerts, R., Simon, G. E., Alonso, J., Angermeyer, M., de Girolamo, G., Demyttenaere, K., Gasquet, I., Haro, J. M., Karam, E., Kessler, R. C., Levinson, D., Medina Mora, M. E., Oakley Browne, M. A., Ormel, J., Villa, J. P., Uda, H., & Von Korff, M. (2008). Obesity and mental disorders in the general population: results from the world mental health surveys. *Int J Obes (Lond)*, 32(1), 192-200. doi:10.1038/sj.ijo.0803701
- Scott, K. M., McGee, M. A., Wells, J. E., & Oakley Browne, M. A. (2008). Obesity and mental disorders in the adult general population. *Journal of Psychosomatic Research*, 64(1), 97-105. doi:10.1016/j.jpsychores.2007.09.006
- Serlachius, A., Hamer, M., & Wardle, J. (2007). Stress and weight change in university students in the United Kingdom. *Physiology & Behavior*, 92(4), 548-553. doi:10.1016/j.physbeh.2007.04.032
- Silliman, K., Rodas-Fortier, K., & Neyman, M. (2004). A Survey of Dietary and Exercise Habits and Perceived Barriers to Following a Healthy Lifestyle in a College Population. *Californian J Health Promot*, 2(2), 10-19.
- Sirang, Z., Bashir, H. H., Jalil, B., Khan, S. H., Hussain, S. A., Baig, A., Taufeeq, M., Samad, K., & Kadir, M. M. (2013). Weight patterns and perceptions among female university students of Karachi: a cross sectional study. *BMC Public Health*, 13, 230. doi:10.1186/1471-2458-13-230
- Smith, D. R., & Leggat, P. A. (2007). Tobacco smoking habits among a complete cross-section of Australian nursing students. *Nurs Health Sci*, 9(2), 82-89. doi:10.1111/j.1442-2018.2007.00306.x
- Souza, I. M., Paro, H. B., Morales, R. R., Pinto Rde, M., & da Silva, C. H. (2012). Health-related quality of life and depressive symptoms in undergraduate nursing students. *Rev Lat Am Enfermagem*, 20(4), 736-743.
- Staiano, A. E., Marker, A. M., Martin, C. K., & Katzmarzyk, P. T. (2016). Physical activity, mental health, and weight gain in a longitudinal observational cohort of nonobese young adults. *Obesity (Silver Spring, Md.)*, 24(9), 1969-1975. doi:10.1002/oby.21567
- Stallman, H. M. (2010). Psychological distress in university students: A comparison with general population data. *Australian Psychologist*, 45(4), 249-257. doi:10.1080/00050067.2010.482109

- Steptoe, A., Wardle, J., Cui, W., Bellisle, F., Zotti, A.-M., Baranyai, R., & Sanderman, R. (2002). Trends in Smoking, Diet, Physical Exercise, and Attitudes toward Health in European University Students from 13 Countries, 1990–2000. *Preventive Medicine, 35*(2), 97-104. doi:10.1006/pmed.2002.1048
- Stewart-Brown, S., Evans, J., Patterson, J., Petersen, S., Doll, H., Balding, J., & Regis, D. (2000). The health of students in institutes of higher education: an important and neglected public health problem? *J Public Health Med, 22*(4), 492-499.
- Suija, K., Timonen, M., Suviola, M., Jokelainen, J., Jarvelin, M. R., & Tammelin, T. (2013). The association between physical fitness and depressive symptoms among young adults: results of the Northern Finland 1966 birth cohort study. *BMC Public Health, 13*, 535. doi:10.1186/1471-2458-13-535
- Sutin, A. R., Stephan, Y., Grzywacz, J. G., Robinson, E., Daly, M., & Terracciano, A. (2016). Perceived weight discrimination, changes in health, and daily stressors. *Obesity (Silver Spring), 24*(10), 2202-2209. doi:10.1002/oby.21598
- Sutin, A. R., & Terracciano, A. (2013). Perceived weight discrimination and obesity. *PLoS One, 8*(7), e70048. doi:10.1371/journal.pone.0070048
- Sutin, A. R., & Terracciano, A. (2017). Perceived weight discrimination and high-risk health-related behaviors. *Obesity (Silver Spring), 25*(7), 1183-1186. doi:10.1002/oby.21845
- Talamayan, K. S., Springer, A. E., Kelder, S. H., Gorospe, E. C., & Joye, K. A. (2006). Prevalence of overweight misperception and weight control behaviors among normal weight adolescents in the United States. *TheScientificWorldJOURNAL, 6*, 365-373. doi:10.1100/tsw.2006.70
- Tan, P. C., Zaidi, S. N., Azmi, N., Omar, S. Z., & Khong, S. Y. (2014). Depression, anxiety, stress and hyperemesis gravidarum: temporal and case controlled correlates. *PLoS One, 9*(3), e92036. doi:10.1371/journal.pone.0092036
- Thome, J., & Espelage, D. L. (2004). Relations among exercise, coping, disordered eating, and psychological health among college students. *Eat Behav, 5*(4), 337-351. doi:10.1016/j.eatbeh.2004.04.002
- Tomiya, A. J. (2014). Weight stigma is stressful. A review of evidence for the Cyclic Obesity/Weight-Based Stigma model. *Appetite, 82*(Supplement C), 8-15. doi:10.1016/j.appet.2014.06.108
- Tran, T. D., Tran, T., & Fisher, J. (2013). Validation of the depression anxiety stress scales (DASS) 21 as a screening instrument for depression and anxiety in a rural community-based cohort of northern Vietnamese women. *BMC Psychiatry, 13*, 24. doi:10.1186/1471-244x-13-24
- Turner-Bowker, D. M., Bayliss, M. S., Ware, J. E., Jr., & Kosinski, M. (2003). Usefulness of the SF-8 Health Survey for comparing the impact of migraine and other conditions. *Qual Life Res, 12*(8), 1003-1012.
- Tyson, P., Wilson, K., Crone, D., Brailsford, R., & Laws, K. (2010). Physical activity and mental health in a student population. *J Ment Health, 19*(6), 492-499. doi:10.3109/09638230902968308
- V., L. R., & S., J. G. (2008). Effects of Weight Stigma on Exercise Motivation and Behavior. *Journal of Health Psychology, 13*(1), 131-138. doi:10.1177/1359105307084318
- Vella-Zarb, R., & Elgar, F. J. (2009). The 'Freshman 5': A Meta-Analysis of Weight Gain in the Freshman Year of College. *Journal of American College Health, 58*(2), 161-166.
- Vella-Zarb, R. A., & Elgar, F. J. (2010). Predicting the 'freshman 15': Environmental and psychological predictors of weight gain in first-year university students. *Health Education Journal, 69*(3), 321-332. doi:10.1177/0017896910369416
- Wardle, J., Chida, Y., Gibson, E. L., Whitaker, K. L., & Steptoe, A. (2011). Stress and adiposity: a meta-analysis of longitudinal studies. *Obesity (Silver Spring), 19*(4), 771-778. doi:10.1038/oby.2010.241
- Ware, J. E., Kosinski, M., & Dewey, J. E. (2001). How to score and interpret single-item health status measures: a manual for users of the SF-8 health survey. *Quality Metric Inc., Lincoln, RI*.
- Williams, D. R., Gonzalez, H. M., Williams, S., Mohammed, S. A., Moomal, H., & Stein, D. J. (2008). Perceived Discrimination, Race and Health in South Africa. *Soc Sci Med, 67*(3), 441-452. doi:10.1016/j.socscimed.2008.03.021
- Williams, D. R., Yan, Y., Jackson, J. S., & Anderson, N. B. (1997). Racial Differences in Physical and Mental Health: Socio-economic Status, Stress and Discrimination. *J Health Psychol, 2*(3), 335-351. doi:10.1177/135910539700200305
- Wong, J. G. W. S., Cheung, E. P. T., Chan, K. K. C., Ma, K. K. M., & Tang, S. W. (2006). Web-Based Survey of Depression, Anxiety and Stress in First-Year Tertiary Education Students in Hong Kong. *Australian & New Zealand Journal of Psychiatry, 40*(9), 777-782. doi:10.1080/j.1440-1614.2006.01883.x
- World Health Organization. (2000). *Obesity: preventing and managing the global epidemic*. Retrieved from Geneva: [http://www.who.int/nutrition/publications/obesity/WHO\\_TRS\\_894/en/](http://www.who.int/nutrition/publications/obesity/WHO_TRS_894/en/)
- World Health Organization. (2016, April 2016). Mental health: strengthening our response. Retrieved from <http://www.who.int/mediacentre/factsheets/fs220/en/>
- World Health Organization. (2017a, April 2017). Mental disorders. Retrieved from <http://www.who.int/mediacentre/factsheets/fs396/en/>
- World Health Organization. (2017b, October 2017). Obesity and overweight. Retrieved from <http://www.who.int/mediacentre/factsheets/fs311/en/>
- Zhao, G., Ford, E. S., Dhingra, S., Li, C., Strine, T. W., & Mokdad, A. H. (2009). Depression and anxiety among US adults: associations with body mass index. *Int J Obes, 33*(2), 257-266.
- Zhu, K., Allen, K., Mountain, J., Lye, S., Pennell, C., & Walsh, J. P. (2017). Depressive symptoms, body composition and bone mass in young adults: a prospective cohort study. *Int J Obes, 41*(4), 576-581. doi:10.1038/ijo.2016.214



## **Statutory Declaration**

To the best of my knowledge and belief this thesis is my own and the exact source of any material (idea, information, figures or text) derived or quoted from the published or unpublished work of other persons has been cited according to the required conventions.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

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Date and signature

## Appendix

Table 03. Descriptive Statistic BMI and age

	BMI	BMI categories	BMI combined	Age
<b>N</b>	286	286	286	286
<b>Missings</b>	0	0	0	0
<b>Mean</b>	22.52	2.1259	2.08	20.75
<b>Median</b>	22.18	2	2	21.00
<b>Mode</b>	21	2	2	20
<b>Standard Deviation</b>	3.553	0.608	0.503	1.736
<b>Variance</b>	12.626	0.370	0.253	3.015
<b>Range</b>	22	3.00	2	6
<b>Minimum</b>	15	1	1	18
<b>Maximum</b>	37	4	3	24
<b>Percentiles</b>				
<b>25</b>	20.33	2	2	19
<b>50</b>	22.18	2	2	21
<b>75</b>	24.23	2	2	22

Table 04. Frequency Table BMI categories

	Frequency	Percent	Valid Percent	Cumulative Percent
Underweight	25	8.7	8.7	8.7
Normal weight	212	74.1	74.1	82.9
Overweight	37	12.9	12.9	95.8
Obesity	12	4.2	4.2	100.00
<b>Total</b>	286	100.00	100.00	

Table 05. Frequency Table Age

	Frequency	Percent	Valid Percent	Cumulative Percent
18	25	8.7	8.7	8.7
19	52	18.2	18.2	26.9
20	62	21.7	21.7	48.6
21	57	19.9	19.9	68.5
22	36	12.6	12.6	81.1
23	28	9.8	9.8	90.9
24	26	9.1	9.1	100.00
<b>Total</b>	286	100.00	100.00	

Table 06. Frequency Table Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	77	26.9	27.1	27.1
Female	199	69.6	70.1	97.2
Genderqueer	3	1.0	1.1	98.2
Other	5	1.7	1.8	100.00
<b>Total</b>	284	99.3	100.00	
Missings	2	0.7		

Table 07. Descriptive Statistic EDS and perceived mental health

	EDS	Perceived Mental Health	Perceived Mental Health (4 items)
<b>N</b>	275	278	278
<b>Missings</b>	11	8	8
<b>Mean</b>	2.08	2.60	2.62
<b>Median</b>	1	3	3
<b>Mode</b>	0	3	3
<b>Standard Deviation</b>	2.442	1.025	0.979
<b>Variance</b>	5.961	1.050	0.959
<b>Range</b>	10	4	3
<b>Minimum</b>	0	0	1
<b>Maximum</b>	10	4	4
<b>Percentiles</b>			
	<b>25</b>	0	2
	<b>50</b>	1	3
	<b>75</b>	3	3

Table 08. Frequency Table Perceived Mental Health

	Frequency	Percent	Valid Percent	Cumulative Percent
Very poor	6	2.1	2.2	2.2
Poor	43	15.0	15.5	17.6
Neither poor nor good	59	20.6	21.2	38.8
Good	119	41.6	42.8	81.7
Very good	51	17.8	18.3	100.00
<b>Total</b>	<b>278</b>	<b>97.2</b>	<b>100.00</b>	
Missings	8	2.8		

Table 09. Frequency Table EDS

	Frequency	Percent	Valid Percent	Cumulative Percent
0	114	39.9	41.5	41.5
1	34	11.9	12.4	53.8
2	29	10.1	10.5	64.4
3	31	10.8	11.3	75.6
4	18	6.3	6.5	82.2
5	17	5.9	6.2	88.4
6	10	3.5	3.6	92.0
7	13	4.5	4.7	96.7
8	4	1.4	1.5	98.2
9	4	1.4	1.5	99.6
10	1	0.3	0.4	100.00
<b>Total</b>	<b>275</b>	<b>96.2</b>	<b>100.00</b>	
Missings	11	3.8		

Table 10. Frequency Table EDS Main Reason

	Frequency	Percent	Valid Percent	Cumulative Percent
Your ancestry or national origins	11	3.8	4.6	4.6
Your gender	51	17.8	21.3	25.9
Your race	17	5.9	7.1	33.1
Your religion	7	2.4	2.9	36.0
Your height or weight	9	3.1	3.8	39.7
Your shade of skin colour	9	3.1	3.8	43.5
Your sexual orientation	3	1.0	1.3	44.8
Your education or income level	13	4.5	5.4	50.2
A physical disability	1	0.3	0.4	50.6
The way you look	68	23.8	28.5	79.1
Other	50	17.5	20.9	100.00
<b>Total</b>	239	83.6	100.00	
Missings	47	16.4		

Table 11. Descriptive Statistic DASS

	DASS Depression	DASS Anxiety	DASS Stress
<b>N</b>	268	268	268
<b>Missings</b>	18	18	18
<b>Mean</b>	11.99	9.72	13.65
<b>Median</b>	10	8	12
<b>Mode</b>	0	2	6
<b>Standard Deviation</b>	10.652	8.612	9.404
<b>Variance</b>	113.468	74.166	88.431
<b>Range</b>	42	42	42
<b>Minimum</b>	0	0	0
<b>Maximum</b>	42	42	42
<b>Percentiles</b>			
<b>25</b>	2	2	6
<b>50</b>	10	8	12
<b>75</b>	18	14	20

Table 12. Frequency Table DASS Depression

	Frequency	Percent	Valid Percent	Cumulative Percent
0	36	12.6	13.4	13.4
2	34	11.9	12.7	26.1
4	24	8.4	9.0	35.1
6	16	5.6	6.0	41.0
8	12	4.2	4.5	45.5
10	16	5.6	6.0	51.5
12	25	8.7	9.3	60.8
14	24	8.4	9.0	69.8
16	9	3.1	3.4	73.1
18	11	3.8	4.1	77.2
20	10	3.5	3.7	81.0
22	6	2.1	2.2	83.2
24	8	2.8	3.0	86.2
26	10	3.5	3.7	89.9
28	3	1.0	1.1	91.0
30	5	1.7	1.9	92.9
32	2	0.7	0.7	93.7
34	7	2.4	2.6	96.3
36	2	0.7	0.7	97.0
38	1	0.3	0.4	97.4
40	3	1.0	1.1	98.5
42	4	1.4	1.5	100.00
<b>Total</b>	268	93.7	100.00	
Missings	18	6.3		

Table 13. Frequency Table DASS Anxiety

	Frequency	Percent	Valid Percent	Cumulative Percent
0	33	11.5	12.3	12.3
2	41	14.3	15.3	27.6
4	33	11.5	12.3	39.9
6	20	7.0	7.5	47.4
8	18	6.3	6.7	54.1
10	17	5.9	6.3	60.4
12	21	7.3	7.8	68.3
14	22	7.7	8.2	76.5
16	17	5.9	6.3	82.8
18	8	2.8	3.0	85.8
20	9	3.1	3.4	89.2
22	8	2.8	3.0	92.2
24	6	2.1	2.2	94.4
26	1	0.3	0.4	94.8
28	3	1.0	1.1	95.9
30	4	1.4	1.5	97.4
32	2	0.7	0.7	98.1
34	1	0.3	0.4	98.5
36	2	0.7	0.7	99.3
38	1	0.3	0.4	99.6
40	0	0	0	0
42	1	0.3	0.4	100.00
<b>Total</b>	268	93.7	100.00	
Missings	18	6.3		

Table 14. Frequency Table DASS Stress

	Frequency	Percent	Valid Percent	Cumulative Percent
0	19	6.6	7.1	7.1
2	18	6.3	6.7	13.8
4	18	6.3	6.7	20.5
6	24	8.4	9.0	29.5
8	20	7.0	7.5	36.9
10	23	8.0	8.6	45.5
12	15	5.2	5.6	51.1
14	21	7.3	7.8	59.0
16	17	5.9	6.3	65.3
18	15	5.2	5.6	70.9
20	18	6.3	6.7	77.6
22	13	4.5	4.9	82.5
24	9	3.1	3.4	85.8
26	9	3.1	3.4	89.2
28	10	3.5	3.7	92.9
30	5	1.7	1.9	94.8
32	7	2.4	2.6	97.4
34	4	1.4	1.5	98.9
36	2	0.7	0.7	99.6
38	0	0	0	0
40	0	0	0	0
42	1	0.3	0.4	100.00
<b>Total</b>	268	93.7	100.00	
Missings	18	6.3		

Table 15. Chi-Square EDS

Chi-Square EDS					
			You have been called names or insulted	You have been threatened or harassed	You have been followed around in shops
<b>BMI</b>	<b>Pearson Chi-Square</b>	Value	234.442 <sup>a</sup>	246.634 <sup>d</sup>	260.731 <sup>g</sup>
		df	226	226	226
		Significance	0.336	0.165	0.056
	<b>Cramer's V</b>	Value	0.923	0.947	0.974
		Significance	0.336	0.165	0.056
<b>BMI combined</b>	<b>Pearson Chi-Square</b>	Value	4.275 <sup>b</sup>	13.872 <sup>e</sup>	13.275 <sup>h</sup>
		df	2	2	2
		Significance	0.118	0.001	0.001
	<b>Cramer's V</b>	Value	0.125	0.225	0.220
		Significance	0.118	0.001	0.001
<b>BMI categories</b>	<b>Pearson Chi-Square</b>	Value	8.929 <sup>c</sup>	15.665 <sup>f</sup>	14.590 <sup>i</sup>
		df	3	3	3
		Significance	0.030	0.001	0.002
	<b>Cramer's V</b>	Value	0.180	0.239	0.230
		Significance	0.030	0.001	0.002

- a. 454 cells (100.00%) have expected count less than 5. The minimum expected count is 0.21.
- b. 0 cells (0%) have expected count less than 5. The minimum expected count is 5.06.
- c. 1 cell (12.5%) have expected count less than 5. The minimum expected count is 2.32.
- d. 454 cells (100.00%) have expected count less than 5. The minimum expected count is 0.12.
- e. 1 cell (16.7%) have expected count less than 5. The minimum expected count is 2.79.
- f. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 1.28.
- g. 454 cells (100.00%) have expected count less than 5. The minimum expected count is 0.04.
- h. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 0.87.
- i. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 0.40.

Table 16. Correlation EDS

Correlation EDS			
		You have been followed around in shops	You have been threatened or harassed
BMI	Pearson Correlation	0.128	0.109
	Significance	0.034	0.071
	N	275	275
BMI combined	Spearman Correlation	0.080	0.161
	Significance	0.188	0.008
	N	275	275
BMI categories	Spearman Correlation	0.079	0.169
	Significance	0.193	0.005
	N	275	275

Table 17. Chi-Square DASS

Chi-Square DASS					
			I found it difficult to relax	I was unable to become enthusiastic about anything	DASS Depression
BMI	Pearson Chi-Square	Value	659.461 <sup>a</sup>	669.468 <sup>d</sup>	4771.253 <sup>g</sup>
		df	663	663	4641
		Significance	0.532	0.423	0.089
	Cramer's V	Value	0.906	1.581	0.921
		Significance	0.532	0.432	0.089
BMI combined	Pearson Chi-Square	Value	12.994 <sup>b</sup>	16.304 <sup>e</sup>	73.535 <sup>h</sup>
		df	6	6	42
		Significance	0.043	0.012	0.002
	Cramer's V	Value	0.153	0.174	0.370
		Significance	0.043	0.012	0.002
BMI categories	Pearson Chi-Square	Value	15.552 <sup>c</sup>	17.603 <sup>f</sup>	110.829 <sup>i</sup>
		df	9	9	63
		Significance	0.077	0.040	<0.001
	Cramer's V	Value	0.139	0.148	0.371
		Significance	0.077	0.040	<0.001

- a. 888 cells (100.00%) have expected count less than 5. The minimum expected count is 0.08.
- b. 2 cells (16.7%) have expected count less than 5. The minimum expected count is 1.88.
- c. 6 cells (37.5%) have expected count less than 5. The minimum expected count is 0.86.
- d. 888 cells (100.00%) have expected count less than 5. The minimum expected count is 0.06.
- e. 3 cells (25.0%) have expected count less than 5. The minimum expected count is 1.52.
- f. 7 cells (43.8%) have expected count less than 5. The minimum expected count is 0.70.
- g. 4884 cells (100.00%) have expected count less than 5. The minimum expected count is 0.00.
- h. 50 cells (75.8%) have expected count less than 5. The minimum expected count is 0.09.
- i. 74 cells (84.1%) have expected count less than 5. The minimum expected count is 0.04.
- j. 1110 cells (100.00%) have expected count less than 5. The minimum expected count is 0.09.
- k. 6 cells (40.0%) have expected count less than 5. The minimum expected count is 2.15.
- l. 10 cells (50.0%) have expected count less than 5. The minimum expected count is 0.99.

Table 18. Correlation DASS Questions

Correlation DASS Questions												
		I couldn't seem to experience any positive feeling at all	I felt that I was using a lot of nervous energy	I was worried about situations in which I might panic and make a fool of myself	I felt that I had nothing to look forward to	I found myself getting agitated	I found it difficult to relax	I felt I was close to panic	I was unable to become enthusiastic about anything	I felt that I was rather touchy	I felt I wasn't worth much as a person	I was aware of the action of my heart in the absence of physical exertion
BMI	Pearson Correlation	0.130	0.126	0.140	0.157	0.122	0.132	0.185	0.167	0.127	0.097	0.127
	Significance	0.033	0.039	0.022	0.010	0.047	0.030	0.002	0.006	0.038	0.114	0.038
	N	268	268	268	268	268	268	268	268	268	268	268
BMI combined	Spearman Correlation	0.099	0.104	0.101	0.125	0.111	0.128	0.154	0.153	0.039	0.126	0.147
	Significance	0.105	0.089	0.101	0.040	0.070	0.036	0.012	0.012	0.523	0.040	0.016
	N	268	268	268	268	268	268	268	268	268	268	268
BMI categories	Spearman Correlation	0.100	0.105	0.101	0.132	0.111	0.127	0.159	0.152	0.046	0.128	0.154
	Significance	0.102	0.085	0.099	0.031	0.69	0.038	0.009	0.013	0.452	0.036	0.018
	N	268	268	268	268	268	268	268	268	268	268	268



Table 19. Correlation DASS

Correlation DASS				
		DASS Depression	DASS Anxiety	DASS Stress
BMI	Pearson Correlation	0.133	0.161	0.137
	Significance	0.030	0.008	0.025
	N	268	268	268
BMI combined	Spearman Correlation	0.121	0.121	0.105
	Significance	0.049	0.048	0.089
	N	268	268	268
BMI categories	Spearman Correlation	0.123	0.123	0.107
	Significance	0.044	0.044	0.080
	N	268	268	268

Table 20. Correlation Perceived Mental Health

Correlation Perceived Mental Health			
		How would you rate your own mental health	How would you rate your own mental health (4 items)
BMI	Pearson Correlation	-0.123	-0.128
	Significance	0.040	0.032
	N	278	278
BMI combined	Spearman Correlation	-0.103	-0.101
	Significance	0.085	0.093
	N	278	278
BMI categories	Spearman Correlation	-0.108	-0.105
	Significance	0.073	0.080
	N	278	278

Table 21. Chi-Square SF-8

Chi-Square SF-8					
			Overall, how would you rate your health during the past 4 weeks?	During the past 4 weeks, how much did physical health problems limit your physical activities (such as walking or climbing stairs)?	During the past 4 weeks, how much energy did you have?
<b>BMI</b>	<b>Pearson Chi-Square</b>	Value	1238.619 <sup>a</sup>	989.235 <sup>d</sup>	955.220 <sup>e</sup>
		df	1175	940	940
		Significance	0.096	0.129	0.358
	<b>Cramer's V</b>	Value	0.931	0.930	0.914
		Significance	0.096	0.129	0.358
<b>BMI combined</b>	<b>Pearson Chi-Square</b>	Value	19.067 <sup>b</sup>	9.798 <sup>e</sup>	10.248 <sup>h</sup>
		df	10	8	8
		Significance	0.039	0.279	0.248
	<b>Cramer's V</b>	Value	0.183	0.131	0.189
		Significance	0.039	0.279	0.248
<b>BMI categories</b>	<b>Pearson Chi-Square</b>	Value	26.644 <sup>c</sup>	29.788 <sup>f</sup>	26.522 <sup>i</sup>
		df	15	12	12
		Significance	0.032	0.003	0.009
	<b>Cramer's V</b>	Value	0.176	0.186	0.176
		Significance	0.032	0.003	0.009

- 1416 cells (100.00%) have expected count less than 5. The minimum expected count is 0.01.
- 7 cells (38.9%) have expected count less than 5. The minimum expected count is 0.26.
- 14 cells (58.3%) have expected count less than 5. The minimum expected count is 0.13.
- 1180 cells (100.0%) have expected count less than 5. The minimum expected count is 0.00.
- 6 cells (40.0%) have expected count less than 5. The minimum expected count is 0.09.
- 11 cells (55.0%) have expected count less than 5. The minimum expected count is 0.04.
- 1180 cells (100.0%) have expected count less than 5. The minimum expected count is 0.02.
- 6 cells (40.0%) have expected count less than 5. The minimum expected count is 0.52.
- 11 cells (55.0%) have expected count less than 5. The minimum expected count is 0.25.

Table 22. Correlation SF-8

Correlation SF-8			
		Overall, how would you rate your health during the past 4 weeks?	During the past 4 weeks, how much difficulty did you have doing your daily work, both at home and away from home, because of your physical health?
<b>BMI</b>	<b>Pearson Correlation</b>	0.178	0.134
	<b>Significance</b>	0.003	0.023
	<b>N</b>	286	286
<b>BMI combined</b>	<b>Spearman Correlation</b>	0.107	0.050
	<b>Significance</b>	0.07	0.398
	<b>N</b>	286	286
<b>BMI categories</b>	<b>Spearman Correlation</b>	0.115	0.057
	<b>Significance</b>	0.051	0.338
	<b>N</b>	286	286

Table 23. Comparison Frequency BMI categories

	<b>USHWS</b>	<b>Australian Bureau of Statistics, 2004-05</b>
Underweight	8.7 %	5.8 %
Normal weight	74.1 %	56.2%
Overweight	12.9 %	22.1 %
Obesity	4.2 %	7.0 %

Table 24. Comparison of results of DASS

	<b>USHWS</b>	<b>Wong et al., 2006</b>	<b>Demirel, 2016</b>
DASS Depression	11.99	8.66	9.84
DASS Anxiety	9.72	9.36	9.69
DASS Stress	13.65	13.97	15.62

## Coding Definitions

### BMI categories

1	Underweight
2	Normal weight
3	Overweight
4	Obesity

### Gender (current)

0	Male
1	Female
2	TransMale/Transman
3	TransFemale/Transwoman
4	Genderqueer
5	Additional Category
6	Other

### DASS Scale categories

0	Normal
1	Mild
2	Moderate
3	Severe
4	Extremely Severe

### DASS Scale answers

0	Did not apply to me at all
1	Applied to me to some degree, or some of the time
2	Applied to me to a considerable degree, or a good part of time
3	Applied to me very much, or most of the time

### EDS Scale answers

0	Never
1	Once
2	Two or three times
3	Four or more times

### Perceived mental health

0	Very poor
1	Poor
2	Neither poor nor good
3	good
4	Very good

## Scales used in the USHWS

### EDS

In your day-to-day life, how often have any of the following things happened to you?

	Never	Once	Two or three times	Four or more times
You have been treated with less courtesy than other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You have been treated with less respect than other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You have received poorer service than other people at restaurants or shops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People have acted as if they think you are not smart	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People have acted as if they are afraid of you	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People have acted as if they think you are dishonest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People have acted as if they're better than you are	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You have been called names or insulted	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You have been threatened or harassed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
You have been followed around in shops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If any of the above events have occurred to you, what do you think was the MAIN reason for this/these experiences?

- Your ancestry or national origins
- Your gender
- Your race
- Your age
- Your religion
- Your height or weight
- Your shade of skin colour
- Your sexual orientation
- Your education or income level
- A physical disability
- The way you look
- Other (please specify) \_\_\_\_\_

#### Perceived mental health

How would you rate your own mental health?

- Very poor
- Poor
- Neither poor nor good
- Good
- Very Good

#### DASS-21

Please read each statement and circle a number 0, 1, 2 or 3, which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

- 0 Did not apply to me at all
- 1 Applied to me to some degree, or some of the time
- 2 Applied to me to a considerable degree, or a good part of time
- 3 Applied to me very much, or most of the time

	0	1	2	3
I found it hard to wind down	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was aware of dryness of my mouth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I couldn't seem to experience any positive feeling at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found it difficult to work up the initiative to do things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tended to over-react to situations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I experienced trembling (eg, in the hands)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt that I was using a lot of nervous energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was worried about situations in which I might panic and make a fool of myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt that I had nothing to look forward to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found myself getting agitated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found it difficult to relax	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt down-hearted and blue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was intolerant of anything that kept me from getting on with what I was doing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I felt I was close to panic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was unable to become enthusiastic about anything	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt I wasn't worth much as a person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt that I was rather touchy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt scared without any good reason	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I felt that life was meaningless	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



SF-8

1) Overall, how would you rate your health during the past 4 weeks?

- Excellent
- Very Good
- Good
- Fair
- Poor
- Very Poor

2) During the past 4 weeks, how much did physical health problems limit your physical activities (such as walking or climbing stairs)?

- Not at all
- Very little
- Somewhat
- Quite a lot
- Could not do physical activities

3) During the past 4 weeks, how much difficulty did you have doing your daily work, both at home and away from home, because of your physical health?

- Not at all
- Very little
- Somewhat
- Quite a lot
- Could not do daily work

4) How much bodily pain have you had during the past 4 weeks?

- None
- Very mild
- Mild
- Moderate
- Severe

5) During the past 4 weeks, how much energy did you have?

- Very much
- Quite a lot
- Some
- A little
- None

6) During the past 4 weeks, how much did your physical health or emotional problems limit your usual social activities with family or friends?

- Not at all
- Very little
- Somewhat
- Quite a lot
- Could not social activities

7) During the past 4 weeks, how much have you been bothered by emotional problems (such as feeling anxious, depressed or irritable)?

- Not at all
- Slightly
- Moderately
- Quite a lot
- Extremely

8) During the past 4 weeks, how much personal or emotional problems keep you from doing your usual work, school or other daily activities?

- Not at all
- Very little
- Somewhat
- Quite a lot
- Could not do daily activities