UHASSELT

KNOWLEDGE IN ACTION

School voor Educatieve Studies

Educatieve master in de wetenschappen en technologie

Masterthesis

The relation between mental health and academic performance of students in higher education

Anne Stulens

Scriptie ingediend tot het behalen van de graad van Educatieve master in de wetenschappen en technologie, afstudeerrichting wetenschappen

PROMOTOR :
Prof. dr. Elke EMMERS

COPROMOTOR :
dr. Karen JACOBS
mevr. Ilse VANDEPOEL

2022
2023

UHASSELT

KNOWLEDGE IN ACTION

www.uhasselt.be
Universiteit Hasselt
Campus Hasselt:
Martelarenlaan 42 | 3500 Hasselt
Campus Diepenbeek:
Agoralaan Gebouw D | 3590 Diepenbeek

School voor Educatieve Studies

Educatieve master in de wetenschappen en technologie

Masterthesis

The relation between mental health and academic performance of students in higher education

Anne Stulens

Scriptie ingediend tot het behalen van de graad van Educatieve master in de wetenschappen en technologie, afstudeerrichting wetenschappen

PROMOTOR :
Prof. dr. Elke EMMERS

COPROMOTOR :
dr. Karen JACOBS
mevr. Ilse VANDEPOEL

The relation between mental health and academic performance of students in higher education

Anne Cortleven
Stijn Jaspers
Lauren Moors
Anne Stulens
Petri Schotman
Stoffel Wirges

Inhoudsopgave

Abstract

Academic success of students is known to be influenced by a large number of both internal and external factors. In this thesis, the aim is to look closer at the specific effects of mental health disorders on the performance of higher education of students. Indeed, throughout literature, it has been shown that mental health disorders might impact both the grade percentage of students as well as the likelihood for students to drop-out of college. In addition, the prevalence of many such disorders has increased over the last years due to the COVID-19 pandemic. Therefore, understanding the underlying relationships between mental health disorders and academic performance has become increasingly important.

Three outcome variables were considered as measurements of academic success, i.e. the continuous average year percentage, the three-category cumulative study efficiency and the binary drop-out indicator. Unlike many other studies, who often look at the effect of a single mental health disorder on the performance of students, this thesis focuses on the joint effect of multiple disorders. Data were obtained at one of the largest university colleges of Belgium using a survey that is part of the WHO World Mental Health International College Student (WMH-ICS) initiative to map the mental well-being of students worldwide. In total, 13 mental health disorders are included in our analysis. In addition, the questionnaire also includes institute specific questions to obtain socio-demographic, college and student well-being related information.

In a first analysis, the mental health disorders were regarded on an individual basis, using three types of regression models (dependent on the type of outcome variable). For all outcomes, it was seen that especially illegal substance use disorder, eating disorder, bipolar 1 disorder and suicide attempt were highly associated with academic performance (both with and without correcting for background information). Even though not all their effects were significant for the three outcome types, it was observed that suffering from at least one of these disorders had a negative impact on the academic year percentage, the cumulative study efficiency and drop-out. A moderator analysis showed that feeling more connected with school (p-value<0.001) or with other students (p-value= 0.017) both mitigate the negative effect of illegal substance use on academic performance. In a second stage, the effect of the total number of disorders within a student on the performance was regarded. From there, a first indication towards the joint effect of the disorders was observed, since every additional disorder resulted into 1) a decrease in the average year percentage by 0.92, 2) an increased probability to belong to the lower CSE classes by a factor of 1.10, and 3) an increased odds to drop-out by a factor of 1.11 (all p-values below 0.001). Moreover, a cluster analysis was performed to further look at the effect of multivariate disorder profiles on the performance. Next to a baseline cluster, consisting of students who do not suffer from any disorder, four additional clusters were identified. Including these into the respective models, it was found that especially the co-occurrence of major depressive episodes, eating disorders, social anxiety and suicide ideation, together with panic disorders and recurrent untriggered panic attacks (cluster three) or together with the suicide-related indicators (cluster four) had a negative influence on all three outcomes. The largest effect was observed for cluster four, where students scored on average 10.31% AYP less as compared to the baseline (p-value= 0.001), had an increased probability to belong to the lower cumulative study efficiency class with a factor of 3.52 (p-value<0.001) and had 4.66 times higher odds to drop-out (p-value<0.001). For cluster three, these values were 6.79% (p-value= 0.005), 1.75 (p-value= 0.040) and 1.98 (p-value= 0.022), respectively.

It can be concluded that mental health disorders do indeed have an impact on the study performance and that their effects are often enhanced by the comorbidity patterns. In this perspective, the current analyses should be further extended with more advanced techniques to fully grasp the interplay between the disorders and their effects on the study performance.

List of abbreviations

- **12M** 12 months
- **AEDS** Eating disorder screener
- **AIC** Akaike information criterion
- **AUD** Alcohol use disorder
- **AUDIT** Alcohol use disorder identification test
- **AYP** Academic year percentage
- **BIP1** Bipolar disorder 1
- **BP** Bipolar disorder
- **BPB** Binge eating and purging behaviors
- **CSE** Cumulative study efficiency
- **DAA** Drug and alcohol abuse
- **DSM** Diagnostic and Statistical Manual of Mental Disorders
- **ED** Eating disorder
- **GAD** Generalized anxiety disorder
- **GPA** Grade point average
- **HEC** Heavy episodic drinking
- **ISUD** Illegal substance disorder
- **LT** Lifetime
- **MDE** Major depressive episode
- **MHD** Mental health disorder
- **NSSI** Non suicidal self-injury
- **PD** Panic disorder
- **PTSD** Post-traumatic stress disorder
- **RUPA** Recurrent panic attacks
- **SA** Suicide attempt
- **SAD** Social anxiety disorder
- **SAS** Social anxiety screener
- **SI** Suicidal ideation
- **SP** Suicide plan
- **STB** Suicidal thoughts and behaviors
- **WHO** World Health organization
- **WMH-ICS** World mental health international college student

1. Introduction

Recent reports by the Organization for Economic Co-operation and Development (OECD) indicate the importance of education with respect to a successful labor market participation (Indicators, 2020). Higher educational attainment is often associated with better employment prospects. Indeed, in Belgium the employment rate among 25–34 year-olds with tertiary education was 42% higher than among those with below upper secondary attainment. Belgium experiences a high entry rate to tertiary education: 72% of young adults in Belgium will enter a bachelor's or equivalent program before the age of 25. However, many students fail to complete their education (Indicators, 2020).

Academic success is a broad concept, which is measured in a variety of ways throughout literature. Based on the systematic review performed by York et al. (2015), academic achievement (measured via grades or grade point average **(GPA)**) and persistence (reflected by the degree of completion rate or retention) are among the two most used outcome measures for academic success. Academic success is known to be influenced by an interplay of many factors. These factors include internal and external categories (Al Husaini & Shukor, 2022). The factors in the internal category include personal *(age, gender, disability status, health status…)* and psychological *(first generation learner, learning style)* factors. The external category is comprised of academic (*pre-college grades, scores on entrance exams)*, social *(number of friends, extra-curricular activities),* economic *(family income, mother's occupation)* and demographic *(race, living location)* factors.

To determine the academic performance of students, different parameters can be used. These include among others the academic year percentage **(AYP)**, cumulative study efficiency **(CSE)** and drop-out rate. Researchers have demonstrated that internalizing and externalizing mental health problems are associated with decreased AYP (Bruffaerts et al., 2018). Moreover, the decision to drop-out has been described as the result of a longitudinal process of interactions between an individual and its characteristics, abilities, financial status, college history, intentions and commitments on the one hand and the members of the academic and social systems within an educational institution on the other hand (Tinto, 1975).

Although "health status" is mentioned as an important internal and personal factor, we believe this term does not cover the full health continuum. More specifically, three dimensions should be taken into account according to the WHO: mental, physical and social health (Matingwina, 2018). Physical health can be defined as the normal functioning of the body and could indeed be classified as being an internal, personal factor. In contrast, social health is the ability of individuals to establish healthy and rewarding interpersonal relationships with others. It refers to the sense of belonging. People have a need to belong and join other groups and be accepted within them. This health dimension can be linked to the external, social category and becomes important when freshmen try to integrate and connect with their fellow students. Finally, mental health includes our emotional, psychological, and social well-being. It influences how we think, feel, and act. It determines how we handle stress, relate to others and make healthy choices (World Health Organization: WHO, 2022).

Over the last years, the mental well-being of higher education students has been a growing concern (Storrie et al., 2010; Hughes & Spanner, 2019). Studies have shown that the COVID-19 pandemic has had a detrimental impact on the prevalence of numerous mental health disorders among college students (Son et al., 2020; Kecojevic et al., 2020; Evans et al., 2021). Most studies that explore the relationship between mental health disorders (MHDs) and academic performance mainly focus on only one or a few disorders. However, several studies have shown that MHDs often occur simultaneously, i.e., **comorbidity** is present (e.g. Kessler et al., 2005; Plana-Ripoll et al., 2019). To the best of our knowledge, a thorough analysis of how these comorbidity patterns might affect the performance of students has not yet been performed. Therefore, important information required to provide the best possible guidance for students with poor mental health is lacking. According to the findings of the World Mental Health International College Student Surveys (WMH-ICS) there are effective treatments to address these mental problems but only the minority of students with mental disorders are treated (WHM-ICS, 2022).

In this master thesis, we intend to show which mental health comorbidities exist and how they influence student's performance in terms of year percentage (AYP), cumulative study efficiency (CSE) and probability to drop-out. A more formal definition of these study outcomes will follow in the material and methods section. In addition to the effect of MHDs on study performance, we are also interested in investigating whether the social health dimension might moderate this effect. More specifically, it can be argued that the performance of students that feel more connected with their peers, with lecturers or with the school might be less impacted by mental disorders since they have a social network to rely on. A similar idea applies for students that are more resilient, have a better future orientation or experience a higher caring school climate. These six factors are summarized under the umbrella term 'sense of belonging'.

In the following subsections, an introduction to several mental disorders will be given. These include anxiety disorders, mood disorders, eating disorders, substance abuse and suicidal thoughts. In addition to a general description, we will also mention how the disorders impact the functioning and well-being of the students and, when possible, identify existing links with study performance. Beyond these disorders, we will also dive deeper into the specific factors related to the sense of belonging, as they are assumed to moderate the relationship between the MHDs and academic performance.

1.1 Overview of the mental health disorders

A mental health disorder occurs when a person's cognition, emotional regulation or behavior is disturbed to the point where the person is limited in important areas of functioning (WHO, 2022). MHDs have an age of onset in late childhood or early adolescence. The transition from adolescence to adulthood is a critical time period which can be marked by the college years. These years are accompanied by an increased risk for mental disorders and hazardous behaviors (Zivin et al., 2009; Bruffaerts et al., 2018; Auerbach et al., 2018). The occurrence of mental disorders during this critical period can have negative effects on academic outcomes such as college attrition (Auerbach et al., 2016) and grades (Bruffaerts et al., 2018). Furthermore, it can cause role impairment and the inability to attend class (Alonso et al., 2018). Ultimately resulting in the emergence of suicidal thoughts and behaviors (STB) (Mortier et al., 2017).

1.1.1 Anxiety disorders

Anxiety can be described as a worrying, uncomfortable feeling that creates tension in the body caused by a release of hormones (Kenwoodet al., 2022). Hormones such as cortisol and adrenaline are associated with the "fight or flight" response, preparing the body for external threats (Kim & Gorman, 2005). External threats involve issues regarding financial stability, social acceptance, and health. However, normal levels of anxiety do not harm and are proven to be beneficial. Yet, excessive worry and/or anxiety without a direct threat will negatively impact different areas of a person's functioning and wellbeing including their career and social life (Stein og Stein, 2008). For example, anxious employees show reduced work performance and significant higher levels of absence due to illness (Deady et al., 2022). Analogous studies have been performed on college students and show conflicting results. Various studies indicate that anxiety levels are negatively correlated with GPA, but often correlations are not found significant (Brook & Willoughby, 2015; Zukerman et al., 2019). Other research has shown that anxiety did not come out as a predictor of college persistence or GPA (Bisson, 2017; Strahan, 2003). Conflicting outcomes emphasize a need for further research on the matter. In addition, most studies were performed pre-COVID-19 times. This nuance is important, given that estimates indicate an increase of "anxiety rates" by 25% post COVID-19 (World Health Organization: WHO, 2022). Considering that anxiety disorders are at an all-time high, it is crucial to understand its prevalence amongst college students and how it affects their learning experiences World Health Organization: WHO, 2022).

Social Anxiety disorder

Social Anxiety disorder (SAD), often referred to as social phobia, is described as a strong fear of social situations. Specifically, situations that could potentially lead to humiliation and/or embarrassment of the individual (Stein & Stein, 2008). Research indicates that SAD is the most common anxiety disorder, with a lifetime prevalence of approximately 7–18 % (Stein & Stein, 2008; Topham & Russell, 2012). Individuals experiencing SAD will over-analyze interactions and doubt their ability to present a favorable public image. In an attempt to avoid the phobia, the person shuns social encounters all together (Stein & Stein, 2008). According to the DSM-V criteria, an individual with SAD must have a persistent fear of exposure to social situations that impacts their day-to-day routine and normal functioning. Currently, a variety of SAD screeners are used in online questionnaires. These questionnaires determine if an individual experiences increased levels of social anxiety compared to baseline anxiety levels.

SAD has been assumed to influence GPA as well as academic persistence in college students (Russell & Topham, 2012; Stein & Stein, 2008; Topham & Russell, 2012). Specifically, learning activities that involve public speaking are anticipated by high levels of phobia in socially anxious students (Russell & Topham, 2012). When avoiding such social activities, the students miss out on critical learning opportunities that result in academic underachievement and smaller social circles (Topham & Russell, 2012). Indeed, studies show that a significant number of students withdraw from school due to their SAD (Strahan & Conger, 1998; Van Ameringen et al., 2003). However, studies exist where social anxiety did not come out as a predictor of GPA or college persistence (Bisson, 2017; Strahan, 2003). Including a study from Bisson (2017) that showed no significant impact of SAD on GPA. This study targets a group of students that predominantly experienced low to moderate levels of anxiety. The author suggests that students with high/severe levels of anxiety may have dropped out and did not participate. On the contrary, (Strahan, 2003) argues that college students can manage college despite experiencing elevated levels of fear. Taken together, there does not seem to be a straightforward connection between SAD and academic performance. The current study will further examine this possible relationship, also in the presence of other disorders and background variables.

Panic Disorder

Panic disorder (PD) affects approximately 5% of the population and is characterized as an "abrupt surge" of fear involving heart palpitations, sweating, and trembling, amongst other physiological symptoms (Locke et al., 2015; Roy-Byrne et al., 2006). Furthermore, PD requires the recurrence of such panic attacks (RUPA - recurrent panic attacks) accompanied by an intense fear of worry about the possibility of a future attack (Roy-Byrne et al., 2006). Similar to SAD, PD patients avoid situations that could trigger anxiety or a potential attack. Such avoidance behaviors could be maladaptive to the individual's social life and career. Literature mentions that PD is a "secondary disorder," since it rarely occurs in the absence of other comorbid illnesses, meaning that two or more disorders manifest in the same individual. For instance, PD might occur together with post-traumatic stress disorder (PTSD), agoraphobia (a fear of fear), major depressive disorder and/or bipolar disorder (Kessler et al., 2006; Roy-Byrne et al., 2006; Tilli et al., 2012). For this reason, PD is often grouped together with other anxiety or mood disorders to determine any association with students' wellbeing.

Generalized anxiety disorder

Generalized anxiety disorder (GAD) involves anxiety-related symptoms that are not directly related to stressful events (Tyrer & Baldwin, 2006). However, specific situations could aggravate a patient's symptoms. Comorbidity with either PD, major depression, or post-traumatic stress disorder (PTSD) is often present in GAD patients (Kessler et al., 2006; Nutt et al., 2002; Tyrer & Baldwin, 2006). Due to the excessive worrying and fear, the individual will experience restlessness, fatigue, and difficulty focusing. More specific for students, GAD is postulated to negatively impact their academic achievements. A study by Alenizi et al. (2020), found that the GPA of students with GAD was reduced compared to students with normal or mild anxiety levels. However, no significant differences in GPA were found and there is little to no information available on college persistence.

1.1.2 Mood disorders

Major depressive episode

Major depressive episode (MDE) is a common mental disorder with significant social impact (Andrews et al., 2007). An MDE is characterized by a persistent low or depressed mood as well as with a decreased interest in pleasurable activities, feelings of guilt or worthlessness. People with an MDE may also suffer from a lack of energy, poor concentration changes in appetite, psychomotor disabilities, sleep disturbances and/or suicidal thoughts (Bains & Abdijadid, 2022). In Belgium the prevalence of depression in the general population is estimated at 13–16% in 2022. The lingering impact of the corona crisis on this percentage must be taken into account considering that the prevalence in 2018 was 9.5% (*Long covid*, 2022).

The prevalence of MDE among college students has been examined in several studies. Auerbach et al. (2016) found a 12-month prevalence of DSM-IV/CIDI disorders with a percentage of 20.3 among college students, compared to 21.4% among nonstudents. In contrast to the findings of D'Hulst et al. (2021), who reported a prevalence of 13.6%. Furthermore, a study conducted in Brazil found the presence of a MDE in 32% of the university students (Flesch et al., 2021). All studies are consistent in showing that the disorder is more frequent among women, with a prevalence ratio of 1.59 to 1.09 (D'Hulst et al., 2021; Flesch et al., 2021). Flesch et al. (2021) found the highest prevalence of MDE among university students in the age range of 21 to 23 years. Several studies described a negative impact of MDE on the academic functioning of freshmen college students (Bruffaerts et al., 2018; Kiekens et al., 2015; Mortier et al., 2015). In accordance with previous studies, D'Hulst et al. (2021) showed that MDE students have an average annual percentage drop of 3.6 to 6.4% and a 1.5- to 2-fold increase in the likelihood of needing reorientation after the first year of college. Bruffearts et al. (2018) found a significant decrease of 4.7% in AYP. Thus, in all studies mentioned above, MDE has a negative effect on the AYP.

Bipolar disorder

Bipolar disorder (BP) is a disorder marked by abrupt mood changes and a person's ability to function without any apparent justifiable reason (Perrotta, 2019). Bipolar disorder is often misdiagnosed, and the correct diagnosis can take years since they are the "chameleon of psychiatric disorders". Symptoms change from one patient to another and from one episode of illness to the next in the same patient (Mondimore, 2014). The prevalence of college students with bipolar disorder is low, with a percentage of 1.2-1.7. However, over the last decade, the presence of bipolar disorder students has increased (Kruse & Oswal, 2018; Pedersen, 2020). Students diagnosed with bipolar disorder have trouble focussing and concentrating, as well as a greater likelihood of comorbidity with learning disorders and substance abuse. In addition, they are at a higher risk of maladaptive coping strategies and dropping out (Blanco et al., 2008; Pedersen, 2020). Throughout research, the coping strategy of "giving up" has been found to be the reason most bipolar students fail to complete their studies (Blanco et al., 2008; Venville et al., 2014). Moreover, students with a bipolar disorder have a greater likelihood of engaging in risky financial and sexual behavior, which can have potentially severe long-term effects such as health consequences and financial instability, which are common reasons for attrition (Cox et al., 2016).

1.1.3 Eating disorders

Eating disorders (EDs) are marked by serious disturbances in eating behavior and body weight (Schmidt et al., 2016). Throughout their university years, students often encounter numerous unhealthy food choices that can have negative impacts on their cognitive abilities (Deliens et al., 2013). Various factors contribute to whether students adopt healthy or unhealthy eating habits, including their body image perceptions, genetic makeup, lifestyle choices, environmental factors, and other habits, which all interact with one another (Celik et al., 2015). Research has shown a strong positive association between a balanced diet and academic performance (Khan et al, 2022). Students who consume a balanced diet tend to perform better in exams and show better performance than malnourished students (Peter et al., 2020; Bernadetta, 2021; Rola & Ahlan, 2021). Insecurity in food has been found to adversely affect academic performance, leading to poor concentration and exam failure (Farahbakhsh et al., 2019). Malnutrition or poor nutrition resulting from EDs can cause cognitive and linguistic deficiencies that can significantly hamper academic success (Sawaya, 2006). Surprisingly, despite the potential link between malnutrition, personality traits, and academic performance, there is a lack of research investigating the connection between EDs and academic performance among college students (Wade et al., 2016).

The study of Valladares et al. (2016) evaluated the EDs dimensions of cognitive restriction, uncontrolled eating, and emotional eating, finding that women had higher emotional eating scores than men. Women with higher GPAs had lower uncontrolled eating scores. Higher uncontrolled eating scores were strongly associated with higher BMI, which has been linked to memory impairment and problems with executive function that can affect academic performance (Loffler et al., 2015; Calvo et al. 2014). However, there was no statistically significant relation between eating behavior dimensions and academic performance in men.

The study of Serra et al. (2019) conducted on first-year college students, examined the prevalence of BPB (Binge eating and Purging Behaviors) and its correlation with objectively measured indicators of academic functioning and associated psychiatric comorbidities. The results showed that BPB, particularly binge eating, is a common occurrence in first-year college students, and it is linked with various mental health issues, as well as decreased academic functioning. Females had higher reported rates of binge eating and purging compared to males. The study's findings provide further evidence of the strong connection between BPB and emotional problems that may have a shared underlying vulnerability, with BPB possibly being used as a coping mechanism for anxiety, depression, or PTSD-related traumatic memories (Palmisano et al., 2018). Additionally, comorbidity with NSSI/suicidal behaviors has been reported in eating disorder patients (Claes & Muehlenkamp, 2014; Fox et al., 2019). For this reason, it would be interesting to further examinate the effect of EDs on academic performance/ persistence and its prevalence (comorbidity) with other mental health disorders.

1.1.4 Substance abuse

According to the WHO, 38.3% of the world population consumes alcohol (WHO, 2022). The use of psychoactive substances (drugs) is estimated at 5.7% worldwide. The abuse of such substances, including alcohol, imposes detrimental impacts on society. Drug and alcohol abuse (DAA) can lead to violence, incarceration and reduced work/school performance. It is estimated that more than 1 in 4 adults diagnosed with a mental health disorder are comorbid for substance abuse (Deas & Brown, 2006; Watkins et al., 2022). Thus, diagnosing and treating a mental illness early, could prevent a possible substance abuse disorder and reduce this comorbidity. It is important to note that causality is complex and multiple risk factors can cause DAA. Psychiatric conditions co-occurring with DAA are often anxiety disorders, depression, bipolar disorder, AHDH and schizophrenia (Arnaud et al., 2022; Saha et al., 2022).

During college, students can be subjected to heavy episodic drinking (HED) (WHO, 2022). Furthermore, 20% of students in the U.S. self-reported Cannabis use in the past month. An increase in alcohol and drug use amongst students is postulated to influence academic performance and college persistence. Indeed, various studies show a significant lower GPA for those who abuse substances compared to those who do not.

1.1.5 Suicidal thoughts, behaviors and non-suicidal self-injury

College students are particularly fragile when unfolding suicidal thoughts and behaviors (STBs) (Mortier et al., 2018; O'Neil et al., 2018). These STBs refer to suicidal ideation (SI), suicide plan (SP) and suicide attempt (SA) (Bursztein & Apter, 2009). According to the findings of the WMH-ICS, 17.2% of incoming college students indicated suicidal ideation at some point in the past 12 months with a median age of onset of 14.2 years. 8.8% indicated plans and 1.0% made at least one suicide attempt. In accordance with most MHDs, higher rates of STBs are visible in females. Suicide itself has become a significant health problem as it is the main cause of preventable death among young people worldwide (World Health Organization: WHO, 2022). Generally, suicide is one of the leading causes of death among college students (*About Mental Health*, n.d.). Within this cluster of mental health problems, there is also non-suicidal self-injury (NSSI): the deliberate, self-directed damage of body tissue without suicidal intent (*skin cutting; burning; self-battery*) (Klonsky et al., 2014).

Providing insight into potentially modifiable risk factors for suicidal thoughts is key to decreasing the rate of adolescent suicides (Chiu et al., 2018; Fuller-Thomson et al., 2019). A major risk factor for suicidal thoughts is sleep deprivation (McKnight-Eily et al., 2011). Sleep deprivation has been found to have a significant negative impact on the physical and mental health of adolescents (Baiden et al., 2015; Roberts et al., 2009; Talbot et al., 2010). Specifically, a heightened risk of suicidality can be seen in students with insomnia symptoms and nightmares. An association is also apparent between experiencing nightmares/nightmare distress and NSSI/self-harm (Russell et al., 2019). Some other known risk factors associated with suicidal ideation are female sex, eating disorders (EDs), feelings of sadness or hopelessness and substance abuse (DAA) (Randall et al., 2015; Lardier et al., 2017; Baiden et al., 2019; Horwitz et al.,2017; Brausch & Gutierrez, 2009). Furthermore, social disconnection is an important factor for increased suicide risk (Arria et al., 2009). Higher suicide risk is therefore associated with low social support and loneliness (see "sense of belonging" section 1.2) (Arria et al., 2009).

Lastly, SI and a history of SA are known risk factors and clear predictors of future suicide behavior and death (Abdu et al., 2020). In the context of academic performance, there is also an association between lifetime SP and SA upon college admission and significant declines in AYP (3.6% and 7.9%, respectively) among college students (Mortier et al., 2015). Specific studies for the relationship between NSSI and academic achievement in college students are still scarce, those that already exist find mixed results. Clear reasons for low academic performance are difficult to find since few studies have been done to examine the relationship between NSSI and academic performance among students. The studies that do already exist then again find mixed results (Kiekens et al., 2016).

1.2 Sense of belonging

Social connections with other people are essential for maintaining both mental and physical health. An essential aspect of social functioning is a sense of belonging. For example, people with many high-quality social connections live longer than others who are more solitary (Holt-Lunstad et al., 2010). The role of perceived belongingness in psychological well-being has been explored extensively (Moeller et al., 2020). A valuable theoretical framework in this regard has been founded under the guidance of Baumeister and Leary. According to the "Need to Belong Theory", human beings are motivated to establish a certain amount of stable and positive interpersonal relationships (Baumeister & Leary, 1995). A strong positive relation has been demonstrated between an individual's sense of interpersonal belonging and their ratings of happiness and subjective well-being (McAdams & Bryant, 1987). Meanwhile, a lack of social bonds or explicit feelings of social exclusion can contribute to anxiety, depression, social anxiety and loneliness (Williamson et al., 2018).

For this reason, a sense of belonging was hypothesized to be a moderating factor in this study. A sense of belonging can be dissected in three different environments: connectedness with peers, connectedness with the school and connectedness with lecturers. Furthermore, an individual's resilience and future orientation are notable well-being correlates.

1.2.1 Connectedness with campus

The school or institution's climate is defined as the quality and character of school life, including norms, values, and expectations that support people feeling socially, emotionally, and physically safe (Cohen et al., 2009). School climate has been linked to a wide range of academic, behavioral, and socio-emotional outcomes, including academic achievement; student academic, social, and personal attitudes and motives; attendance and school avoidance; student delinquency; attitudes and use of illegal substances; bullying; victimization; depression; self-esteem; and general behavior problems (Bear et al., 2011). For instance, a positive connection exists between the campus' climate and a greater likelihood of help-seeking from a mental health professional or school counsellor (Samuolis et al., 2017).

A predictor for how a student experiences their campus' climate is the connectedness with the campus. Feeling uncertainty about belonging in a new school environment has been associated with negative thought processes that harm academic and social integration (Cohen et al., 2009). Recently, research has demonstrated that students who indicated that they felt in place at their institution, had a lower likelihood of experiencing adverse mental health outcomes, such as depression and anxiety (Gopalan et al., 2022). Furthermore, it was found that higher levels of campus connectedness predict higher academic performance among students (Wilson et al., 2020).

1.2.2 Connectedness with peers

Connectedness with peers refers to a variety of interactions between students. For example, students may perceive a feeling of confirmation between themselves, referring to the transactional process by which students communicate that they endorse, recognize, and acknowledge their peers as valuable and significant individuals (LaBelle & Johnson, 2018). Research has demonstrated that positive student-to-student confirmation interactions could be related to positive mental health outcomes and increased academic efficacy (LaBelle & Johnson, 2021). Moreover, students may experience academic assistance from their peers, resulting in feeling cared about, both as a person and with respect to their academic learning (Johnson & Tversky, 1983). Academic assistance from students' peers results in greater self-regulatory behavior and more task-related interactions (Patrick et al., 2017). On the other hand, students may also be rejected by their peers. In this situation, students are at greater risk of poor achievement, disliking school, school avoidance or not completing school at all (Buhs et al., 2006). Moreover, research suggested that high levels of peer rejection were strongly associated with high levels of depressive symptoms and moderately associated with low levels of academic performance (Fite et al., 2012).

1.2.3 Connectedness with lectors

Next to the connectedness with peers, the student connectedness with academic staff has been reported as a factor of sense of belonging. At the university level, the interactions between students and lecturers are characterized as an adult–adult relationship in which adult-like behavior is expected from students (Halx, 2010). A possible misconception is the assumption that students need less caring and support from their lecturer. However, researchers focusing specifically on university students demonstrated that the relationships and interactions between students and lecturers do make a difference. Where lecturers act rudely, they are viewed as unapproachable, in which case students evaluate the interactions with lecturers as 'costly' (Cotten & Wilson, 2006). Positive interactions with lecturers may help students in their motivation to work towards academic learning abilities which they initially perceived as unachievable (Bailey & Phillips, 2016). Students feel more comfortable and supported in schools and classrooms in which teachers are caring, respectful, and provide emotional support. In those environments, students experience greater school completion, on-task behavior, self-reported academic initiative, academic achievement, peer acceptance, and motivation to act responsibly and prosocial. They also engage in less oppositional and antisocial behaviors, including bullying (Bear et al., 2011). Considering the dimensions of well-being, the impact that connectedness with lecturers exerts on a student's academic performance and sense of belonging could be an indicator of its positive effect on a student's overall well-being (Schonert-Reichl & Lawlor, 2010).

1.2.4 Resilience

Although various definitions of resilience have been proposed, resilience is generally described as an ability of individuals to cope and adapt to situational discontinuities and risk environments successfully (Hjemdal et al., 2006). Moreover, the characteristic is described as an important non-cognitive trait that students require to develop to aid them in overcoming academic stress, adversity, threat and setback (Kang et al., 2019). Therefore, individuals who are regarded as resilient can transcend stressful situations and can avoid burnout and other factors influencing psychological well-being. Research suggests that an individual's resilience is a significant predictor of academic performance (Kotzé & Kleynhans, 2013).

1.2.5 Positive future orientation

Adolescents envision multiple aspects of their future self: educational goals, family characteristics, career aspirations, health status, and life benchmarks (e.g., buying a house) (Johnson et al., 2014). A positive orientation to the future has been identified as an important predictor of adolescents' ability to overcome adverse environments, suggesting a positive influence on general wellbeing (Ostaszewski & Zimmerman, 2006). Future goals of students are associated with their current study, work, or academic performance, thus facilitating individuals to have the motivation to learn (Zhang et al., 2015). The stronger future time orientation of an individual is, the more likely he or she is to develop specific future goals, whereby the individual is prompted to engage in tasks, make efforts, and plans that help to achieve future goals. A positive future orientation is therefore positively correlated with learning engagement (De Bilde et al., 2011).

2. Aim of the study

Mental disorders often result in a negative effect on academic performance (Kernan et al., 2008) and in an increase in drop-out without obtaining a degree (Kessler et al., 1995; Hartley et al: 2010). Recently, Bruffaerts et al. (2018) showed that internalizing and externalizing factors reduce academic functioning.

In this study, we want to investigate the effect of mental disorders on the academic performance of students taking into account several socio-demographic parameters (e.g. sex, age, generation student, educational level of the mother). In addition, we want to find out whether there is a moderating effect of the above-mentioned sense of belonging indicators. To obtain this aim, we will answer the following subquestions:

- What is the prevalence of mental disorders in the used dataset?
- What is the effect of individual mental disorders on academic performance?
- Which mental disorders show comorbidity within the dataset?
- What is the effect of the multivariate mental disorder profile of the students on study performance?
- Does the "sense of belonging" positively influence the academic performance of students suffering from several mental disorders?

3. Material and methods

3.1. Procedures - samples

The University Colleges Leuven-Limburg (UCLL) is a Flemish Catholic college and member of the Katholic University Leuven Association. The UCLL is located on 10 different campuses spread over five cities (Leuven, Diest, Hasselt, Diepenbeek and Genk) and offers higher education to obtain a professional Bachelor's degree or a postgraduate degree. Approximately 14.500 students study at the UCLL.

A web-based self-report questionnaire was sent to all freshmen enrolled for a professional Bachelor's study program at the UCLL. The survey is part of the WHO World Mental Health International College Student (WMH-ICS) initiative to map the mental well-being of students worldwide. In addition, the questionnaire also includes institute specific questions to obtain socio-demographic, college and student well-being related information (see section 2.2.). In autumn, all first year students at UCLL receive an email with an invitation to fill out the mental health survey, the so-called baseline questionnaire. Non-responders received a reminder to complete the survey on seven occasions. In this study, the results of the baseline questionnaire of the academic year 2021/2022 were used.

3.2. Measures

The World Mental Health Survey Consortium developed the WMH-ICS survey instrument which includes multiple screening instruments for a wide range of mental health problems. For each respondent, survey data were linked with demographic correlates, college-related correlates obtained from the UCLL student administration office and student well-being correlates from additional questions in the UCLL questionnaire.

3.2.1. Mental health problems

Mental health problems were assessed using the DSM-V (Diagnostic and Statistical Manual of Mental Disorders) criteria. This classification system includes international agreements on which criteria are decisive to be included into a specific mental health problem. In the current study, Major Depressive Episodes (MDE), Bipolar Disorder 1 (BIP1), General Anxiety Disorder (GAD), Recurrent Untriggered Panic Attacks (RUPA), Panic Disorder (PD), Illegal Substance Use Disorder (ISUD) and Social Anxiety Screener (SAS) are used. The other mental health problems analysed in this study are calculated based on so-called screeners, in which the students indicated whether they have the mental health problem or not, e.g. "Have you ever thought of committing suicide?". These screeners include Suicide Attempt (SA), Suicide Plan (SP), Suicide Intention (SI), Non-Suicidal Self-Injury (NSSI) and Any Eating Disorder Screener (AEDS). Alcohol Use Disorder (AUD) is measured using the Alcohol Use Disorders Identification Test (AUDIT). All disorders were coded as being lifetime (LT) or 12-month (12M) disorders. Since the effects of the most severe disorders are assumed to persist over a longer period of time, both LT and 12M indicators for SA, SI, SP and NSSI were included in the study. For the remaining disorders, only the 12M indicators were regarded. Hence, in summary, 17 indicators of mental disorders are considered in the current study.

3.2.2. Socio-demographic correlates

The survey included several sociodemographic correlates like sex (male or female) and age of the student, but also information on the parental educational level as a measure of the social-economic status of the student. Parental educational level was divided into the educational level of the mother and the educational level of the father. In the remainder of the study, only the mother's educational attainment is included as it acts as a better predictor of the social-economic status (Chen et al., 2018) when compared to the father's level of education. The highest education level of the mother ranged from 1 to 6 (1 = no education, 2 = elementary school, 3 = secondary school, 4 = post-secondary education, 5 = university graduate, 6 = doctoral degree), with the modal value equals to 4. The socio-demographic correlates will be used as background variables.

3.2.3. College-related correlates

Several college-related correlates were measured as well, including the study programme to which the student is enrolled and whether the student is a generation student or not. Information related to the academic performance is contained within the academic year percentage (AYP), the cumulative study efficiency (CSE) and an indicator of drop-out. Since a major aim of this study is to investigate the influence of mental health disorders on the student's performance in higher education, these latter three variables will be the outcome variables used. In contrast, the other college-related correlates are considered as control variables.

Study programmes: The respondents of this survey were divided into the five main study programmes at UCLL, i.e. healthcare (gezondheid), management, education (onderwijs), technology (technologie) and well-being (welzijn). They will be included as background variables to account for possible differences in the study outcomes.

Generation student: A first-year student that enrols for the first time at a university is called a generation student (dichotomous variable = yes/no). In contrast, students that have been enrolled before at a university are no generation students, even when they re-enroll in a first year of a new educational trajectory.

Academic year percentage (AYP) (outcome variable 1 - continuous variable): The AYP is the final grade percentage as calculated by the UCLL administration office. It provides a continuous measure on the interval 0-100.

Cumulative study efficiency (CSE) (outcome variable 2 - three-category categorical variable): The CSE is a percentage reflecting the proportion of credits the student has acquired with respect to the total number of credits the student has taken up in one academic year. The CSE is an important parameter for the students' academic progress within a certain program and, within UCLL, it is used for regulatory purposes as well. More specifically, when a student's CSE is lower than 30%, it is forbidden for the student to enrol for the same study program for the following year and when the CSE is bigger than 30% but smaller than 50%, binding conditions are imposed in the same study programme for the student. Due to the fact that a lot of students in the dataset had a CSE equal to the boundary values of 0% and 100%, this outcome was not considered as continuous, but transformed to three categories (< 30%, 30-50% en >50%).

This transformation into a three-category categorical variable was also done based on practical considerations as model assumptions for the continuous scale were not fulfilled (i.e. non-normal and heteroscedastic error terms).

Drop-out (outcome variable 3 - dichotomous variable (yes/no)): The drop-out indicator was created based on other variables in the dataset. First of all, when a deregistration date is available, it is known for sure that the student left the programme and can be considered as a drop-out student. Similarly, when the CSE at the end of the academic year is smaller than 30%, the student is forced to stop the programme and hence also dropped out. Finally, also the students with a CSE below 50% at the end of the academic year, for which there have been no changes in CSE observed since June are considered to have dropped out.

3.2.4. Student well-being correlates

Student well-being correlates are surveyed in three different sections of the questionnaire. The 'environment' section provides information about the connectedness of the student with 1) the school, 2) other students and 3) the lecturers. The 'individual' section contains questions measuring the students' resilience and the students' orientation towards the future (i.e. positive orientation or not). Finally, the 'climate' section interrogates the students with respect to the caring school climate. As mentioned in the introduction, these six variables might have an impact on how the mental health disorders influence the study performance. For example, the high resilience of students might result in good grades, even though they suffer from a specific disorder. Therefore, possible moderating interaction effects will be investigated.

3.3. Statistical measures

All analyses were conducted using R statistical software version 4.1.2. An initial exploration of the dataset was performed, and summary statistics are presented in Table 1 and 2. In addition to the observed prevalence of the disorders under investigation, also a correlation matrix based on the Spearman correlation coefficient was made to show possible comorbidities. Initial relationships between the considered outcomes (AYP, CSE and drop-out) and the background variables (age, sex, education level of mother, generation student and study program) are presented using boxplots and scatter plots. Statistical tests were performed to assess possible significant univariate relationships.

In a second stage, more extended formal analyses are performed to provide an answer to the research question how mental health indicators influence academic performance, while taking into account possible control variables and moderator variables. Three different types of regression models were used, dependent on the outcome variable of interest. More specifically, a linear regression was employed for the continuous outcome related to the AYP (Y_1), a logistic regression was considered for the binary outcome related to drop-out (Y_2) and a cumulative logit regression for the categorical version of CSE (Y_3). In general, these models all aim at finding a relation between a summary statistic of the distribution of the response (i.e. the mean for linear regression, or class probabilities for logistic and cumulative logit regression) and a set of covariates.

The considered set of covariates included:

- the background variables (age, sex, education level of mother, generation student and study programme),
- variables with respect to the disorders,
- moderating effects of the variables related to connectedness, resilience, future orientation and school climate.

At first, the individual disorder indicators were included separately, thereby showing how individual disorders might affect the outcome. Next, also the total number of disorders that were observed within a student were regarded. This might give indications about how the amount of disorders influence the outcome (irrespective of the type of disorder). Finally, in order to grasp the effect of possible comorbidities, clusters of students, that were created based on the multivariate disorder profiles, were included. In this way, not only the amount, but also the type of disorders is taken into account, and the effect on the outcome can be explored.

For all regression analyses, a stepwise model selection procedure was employed based on the Akaike Information Criterion (AIC) (Akaike, 1974). This information criterion assesses model fit through the likelihood and simultaneously avoids overly complex models through the incorporation of a penalty, based on the number of parameters in the model. This stepwise selection procedure also resolves possible multicollinearity issues that might arise when jointly modelling possibly correlated disorders. Full details about the employed models and their underlying assumptions can be found in other research (Agresti, 2002) (Kutner et al., 2004).

In order to create the clusters of disorder profiles, a multiple correspondence analysis was performed, followed by hierarchical clustering using the HCPC function of the FactoMineR R-package (Husson et al., 2010). In order for the results to be reproducible, the default settings of the function were followed and the suggested clustering of the data was employed.For all analyses, a significance level of 5% was used to determine significant effects. For the correlation analysis, the Holm correction was used to account for multiple testing.

4. Results

4.1. Sample description

In total 1715 students who started in their first year at the UCLL initiated the survey. This equals a response rate of 32.13%. 4% of these respondents did not consent to the use of their data, so the actual response rate is 28.13% (personal communication - Dr. Karen Jacobs). Among them, 1289 students completed the survey, but as observed from Table 1, specific information might still be missing. In the graphs and tables below, we used as many observations as possible to maximize the information required to answer our research questions. It will be clear from the context how many observations were actually used on which occasion.

Table 1: Sample description of the UCLL survey for the academic year 2021-2022 (Max n = 1715)

Sex (n = 1715)		**AYP (n = 1457)**		**Connectedness teachers° (n = 1080)**	
Male	441 (25.7%)	Mean (SD)	52.5 (18.0)	Median	3.51
Female	1273 (74.2%)			Mean (SD)	3.50 (0.56)
Generation Student (n = 1715)		**Drop-out (n = 1708)**		**Connectedness peers° (n = 1078)**	
Yes	914 (53.3%)	No	1229 (71.7%)	Median	3.77
No	800 (46.6%)	Yes	479 (27.9%)	Mean (SD)	3.77 (0.59)
Education mother (n = 1124)		**CSE categories (n = 1683)**		**Connectedness school° (n = 1089)**	
None	12 (0.7%)	<30%	352 (20.5%)	Median	4.00
Elementary school	56 (3.3%)	30%-50%	173 (10.1%)	Mean (SD)	4.01 (0.73)
Secondary school	366 (21.3%)	>50%	1158 (67.5%)		
Post-secondary	507 (29.6%)			**Resilience° (n = 1086)**	
University	183 (10.7%)			Median	3.01
Doctoral degree	9 (0.5%)			Mean (SD)	2.96 (0.86)
Study Programme (n = 1715)				**Positive Future Orientation° (n = 1096)**	
Healthcare	419 (24.4%)			Median	3.45
Management	221 (12.9%)			Mean (SD)	3.33 (1.06)
Education	518 (30.2%)				
Technology	127 (7.4%)			**Caring School Climate° (n = 675)**	
Welfare	335 (19.5%)			Median	4.00
				Mean (SD)	3.94 (0.69)
Age					
Mean (SD)	21.4 (6.16)				

° Weighted scores ranging between 1 and 5. Higher score means more connectedness, higher resilience or more positive orientation.

Based on the full sample characteristics presented in Table 1, it can be seen that, even though the questionnaire was addressed to first year students, the respondents are on average 21.4 years old and 53.3% are generation students. There is an imbalance with respect to sex as there are 25.7% males versus 74.2% females. More than half of the respondents indicated that their mother completed secondary school or post-secondary education (no university). Survey respondents are distributed over five study directions (healthcare, management, technology, education and welfare). The mean academic year percentage (AYP) is 52.5%, with a large standard deviation of 18%, meaning that the observations are highly variable. For the three CSE categories, it can be observed that: 21.3% of the respondents have a CSE below 30% (and are hence also forced drop-outs); 9.3% have a CSE between 30% and 50%; and 67.5% have a CSE that is larger than 50%. The total number of drop-outs in the dataset equals 479, corresponding to 27.9% of the survey respondents. Student well-being correlates were relatively high, as they all (i.e., connectedness to teacher, connectedness to peers, connectedness to school, resilience, positive future orientation and caring school climate) have a median located between 3 and 4, indicating that the respondents have a rather positive attitude towards these correlates.

4.2. Prevalence and correlation of mental disorders

Among the questioned mental health disorders, 13 were considered in the current study. For all of them, the 12M indicators were regarded as being most relevant for linking with the study outcome. In addition, the LT indicators for SA, SP, SI and NSSI were included as well since their effects are assumed to persist over a longer period of time. The observed prevalences can be found in Table 2.

Table 2: Prevalence of mental disorders in the UCLL dataset. The sample size (n) on which this prevalence is based is given between brackets.

Disorder	Prevalence	Disorder	Prevalence
MDE_12M (n=1203)	54.11%	NSSI_LT (n=1175)	28.77%
SI_LT (n=1180)	50.00%	RUPA_12M (n=1299)	18.01%
SAS_12M (n=1231)	35.17%	GAD_12M (n=1370)	15.77%
SI_12M (n=1180)	29.41%	SP_12M (n=1199)	14.43%
AEDS_12M (n=1200)	29.00%	BIP1_12M (n=1101)	12.53%
SP_LT (n=1199)	28.86%	NSSI_12M (n=1175)	11.74%
PD_12M (n=1295)	9.27%	AUD_12M (n=1219)	5.00%
SA_LT (n=1180)	8.98%	ISUD_12M (n=1190)	4.29%
SA_12M (n=1180)	2.54%		

Among the first year UCLL students participating in the survey, the highest prevalence was observed for MDE_12M (54.11%), followed by SI_LT (50%), meaning that over one in two students indicated that they had suffered from major depressive episodes in the last 12 months preceding the survey or thought about suicide during their lives. Social anxiety (SAS_12M), suicide ideation (SI_12M), any eating disorder (AEDS_12M), suicide planning (SP_LT), and lifetime non-suicidal self-injury (NSSI_LT) occured in approximately one in three students. In over one in ten students, recurrent untriggered panic attacks (RUPA_12M), generalized anxiety disorder (GAD_12M), suicide plan in the last 12 months (SP_12M), bipolar disorder 1 (BIP1_12M), and 12-month lifetime non-suicidal self-injury (NSSI_12M) were observed. The lowest prevalences are observed for 12-month panic disorders (PD_12M), alcohol and illegal substance use disorders (AUD_12M and ISUD_12M), and for both lifetime and 12-month suicide attempts (SA).

As mentioned in the introduction, mental health disorders are known to be simultaneously present in individuals. In order to check for possible comorbidities in the current population, the Spearman rank correlation matrix is presented in Figure 1. The observed correlations are rather low, ranging between -0.02 and 0.69. The highest significant correlations are observed for the pairs RUPA_12M/PD_12M, SA_12M/SA_LT, NSSI_12M/NSSI_LT, SP_12M/SP_LT and SI_12M/SI_LT. This is not surprising as the first disorder in every pair is nested within the second disorder. More specifically, one of the requirements for students to be classified as having PD is the presence of RUPA and, of course, when a disorder was present in the last 12 months, it is also present in their entire lifetime. A moderately significant correlation was also observed for the pair SP and SI (both lifetime and 12-month). These correlations give rise to two important remarks. First of all, when jointly modelling the effect of these disorders on the study's performance as done in Section 3.5, care is needed with respect to multicollinearity. The stepwise selection procedure based on AIC is able to deal with this issue. A second remark is that it is important to further investigate these comorbidities and assess the impact of the presence of multiple disorders on study performance. This will be achieved through the cluster analysis in Section 3.6. This is further strengthened by the fact that a lot of students were observed to have multiple disorders, even up to all of them (data not shown). Therefore, the effect of the number of disorders is regarded as well in Section 3.5.

4.3. Relation between the output variables

The major aim of this study is to assess the influence of mental health disorders on academic performance. As indicated in the Material and Methods section, three different outcome variables for academic performance are used. Figure 2 shows the relationship between the AYP (percentage), CSE and drop-out. Students with a CSE < 30 have an average AYP of 24.5% (sd = 12.2%). These students will be forbidden to re-enroll for the following academic year and are all considered as drop-outs. Students with a CSE between 30 and 50 have an average AYP of 39.6% (sd = 6.79%), and students with a CSE>50% have an average AYP of 61.8% (sd = 9.79%). Thus, the higher the AYP, the higher the CSE. Similarly, within CSE groups, lower percentages are observed for the drop-out students. Indeed, drop-out students with CSE between 30 and 50 have an average AYP of 38.2% (sd = 7.86%), while non-drop-out students in that CSE class have an average AYP of 41% (sd = 5.25%). Similarly, for the highest CSE group, these average AYP values were 57.7% (sd = 17.5%) and 61.8% (sd = 9.70%) for drop-out and non-drop-out students, respectively. In total, there are 270 drop-outs in the lowest CSE group, as compared to 73 and 9 students in the respective higher groups. In summary, there is a strong correlation between the AYP, the CSE and drop-outs, so conclusions can be drawn across the different analyses. Although correlated, the endpoints are not telling the same story, as there is a difference in meaning between having a lower percentage and effectively dropping out of the study program.

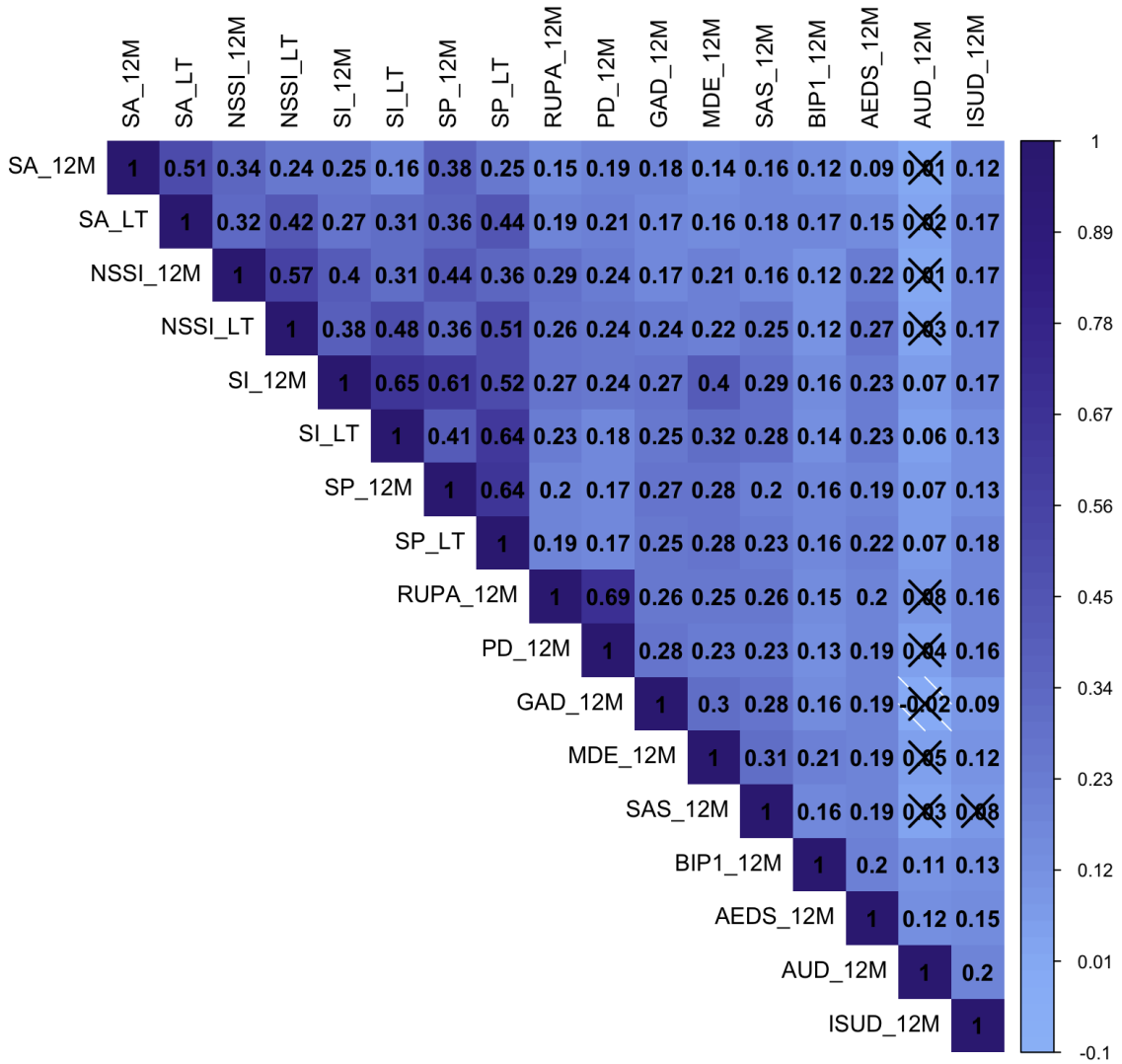


Figure 1: Comorbidity among the mental disorders occurring in the UCLL dataset and analysed in this study.

Spearman correlation matrix displaying the correlation between different mental disorders. The blue scale indicates strong correlation (dark blue) or low correlation (light blue). Crosses indicate insignificant correlations after correcting for multiple comparisons using the Holm method. The remaining correlations are all significant on the 5% significance level.

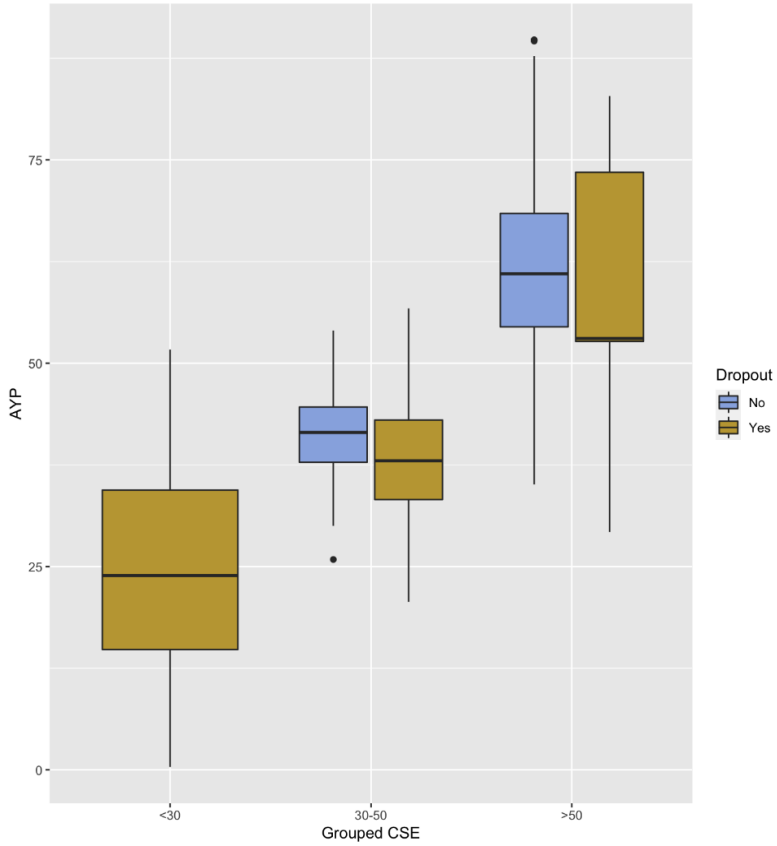


Figure 2: Boxplot showing the relation between grouped CSE, AYP and drop-out.
Total number of respondents were grouped into CSE groups based on the acquired credits and plotted against the AYP. Information about drop-out (No/Yes) was linked to the grouped CSE.

4.4. Description of the background variables and the AYP

The influence of different background variables will be taken into account when modelling the effect of mental health disorders on academic performance. The considered background variables include sex, education level of the mother, study programme, being a first-generation student or not and the age of the student. In Figure 3, these background variables are plotted against the AYP pro sex. As there is a strong correlation between the outcome variables (see Section 3.3.), it was decided to only plot the background variables against the AYP. An overall observation is the high variability in the AYP, which makes it hard to observe clear relationships. It does seem apparent from all the graphs that female students perform better as compared to male students. Indeed a formal test confirms that women score on average between 1.80% and 6.15% higher as compared to men (p-value = 0.0004). Important to mention is that fewer male respondents finished the survey which might bias our analysis. Nevertheless, it was decided not to correct for this imbalance (e.g., through the use of weights), but to use the data as such. Concerning the educational level of the mother, slightly higher median values for the AYP were observed when the mother had post-secondary or university education. The difference in AYP across the education levels of the mother was, however, not found to be significant (p-value = 0.0911). When looking across the different study programs in Figure 3B, a rather constant median AYP is observed, with the exception of male students in health care, who seem to perform less when compared to their female counterparts. Overall, a significant difference in AYP between the programs was identified (p-value = 0.00894).

It should be noted that these male respondents within health care all had missing values for some of the considered covariates and were hence not included in the models in Sections 3.5 and 3.6. Generation students have a slightly lower AYP in comparison to non-generation students, with non-generation students scoring, on average, between 4.75% and 8.39% higher (p-value < 0.0001) (Figure 3C), and the AYP seems to increase with the age of the survey respondents (Figure 3D). It is, however, difficult to draw a strong conclusion from this last graph as there is a large variation in the AYP among the students. Indeed, a formal test reveals a significant positive effect of age on the AYP (p-value < 0.0001), but the R-squared value of this model is only 1.80%, indicating that a lot of the observed variability in the AYP remains unexplained.

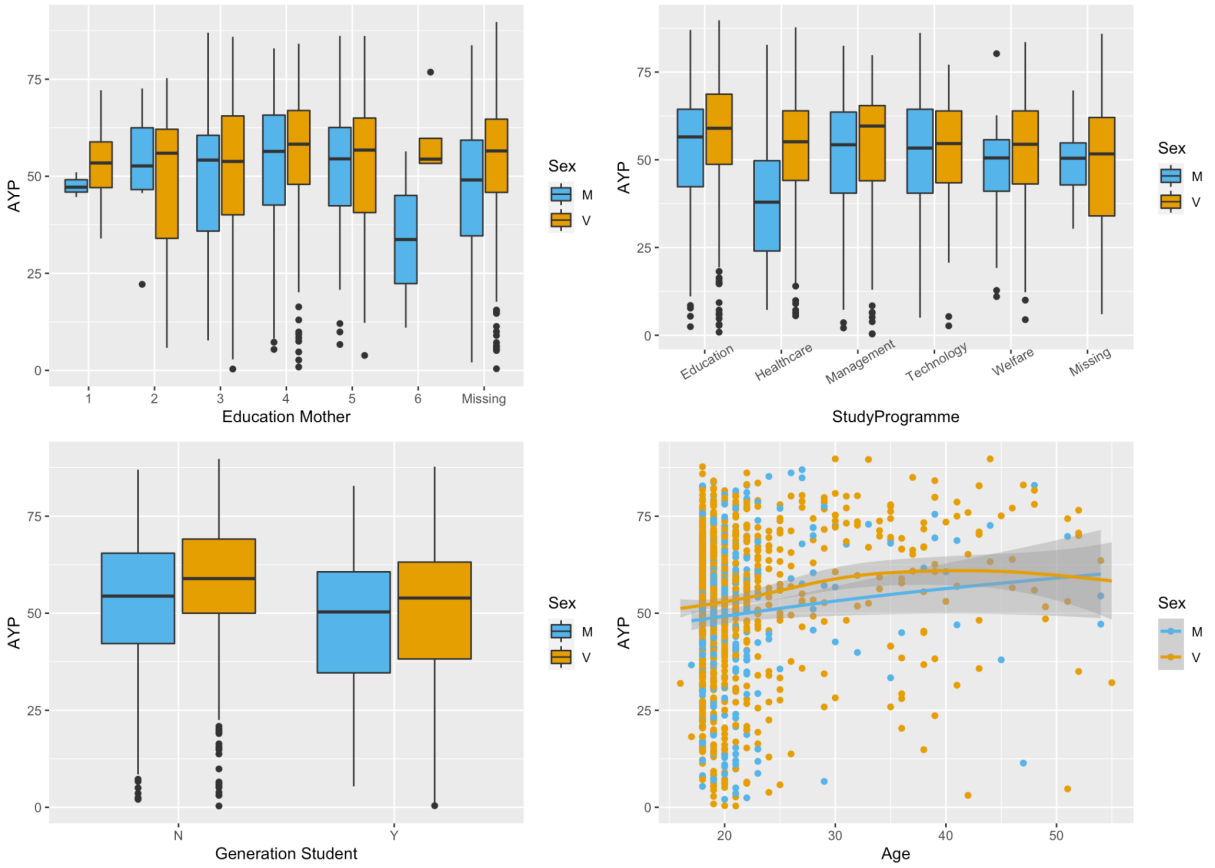


Figure 3: Relation between different background variables and the Academic Year Percentage (AYP). A. Boxplot showing the relation between the AYP and the educational level of the mother pro sex. Respondents indicated the educational level of the mother (no education (1), elementary school (2), secondary school (3), post-secondary school (4), university graduate (5), doctoral degree (6)). B. Boxplot showing the relation between AYP and the study program pro sex. C. Boxplot showing the relation between the AYP and the student status (generation student or not) pro sex. (D) Scatterplot showing the relation between the AYP and age pro sex.

4.5. Relation between the individual mental disorders and the outcome variables

An initial question that arises when studying the influence of mental health on academic performance is how the individual mental disorders influence the AYP, possible drop-out and CSE. After the stepwise model selection based on the AIC, the models presented in Table 3 were selected as best fitting the data. For comparison purposes, Supplemental Tables 1-3 show the parameter estimates of the full models before model selection. Similarly, Table 4 presents the results of the selected models when, in addition to the 17 mental health disorders, also the background variables were also considered.

Based on Table 3, it is seen that BIP1, ISUD, SA, and AEDS are consistently selected as important predictors when describing the relationship with the three study performance measures. For the AYP, an average student without any of the included disorders has a mean AYP of about 56%. A significant decrease is observed when the student has a positive indicator for ISUD (-11.6%), AEDS (-4.1%), and BIP1 (-4.7%) in the last 12 months before the survey. Although the effect of SA is not significant, it also points in the direction of a lower AYP. For the binary drop-out and categorical CSE outcomes (with the <30% category serving as the reference), only the effects of ISUD and AEDS were found to be significant. For respondents that have ISUD status equal to 1, the odds for dropping out vs. not dropping out are 3.13 times the odds for respondents without ISUD and the probability of being in a lower CSE category is 3.27 times higher when ISUD is present. For students indicating the presence of any eating disorder in the last 12 months, the odds of dropping out are 1.29 times higher when compared to students having no eating disorder and a similar effect (1.30) is found for the CSE class probabilities. Similarly, the odds of dropping out for students who performed a SA in their lifetime are 2.06 times higher as compared to students who did not have a LT SA. The probability of belonging to a lower CSE category is 1.81 times higher for students who had SA_LT equal to 1. Even though BIP1 is not significant for the latter two outcomes, the direction of its parameter estimates points in the direction of the conclusions made for the AYP.

Table 3: Best fitted model according to AIC for the association between mental disorder and academic performance (AYP, drop-out and CSE).

Only disorders			
	Estimate	Std Error	p-value
AYP	55.9422	0.8073	< 2e-16
BIP1_12M	-4.7267	1.9638	0.016336
ISUD_12M	-11.5968	3.1359	0.000234
SA_12M	-5.9562	3.8534	0.122611
AEDS_12M	-4.1799	1.4118	0.003170
CSE_intercept 1	-1.72278	0.10986	< 2e-16
CSE_intercept 2	-1.07887	0.09752	< 2e-16
BIP1_12M	0.39101	0.21051	0.0633
ISUD_12M	1.20891	0.30860	8.95e-05
AEDS_12M	0.26364	0.15811	0.0954
SA_LT	0.59258	0.22381	0.0081
Drop-out	-1.4357	0.1042	< 2e-16
BIP1_12M	0.3881	0.2236	0.060517
ISUD_12M	1.3399	0.3314	0.000577
AUD_12M	0.2564	0.1688	0.128774
SA_LT	0.7229	0.2346	0.002062

In Table 4, it can be observed that after accounting for the effects of the background variables, the significant effects of ISUD and AEDS remain present (except for the effect of AEDS on drop-out). Overall, the R-squared increased from 0.0574 to 0.1419, when the background variables were included. With respect to these background variables, the education level of the mother and whether the student is a first-generation student were significant for all three outcomes. Higher education levels point in the direction of better performance. For the AYP, an average increase of 1.88% for each additional level of education is observed and non-generation students have, on average, an increased score of about 7.7%.

Similarly, the odds of dropping out and the probability of being in a lower CSE category are lower when the mother has a higher education level or when the student is not a first-generation student. The male students were found to have significantly lower percentages as compared to females (on average 4.19% lower) and have a higher probability of being in a lower CSE category (1.46 times to the probability for females). A higher age was significantly related to higher drop-out odds. For the CSE, it can now also be observed that the baseline differences in class probabilities in Table 3 are no longer significant after accounting for the background variables in Table 4. Hence, for first-generation students with a mother who has no education, there is the same probability of belonging to either of the three CSE classes. However, as the education level of the mother increases, the odds of belonging to the lower CSE groups as compared to the highest CSE group are reduced by a factor of 80.72%. Similarly, these odds for non-generation students are only 0.51 times the odds for generation students.

Table 4: Best fitted model according to AIC for the association between mental disorder and academic performance taking into account the background variables (AYP, drop-out and CSE).

	Estimate	Std Error	p-value
AYP intercept	42.1205	3.3113	< 2e-16
BIP1_12M	-3.1244	1.9431	0.108273
SAS_12M	-2.2040	1.3207	0.095593
ISUD_12M	-11.6179	3.0627	0.000161
SA_12M	-5.9897	3.7722	0.112760
AEDS_12M	-3.6624	1.4001	0.009088
Sex F	4.1907	1.5262	0.006185
Education mother	1.8854	0.7263	0.009620
Generation student No	7.7285	1.2624	1.51e-09
CSE_intercept 1	-0.32000	0.38053	0.4004
CSE_intercept 2	0.34175	0.37993	0.3684
ISUD_12M	1.24520	0.31312	6.99e-05
SA_12M	0.67823	0.45058	0.1323
AEDS_12M	0.32798	0.15887	0.0390
SA_LT	0.45722	0.26278	0.0819
Sex F	-0.38162	0.17806	0.0321
Education mother	-0.21423	0.08581	0.0125
Generation student No	-0.66294	0.15145	1.20e-05
Drop-out intercept	-0.97357	0.47873	0.041985
BIP1_12M	0.38004	0.22739	0.094660
ISUD_12M	1.24757	0.33650	0.000209
AEDS_12M	0.26228	0.17194	0.127159
SA_LT	0.74815	0.23820	0.001685
Education mother	-0.18525	0.09182	0.043633
Age	0.02906	0.01276	0.022723
Generation student No	-0.62350	0.16868	0.000219

Finally, to make the connection with the next section (i.e. multivariate disorder profiles), Table 5 presents the results about how the number of disorders (sum variable, irrespective of the type of disorder) influences the performance outcomes, taking into account the background variables. For all outcomes, the performance is significantly, and negatively affected by the number of disorders. Indeed, per additional mental health disorder, the AYP drops by about 0.92%, while the odds of dropping out increase by a factor of 1.11. The probability of being in a lower category for the cumulative study efficiency also significantly increases with a factor of 1.10. Again here, similar conclusions can be drawn with respect to the effects of the background variables, i.e. the educational level of the mother and the indicator for being a generation student are significant in all three models, while sex was only found to be significant for the AYP and CSE outcomes. Age was again found to be significantly associated with drop-out. The direction of the effects is in full analogy with the models discussed above: i.e. female students performing better as compared to male students, higher education levels of the mother being beneficial and non-generational students more likely to perform better.

Table 5: Best fitted model according to AIC investigating how the number of disorders influences academic performance taking into account the background variables (AYP, drop-out and CSE).

Sum and background variables			
	Estimate	Std Error	p-value
AYP	42.7109	3.3494	< 2e-16
sum	-0.9217	0.1837	6.55e-07
Sex F	4.5493	1.5151	0.00277
Education mother	1.7068	0.7312	0.01986
Generation student No	8.2945	1.2715	1.29e-10
Drop-out	-1.00292	0.52882	0.05789
sum	0.10363	0.02233	3.48e-06
Sex F	-0.26916	0.18786	0.15193
Age	0.03360	0.01292	0.00931
Education mother	-0.17551	0.09099	0.05375
Generation student No	-0.68092	0.16714	4.62e-05
CSE_intercept 1	-0.52587	0.38299	0.1697
CSE_intercept 2	0.12007	0.38210	0.7533
sum	0.09727	0.02050	2.1e-06
Sex F	-0.42893	0.17409	0.0137
Education mother	-0.18277	0.08447	0.08447
Generation student No	-0.68532	0.15027	5.1e-06

Taken together, by analysing the effect of the individual mental disorders, it appears that ISUD and AEDS have the greatest impact on academic performance. In addition, the number of mental health disorders the students suffer from also has a significant effect on the academic performance. In the following section, we will therefore try to assess whether the type of co-occurring disorders have an influence as well.

4.6. Relation between the multivariate mental disorder profiles and academic performance

As shown in the previous subsections, several disorders are known to be moderately correlated, and the number of disorders that occur within the same student was significantly associated with study outcomes. This indicates that specific comorbidities occur and might impact the study's performance as well. To investigate this in more detail, the multivariate disorder profiles (430 unique ones) of the students are clustered based on an unsupervised hierarchical clustering technique. The group of 160 students without any of the disorders present was considered as a reference group (clust = 0) and was put aside before the analysis. In order to visualize the results for the remaining students in Figure 4A, the first two dimensions of the multiple correspondence analysis are used. Based on the factor map (Supplemental Figure 1), it is observed that higher values of the first dimension are linked to the presence of disorders, with the highest contribution for SA, SP, SI, and NSSI. On the other hand, PD and RUPA are the main drivers of the second dimension. This can also be observed from the prevalence plot in Figure 4B, the co-occurrence plots in Figures 5-8, and the information with respect to the number of disorders in Table 6.

Table 6: Number of disorders within profiles for the different clusters.

Number of disorders within profiles	**Cluster (n; unique profiles)**				
	0 (160; 1)	1 (410; 141)	2 (224; 157)	3 (106; 92)	4 (49; 39)
0	1	-	-	-	-
1	-	9	-	-	-
2	-	28	-	1	-
3	-	42	2	2	-
4	-	38	13	5	-
5	-	19	30	4	-
6	-	5	26	14	-
7	-	-	38	16	-
8	-	-	24	13	1
9	-	-	13	13	4
10	-	-	8	10	4
11	-	-	3	6	6
12	-	-	-	4	13
13	-	-	-	3	6
14	-	-	-	-	3
15	-	-	-	1	1
16	-	-	-	-	-
17	-	-	-	-	1

Four additional clusters are observed. Cluster 1 contains 410 students and consists of 141 unique disorder profiles. The number of disorders in these profiles is rather low, ranging between 1 and 6. In Figure 5, the probability that two disorders simultaneously occur within cluster 1 is shown. From there, it can be seen that 12M MDE, AEDS, SAS, and lifetime SI seem to be co-occurring here. Clusters 2 and 3 contain respectively, 224 and 106 students and consist of 157 and 92 unique profiles, respectively. In most of these profiles, between 5 and 11 disorders are present. The difference is mainly due to dimension two, meaning that in cluster 3, students suffer more from PD and RUPA as compared to cluster 2. This is clearly observed from Figure 4B and Figures 6 and 7.

The co-occurrence pattern of cluster 1 is now extended with NSSI and SP (both 12M and lifetime) for cluster 2, while PD and RUPA are now also clearly present in cluster 3. Finally, cluster 4 consists of 49 students, distributed over 39 unique disorder profiles. These profiles show at least 8 disorders, with a modal value of 12 disorders within a profile. All students with SA in the last 12 months are contained in this cluster. Figure 8 now also indicates a very high co-occurrence of all suicide-related disorder indicators. Some profiles also include the combination of PD and RUPA, but their co-occurrence is lower as compared to cluster 3.

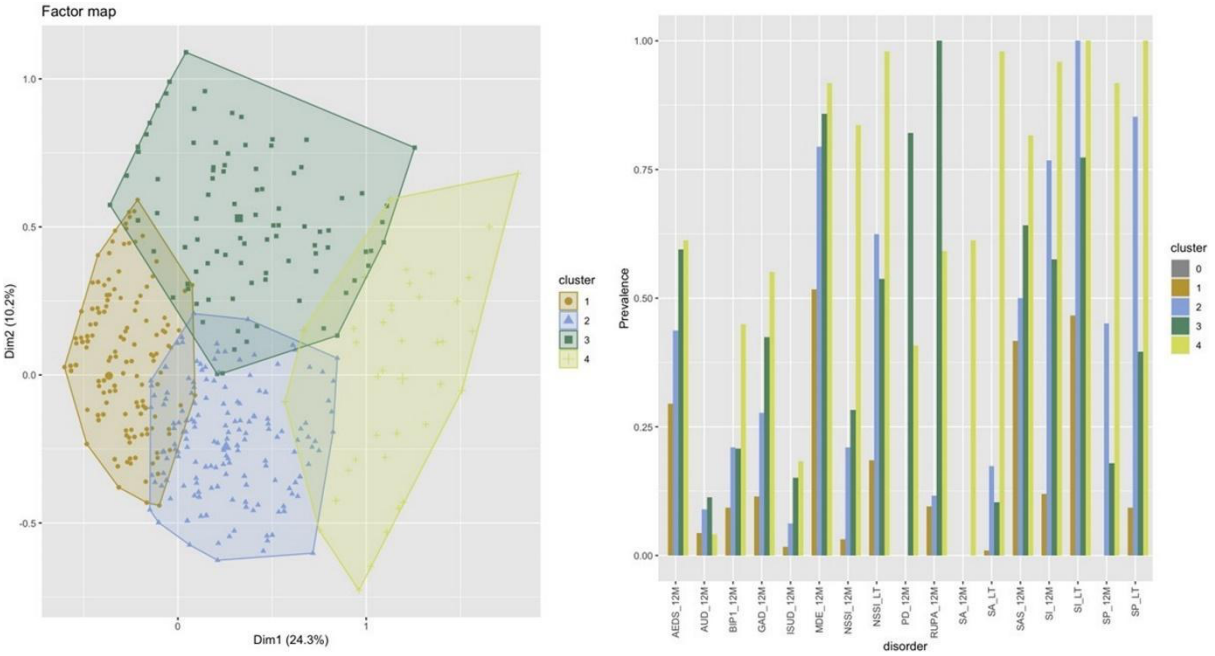


Figure 4: Multivariate disorder profile of the different clusters of students in the UCLL dataset. Respondents to the UCLL survey are grouped into different clusters based on hierarchical clustering after MCA. Cluster 0 contains students without any mental disorder. A. Factor map of the different clusters. B. Prevalence of the disorders within the different clusters. Cluster 0 is not shown in the graph as all the prevalence for the disorders equal 0.

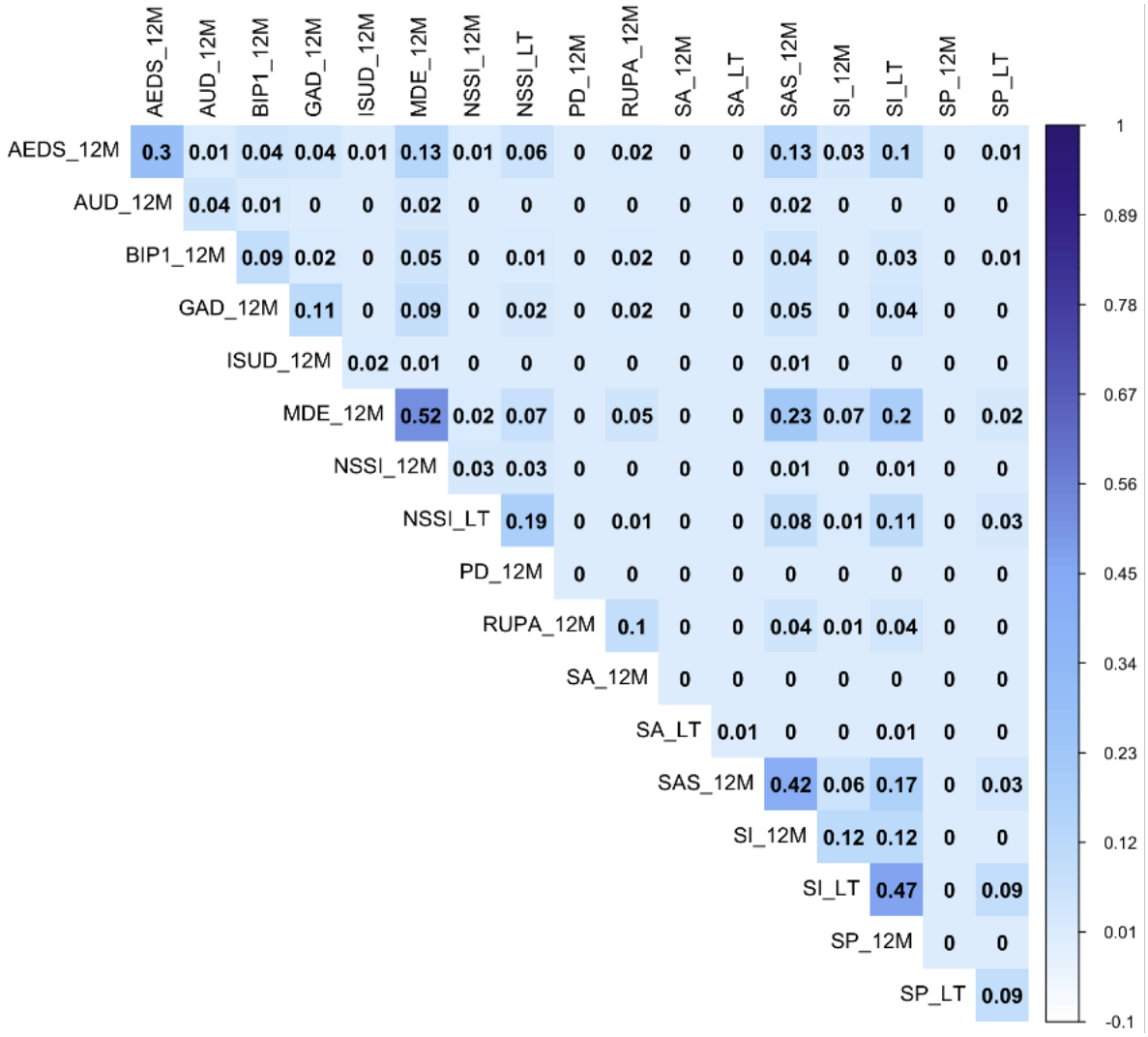


Figure 5: Co-occurrence plots of the mental disorders occurring in cluster 1.The numbers indicate the probability that both MHDs (mental health disorders) are present within an individual. Darker blue represents a probability closer to 1.

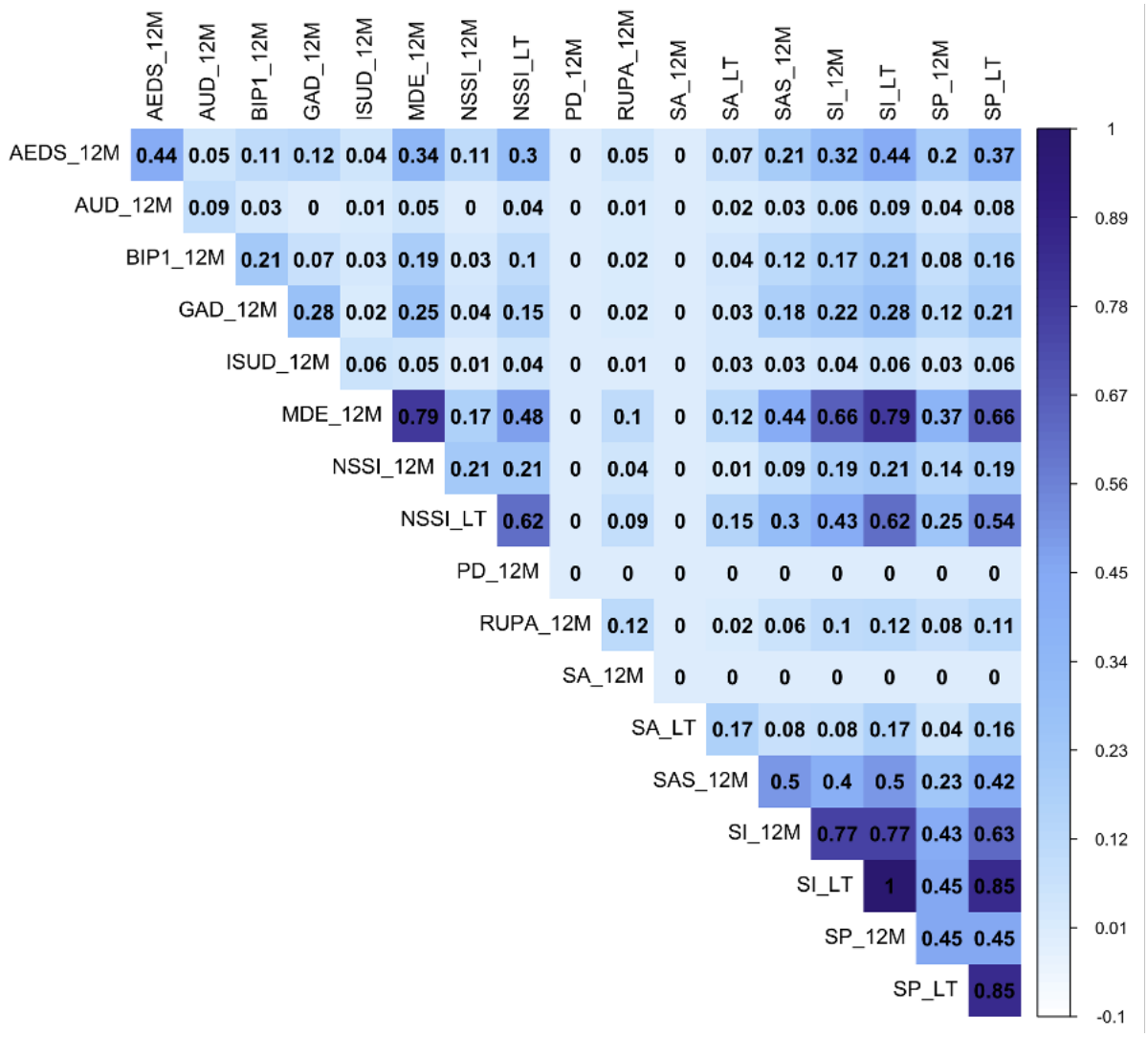


Figure 6: Co-occurrence plots of the mental disorders occurring in cluster 2.The numbers indicate the probability that both MHDs are present within an individual. Darker blue represents a probability closer to 1.

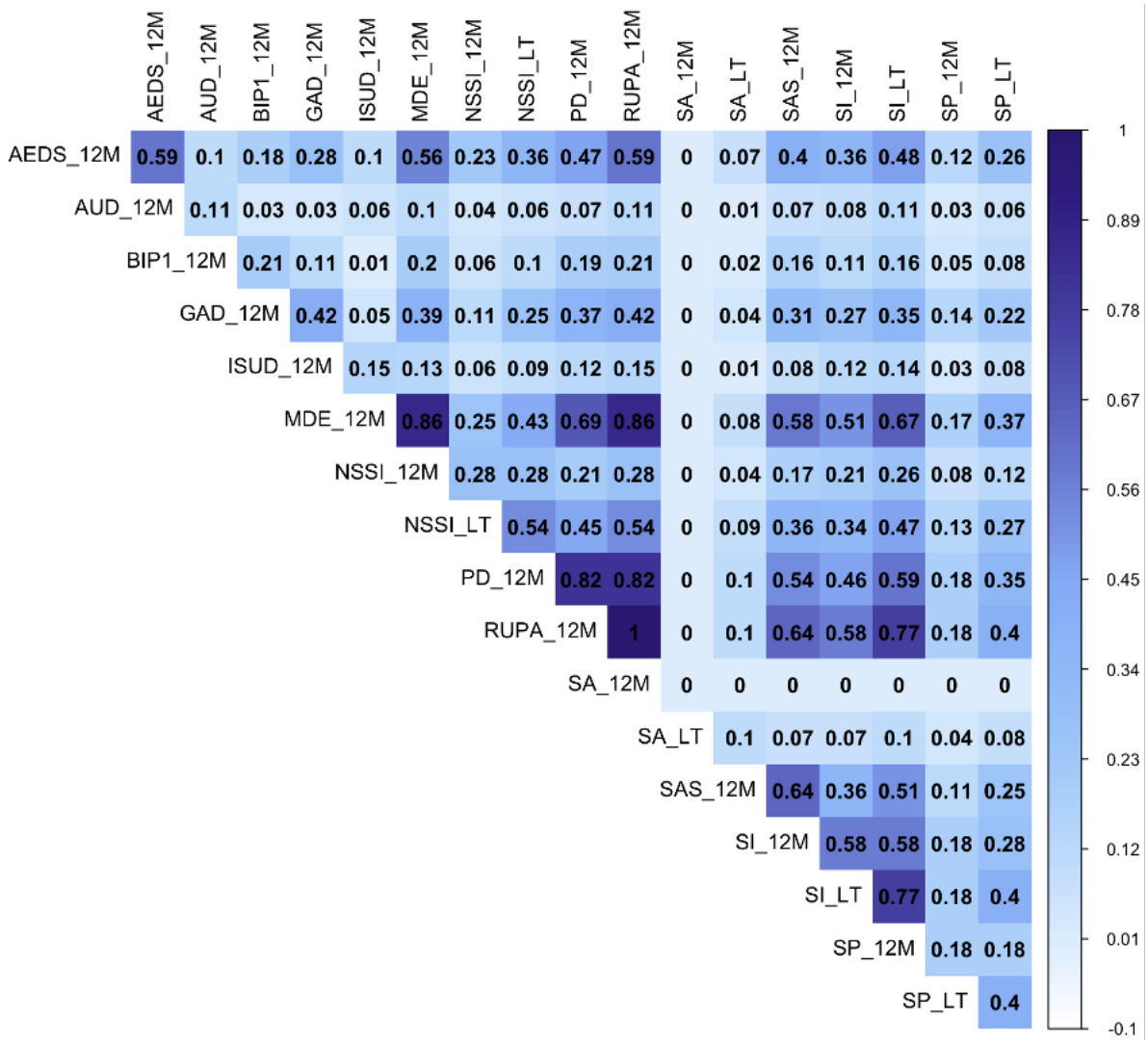


Figure 7: Co-occurrence plots of the mental disorders occurring in cluster 3.The numbers indicate the probability that both MHDs are present within an individual. Darker blue represents a probability closer to 1.

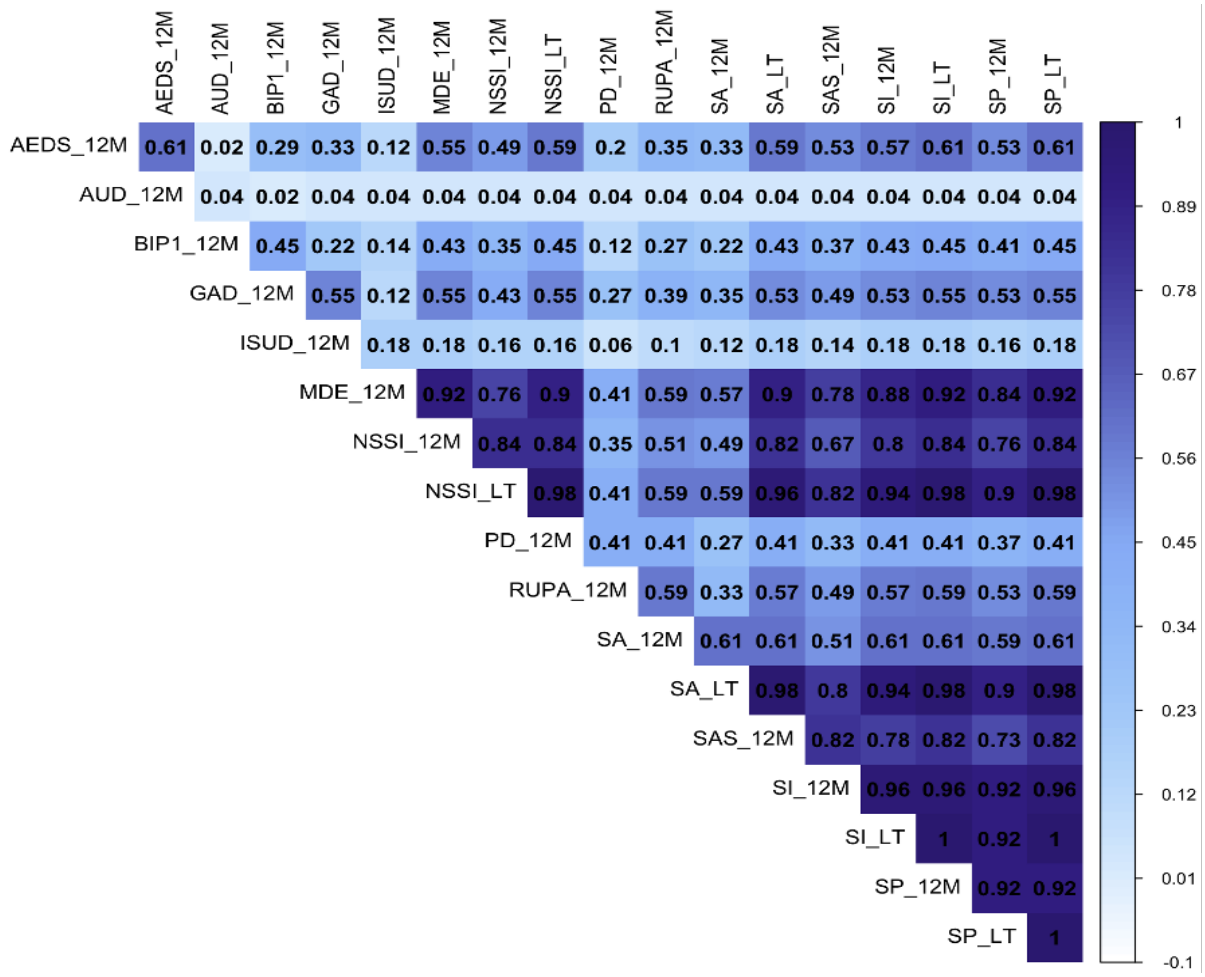


Figure 8: Co-occurrence plots of the mental disorders occurring in cluster 4.The numbers indicate the probability that both MHDs are present within an individual. Darker blue represents a probability closer to 1.

Next, we analysed the difference between the clusters in terms of the students' academic performance, also taking into account the background variables. Table 7 presents the parameter estimates of the best fitting model after stepwise model selection based on AIC. For comparison purposes, Supplemental Tables 4-6 show the parameter estimates of the full models before model selection. Cluster 0 is taken as the baseline. There are again indications that an increased number of mental health disorders has a negative impact on academic performance.

For the AYP, there is no significant difference between the students belonging to cluster 1 and the baseline group of students, meaning that the co-occurrence of at most 12M MDE, SAS and/or AEDS with LT SI does not seem to have a detrimental impact on study performance. The prevalence of AEDS and ISUD is also rather low as compared to the remaining clusters, which might explain this observation. In contrast, students belonging to the clusters 2, 3, or 4 do have a significantly lower average AYP in comparison to the students without any mental disorder. On average, these differences are 5.70%, 6.79%, and 10.31%, respectively. As such, as long as the number of co-occurring disorders is above 4, there is a significant impact on study performance. The presence of PD and RUPA has a bigger effect as compared to the presence of LT suicide-related disorders. However, if the suicide-related variables were also present in the last 12 months (cfr. cluster 4), performance is the lowest.

For the other two outcomes, only clusters 3 and 4 are significantly performing worse when compared to cluster 0, with significantly higher odds of dropping out and a higher probability of belonging to a lower CSE category. This points to the large impact of PD and RUPA (cfr. cluster 3) and the 12 month indicators of suicide-related indicators.

In terms of the background variables, we again observe that the indicator of being a generation student plays an important role in all three models, i.e. non-generation students have significantly higher AYP and significantly lower odds of dropping out or a lower probability to belong to a low CSE category. Also, the conclusions made above with respect to female students performing better and an increased educational level of the mother having a positive effect on study performance are confirmed here.

Table 7: Best fitting model according to AIC investigating the influence of the multivariate disorder profile (clusters) on academic performance taking into account the background variables (AYP, drop-out and CSE).

Cluster analysis and background variables			
	Estimate	Std Error	p-value
AYP intercept	49.28493	2.02101	< 2e-16
Cluster 1	-1.73684	1.81092	0.33782
Cluster 2	-5.69978	2.03361	0.00520
Cluster 3	-6.78889	2.42449	0.00524
Cluster 4	-10.31469	3.20351	0.00134
Sex F	4.49512	1.47934	0.00246
Education mother	-0.15809	0.09625	0.10091
Generation student No	8.11863	1.26325	2.31e-10
Drop-out intercept	-1.60357	0.37221	1.65e-05
Cluster 1	0.24291	0.23434	0.2999
Cluster 2	0.43039	0.25850	0.0959
Cluster 3	0.68215	0.29738	0.0218
Cluster 4	1.53936	0.36613	2.62e-05
Sex F	-0.25659	0.17916	0.1521
Age	0.03518	0.01253	0.0050
Generation student No	-0.68215	0.16361	3.05e-05
CSE_intercept 1	-1.04651	0.23104	5.91e-06
CSE_intercept 2	-0.43119	0.22810	0.058710
Cluster 1	0.09553	0.21599	0.658289
Cluster 2	0.32168	0.23678	0.174297
Cluster 3	0.56128	0.27377	0.040348
Cluster 4	1.25724	0.33814	0.000201
Sex F	-0.38760	0.16660	0.019987
Generation student No	-0.66086	0.14695	6.88e-06

4.7. Relation between mental disorder profiles and academic performance weighted for well-being correlates

Finally, we have analysed whether the relationships between the mental health disorders and the academic performance observed above are moderated by the well-being variables. Six different well-being correlates have been surveyed in the UCLL database. These include connectedness to other students, connectedness with the school, connectedness with the lecturers, resilience, a caring school climate, and a positive future orientation. For each of these variables, a weighted score between 1 and 5 is calculated, where a lower score gives an indication of feeling less connected, being less resilient, having a less positive future orientation or feeling that there is a less caring school climate.

As mentioned in the introduction, increased well-being might have a positive influence on the academic performance of students with many mental disorders. Therefore, we hypothesize that the well-being correlates surveyed in the questionnaire might moderate the effect of the MHD on the academic performance of students. To formally investigate the moderating effect of the well-being variables, "ANCOVA"-type models were constructed based on the final models in Table 4. More specifically, for each of the main disorder effects, an interaction with any of the six well-being variables was included. In Table 8, we show the results of the well-being correlates as moderators of the effect of the mental disorders on the AYP.

Connectedness with school and with other students was found to significantly moderate the effect between illegal substance use disorder and the AYP (p-values < 0.0001 and 0.0168, respectively). The two analyses presented on the top rows of Table 8 indicate that students who have not used any illegal substance over the past 12 months do not perceive any significant effect (neither positive nor negative) of feeling more connected to the school or other students. This is reflected by the top lines in Figures 9A and 9B, which are slightly increasing, but not significantly based on the p-values in Table 8. In contrast, for students who have used illegal substances over the last 12 months, significantly better results are observed when the student feels more connected, as reflected in the lower regression lines in Figures 9A and 9B. Important to note here is that, due to 1) the high variability and 2) the low amount of data in the lower region of connectedness, these results should not be overinterpreted and are merely indicative. For the remaining well-being variables, no significant interactions were found with the mental disorders and the corresponding main effects on study performance can hence be interpreted. Indeed, it is observed that feeling more connected with the lectors has a significant positive effect on the average AYP (p-value = 0.0035). The variables related to resilience, caring school climate and positive future orientation do not have a significant impact on the AYP.

With respect to the remaining two outcomes, no significant interaction effects were present for the drop-out outcome, but similar to the results of AYP, only connectedness to school and connectedness to other students had a minor positive impact on the effect of ISUD on the CSE probabilities. Therefore, the exact model output for these outcomes has been omitted from this report. The interested reader is referred to Supplemental Tables 7-8 in the Appendix for the corresponding parameter estimates.

Table 8: Multivariate analysis of the effect of student-wellbeing correlates on the influence of mental health on the academic performance corrected for background variables.

	Connectedness with the school			**Connectedness with other students**		
	Estimate	Std Error	p-value	Estimate	Std Error	p-value
AYP intercept	34.4677	5.6240	1.50e-09	35.0289	6.4075	6.44e-08
AEDS_12M	4.5227	7.6308	0.553582	3.4717	8.8636	0.69542
Connectedness	1.6898	1.1044	0.126463	1.4499	1.4603	0.32113
ISUD_12M	-76.9409	18.5741	3.87e-05	-51.2439	16.0973	0.00152
Sex	4.5450	1.5309	0.003094	5.2637	1.5475	0.00071
Education_mother	1.8499	0.7544	0.014445	1.8950	0.7575	0.01260
Generation Student	7.7154	1.2833	2.98e-09	7.4600	1.2952	1.28e-08
Interaction with AEDS	-2.3280	1.8806	0.216171	-2.1451	2.3479	0.36125
Interaction with ISUD	17.0320	4.9157	0.000564	11.0048	4.5924	0.01683
	Connectedness with the lectors			**Resilience**		
	Estimate	Std Error	p-value	Estimate	Std Error	p-value
AYP	25.6604	6.1161	3.09e-05	44.77967	4.66994	< 2e-16
AEDS_12M	3.4102	8.3357	0.682588	-9.02314	4.70200	0.05540
Connectedness	4.3534	1.4860	0.003509	-1.40465	1.01234	0.16573
ISUD_12M	-39.1047	19.2790	0.042914	-13.86102	11.80886	0.24089
Sex	5.2972	1.5290	0.000565	4.67075	1.57623	0.00315
Education_mother	1.8809	0.7519	0.012598	1.95347	0.76056	0.01043
Generation Student	6.7342	1.2843	2.11e-07	7.30219	1.30482	3.18e-08
Interaction with AEDS	-2.2627	2.3796	0.342008	1.52962	1.62823	0.34784
Interaction with ISUD	8.0766	5.8640	0.168867	-0.04772	4.50630	0.99155
	Caring school climate			**Positive future orientation**		
	Estimate	Std Error	p-value	Estimate	Std Error	p-value
AYP	33.5179	7.0159	2.45e-06	37.8020	4.3666	< 2e-16
AEDS_12M	-11.4658	9.9041	0.24765	-3.3424	4.2360	0.43037
Connectedness	1.2595	1.4289	0.37859	0.9025	0.7750	0.24466
ISUD_12M	-34.2005	20.8252	0.10128	-12.2395	7.7503	0.11475
Sex	4.8835	1.8947	0.01029	4.8899	1.5552	0.00174
Education_mother	2.6291	0.9624	0.00656	1.8742	0.7584	0.01370
Generation Student	6.3476	1.6004	8.57e-05	7.3321	1.3017	2.59e-08
Interaction with AEDS	1.8636	2.4805	0.45289	-0.3166	1.2634	0.80219
Interaction with ISUD	5.8472	5.4336	0.28249	-0.3489	2.7165	0.89785

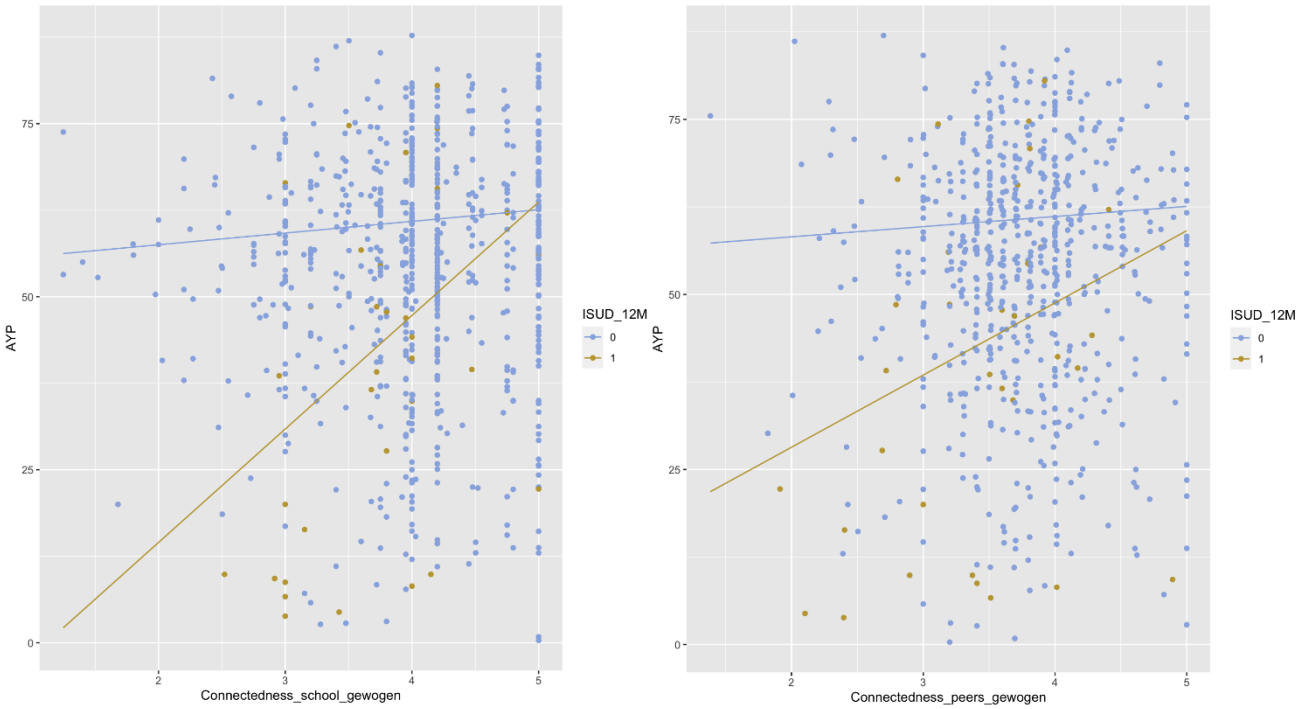


Figure 9: Interaction effects between ISUD and connectedness to A) school (left) and B) other students (right) on the Academic Year Percentag

5. Discussion and Conclusion

In this study we investigated the influence of mental health on the academic performance of higher education students. The analysis is based on information that was obtained from a survey that was filled out by first year students at UCLL. The survey was part of the bigger WMH-ICS and was further supplemented with specific background (socio-demographic) and college-related information about the participating students. In addition, we also received data with respect to the social well-being of the students. This not only allowed us to look at the link between mental health disorders and academic performance while controlling for socio-demographic correlates, but also to check whether this relationship is moderated by social well-being factors (e.g. connectedness).

In contrast to the prevalence measures mentioned in the introduction, generally higher observations were made for the current population of UCLL students. Especially the presence of MDE (54.11%) and SI (50%) were increased, but also the prevalence of SAS was rather high (34%). The latter was also mentioned by Alenizi et al. (2020) in the sense that various screening tools are designed to identify as many anxiety cases as possible, resulting in an extremely high anxiety prevalence amongst the students. In addition, most of the prevalence's in the introduction are based on the general population, often from pre-COVID-19 times, as information among college students is scarce. The assumption regarding the impact of pre-COVID-19 times is supported by the severe increase in the prevalence of MDE after COVID-19 (*Long covid*, 2022). In this way, it is interesting to follow-up on the current population and investigate the evolution of the presence of mental health disorders over time.

Academic performance is a broad concept that can be characterized by several measures. An excellent overview of such measures is provided by York et al. (2015). We decided to focus on three different outcomes: AYP, CSE, and drop-out. The three outcome measures were found to be correlated, reassuring that conclusions drawn across the different analyses are related and complementing. Though related, the outcomes are not the same. In our opinion, a relationship between mental health disorders and the odds of dropping out has a higher impact as compared to scoring lower on the AYP. To be more specific, a student who scores 55% as compared to 65% might still find its way to the job market after graduating. Students who drop-out of college will not (Ramsdal et al., 2018). It is this loss of potential, due to mental health disorders, that should be avoided. Targeted measures can only take place when the underlying relationships between mental health and academic performance are known.

In this perspective, we have looked at a very wide range of 13 mental health disorders, thereby providing valuable added information to the existing literature, which is often limited in the number of disorders or aspects of mental health that are included. In a first analysis, these disorders were regarded on an individual basis, using three types of regression models (depending on the type of outcome variable). For all outcomes, it was seen that especially ISUD, AEDS, BIP1, and SA were highly associated with academic performance. Even though not all of their effects were significant for the three outcome types, it was observed that suffering from at least one of these disorders had a negative impact on AYP, CSE, or drop-out.

It became clear that previous research shows conflicting results for anxiety disorders as a predictor for GPA and/or college persistence. Likewise, in our study no significant relationship was found with AYP and drop-out. This is interesting and would suggest that despite experiencing high levels of anxiety, students manage college. Moreso, the fear of leaving college (drop-out) and starting over might be considerably worse than continuing their studies (Strahan, 2003). As mentioned above, it is also possible that the social anxiety screener overdiagnoses students with an anxiety disorder, thus no significant relationship can be found with our outcome variables. Screeners in addition to doctor's appointments could give students the correct diagnoses.

Significant negative impact of ISUD was observed across the three analyses, even after correcting for background information. Moreover, it was found that the socio-economic status of the students (reflected in the education level of the mother) and whether the student was a first-generation student or not, were significant across all analyses. From our results we can conclude that the higher education level of the mother and not being a first-generation student lead to better performance and lower drop-out odds. In addition, the older the students the more likely to drop-out. Non-generation students belong often to the older population of students and many of them might have paid-work which has a negative impact on study performance (Salamonson et al., 2012). A possible explanation for the importance of the mother's level of education can be sought in parenting. Since in many cases the mother is more involved and present in the child's younger years (Mercy & Steelman, 1982). Therefore, if the mother is more educated, she would be more capable of guiding children in doing homework or possibly stimulating them in other intellectual activities such as puzzles or reading.

Gender has an influence, more specifically females had significantly better AYP and CSE as compared to male students. This finding is also supported in other studies showing that women in general have higher academic achievement than men (Dehon & Ortis, 2008). One possible explanation is that men take longer to mature and females are more likely to spend more time studying (Francis, 2007).

Although only low to moderate correlations between the individual disorders were observed, specific interest in our current study is also related to comorbidity patterns and their effect on the academic performance. First, it was seen that the total number of disorders had a negative impact, irrespective of the type of disorder. Research suggests that individuals with mental disorders often develop comorbidities over time. Previous studies of comorbidity have often been limited to a subset of disorders and few have examined the absolute risks of pre-existing or subsequent comorbidity (Plana-Ripoll et al., 2019). Indeed, for every additional disorder, an average 1% reduction in AYP could be observed and there would be an increased odds of dropping out and higher probabilities of being in lower CSE categories. Similar results were found in the study by Bruffaerts et al. (2018), which states that students with mental health disorders in the previous year showed an average decrease of 2.9 - 4.7% on their AYP in comparison to students without mental health disorders.

This first analysis already indicates that there are indeed joint effects of the disorders, which were further quantified in the current study by looking at the multivariate disorder profiles. In total, the students showed 430 unique profiles, each characterized by the presence or absence of the disorders under consideration. Based on these profiles, the students were grouped into five clusters based on a hierarchical clustering analysis. The reference cluster consisted of 160 students without any of the considered mental health disorders. Significantly reduced performance was observed for students belonging to clusters two, three, and four, but after the correction for background variables especially clusters three and four were significantly different from the baseline. These three clusters showed higher co-occurrence of 12M MDE, AEDS, SAS and lifetime SI. In addition, cluster two also showed co-occurrence of NSSI and SP, while in cluster three, there was an increased presence of PD and RUPA, which shows the additional impact of these latter disorders when combined with other factors.

Finally, as mentioned in our introduction, health is a continuum that is also determined by a social dimension, which is often overlooked. In our thesis, we aimed at incorporating this dimension by investigating the possible moderating effect of social well-being on the relation between mental health and academic performance. In this regard, especially the connectedness with the school and with other students had a significantly positive impact in the effect of ISUD. The higher these connectedness indicators, the smaller the difference with the performance of the students without ISUD. It could therefore be stated that, in order to achieve educational standards (which is their primary objective) colleges and universities should contribute to the general well-being of students by increasing the student's feeling of connectedness. Questionnaires like the ones used in this study are a good start, especially when further actions and measures are taken based on the results. A nice example is the automatic feedback mail system that is in place at UCLL. Depending on the severity of the disorders, feedback mails are sent to the participating students, providing targeted recommendations. This does not only help in the follow-up or treatment of the disorders, but certainly also increases connectedness with the school, which in turn was found to have a positive impact on academic performance. In order to further explore the underlying relationships between mental health, social well-being and study performance, a more advanced multiple mediation analysis could be performed (Anane, 2020) as this was considered to be out of the scope of our thesis.

We conclude this section by mentioning some further limitations and ideas for future research. As with many questionnaires and surveys, we faced a lot of missing values. Since our aim was to look at the effect of many variables, there is, of course, a higher number of incomplete observations. Although 1715 students started the survey, our most extensive models were only based on 734, 863, and 864 students (for AYP, CSE and drop-out, respectively). It was decided to use as many students as possible to limit the loss of information, leading to different datasets for different analyses. However, this should not affect the conclusions that were drawn. A further point of improvement is the time-range that was considered. In this study, we only evaluated the results for one academic year. Nevertheless, based on follow-up studies, it would be possible to perform a cohort analysis in which the evolution over time of both mental health and academic performance could be investigated. With the issue of incomplete data in mind, students should be encouraged to participate in the subsequent questionnaires so that the same students throughout their three-year college experience can be monitored.

Another important limitation of the current study is the high underlying variability. For example, the R squared measure of the linear regression models under consideration was never higher than 14% (meaning that the proportion of variability in the response explained by the covariates included in the model was rather small). Therefore, even after correcting for the important background variables, a lot of variance remains unexplained, and the conclusions drawn from these models should not be overinterpreted. Although the unsupervised hierarchical clustering used in this study gives nice insights, it can be considered to be subjective as it is purely data driven and the final split into clusters is based on the user. We tried to be as objective as possible by following the default settings for splitting the dendrogram, which allows replication by other users. The performed analysis could therefore be seen as the start of more advanced techniques, such as a latent class analysis or a confirmatory factor analysis. This was considered out of the scope of the current thesis.

Our findings are based on data from one university college, and hence it is difficult to generalise this to larger student populations. In addition, in our study, there is a high proportion of females. It should be noted that all male students from the healthcare programme were left out of the final analysis due to missing values. The results and conclusions should therefore not be generalised to the whole student population as male students were not reached sufficiently. To conclude, our research further validates the impact of mental health disorders on academic performance and persistence. In the future, data can be used to establish student support systems for those who are silently suffering.

6. Bibliography

Abdu, Z., Hajure, M. & Desalegn, D. (2020). Suicidal behavior and associated factors among students in mettu university, south west ethiopia, 2019: An institutional based cross-sectional study. *Psychol Res Behav Manag, 13*, 233-243. Doi: 10.2147/PRBM.S240827

About Mental Health. (n.d.). https://www.cdc.gov/mentalhealth/learn/index.htm

Agresti, A. (2002). *Categorical data analysis*. Wiley.

Akaike, H. (1974). A new look at the statistical model identification. *IEEE transactions on automatic control, 19*(6), 716-723.

Al Husaini, Y. N. S. & Shukor, N. S. A. (2022). Factors affecting students' academic performance: A review. *resmilitaris, 12*(6), 284-294.

Alenizi M. M., A. S. D., Almushir S., Alosaimi A., Alqarni A., Anjum I., Omair A. (2020). Impact of maladaptive daydreaming on grade point average (gpa) and the association between maladaptive daydreaming and generalized anxiety disorder (gad). *Cureus, 12*(10), e10776. Doi: 10.7759/cureus.10776

Anane, E. (2020). A multiple mediation analysis of the effect of prior performance on academic achievement through student teachers' motivational orientations. *Higher Education Research, 5*(4), 118-130.

Andrews, G., Brugha, T., Thase, M. E., Duffy, F. F., Rucci, P. & Slade, T. (2007). Dimensionality and the category of major depressive episode. *International journal of methods in psychiatric research, 16*(S1), S41-S51.

Arnaud, A.M., Brister, T.S., Duckworth, K., Foxworth, P., Fulwider, T., Suthoff, E.D., Werneburg, B., Aleksanderek, I., Reinhart, M.L (2022). Impact of Major Depressive Disorder on Comorbidities: A Systematic Literature Review. *J Clin Psychiatry*, *83*(6):21r14328. Doi: 10.4088/JCP.21r14328.

Arria, A. M., O'Grady, K. E., Caldeira, K. M., Vincent, K. B., Wilcox, H. C. & Wish, E. D. (2009). Suicide ideation among college students: A multivariate analysis. *Arch Suicide Res, 13*(3), 230-246. Doi: 10.1080/13811110903044351

Auerbach, R. P., Alonso, J., Axinn, W. G., Cuijpers, P., Ebert, D. D., Green, J. G., ... & Bruffaerts, R. (2016). Mental disorders among college students in the World Health Organization world mental health surveys. *Psychological medicine*, *46*(14), 2955-2970.

Baiden, P., Fallon, B., den Dunnen, W., & Boateng, G. O. (2015). The enduring effects of early-childhood adversities and troubled sleep among Canadian adults: a population-based study. *Sleep Medicine*, *16*(6), 760-767.

Baiden, P., Mengo, C., Boateng, G. O. & Small, E. (2019). Investigating the association between age at first alcohol use and suicidal ideation among high school students: Evidence from the youth risk behavior surveillance system. *J Affect Disord, 242*, 60-67. Doi: 10.1016/j.jad.2018.08.078

Bains, N. & Abdijadid, S. (2022). Major depressive disorder. Í *Statpearls [internet]*. StatPearls Publishing.

Baumeister, R. F. & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological bulletin, 117*(3), 497.

Bear, G. G., Gaskins, C., Blank, J., & Chen, F. F. (2011). Delaware School Climate Survey—Student: Its factor structure, concurrent validity, and reliability. *Journal of School Psychology*, *49*(2), 157-174. Doi: 10.1016/j.jsp.2011.01.001

Bernadetta, A. (2021). An evaluation of the influence of pupils' eating habits on their academic performance in the contemporary school system. *International Journal of Research in Education and Sustainable Development, 1(5),* 44 –57.

Bisson, K. H. (2017). The effect of anxiety and depression on college students' academic performance: Exploring social support as a moderator.

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

Brausch, A. M. & Gutierrez, P. M. (2009). The role of body image and disordered eating as risk factors for depression and suicidal ideation in adolescents. *Suicide Life Threat Behav, 39*(1), 58-71. Doi: 10.1521/suli.2009.39.1.58

Brook, C. A. & Willoughby, T. (2015). The social ties that bind: Social anxiety and academic achievement across the university years. *J Youth Adolesc, 44*(5), 1139-1152. Doi: 10.1007/s10964-015-0262-8

Bruffaerts, R., Mortier, P., Kiekens, G., Auerbach, R. P., Cuijpers, P., Demyttenaere, K., Green, J. G., Nock, M. K. & Kessler, R. C. (2018). Mental health problems in college freshmen: Prevalence and academic functioning. *J Affect Disord, 225*, 97-103. Doi:10.1016/j.jad.2017.07.044

Buhs, E. S., Ladd, G. W., & Herald, S. L. (2006). Peer exclusion and victimization: Processes that mediate the relation between peer group rejection and children's classroom engagement and achievement? *Journal of Educational Psychology*, *98*(1), 1.

Bursztein, C. & Apter, A. (2009). Adolescent suicide. *Curr Opin Psychiatry, 22*(1), 1-6. Doi: 10.1097/YCO.0b013e3283155508

Calvo, D., Galioto, R., Gunstad, J. & Spitznagel, M.B. (2014). Uncontrolled eating is associated with reduced executive functioning. *Clin Obes, 4*, 172–179.

Celik, C.B., Odacı, H. & Bayraktar, N. (2015). Is problematic internet use an indicator of eating disorders among Turkish university students? *Eat Weight Disord, 20*, 167–172.

Chen, Q., Yurou, K., Wenyang, G. and Mo, L. (2018). Effects of socioeconomic status, parent-child relationship, and learning motivation on reading ability. *Frontiers in psychology, 9, 1297.*

Chiu, H. Y., Lee, H. C., Chen, P. Y., Lai, Y. F., & Tu, Y. K. (2018). Associations between sleep duration and suicidality in adolescents: A systematic review and dose–response meta-analysis. *Sleep medicine reviews*, *42*, 119-126.

Claes, L., & Muehlenkamp, J. J. (2014). Non-suicidal self-injury in eating disorders: Advancementes in Etiology and treatment. *Heidelberg: Springer*.

Claydon, E. & Zullig, K.J. (2019): Eating disorders and academic performance among college students, *Journal of American College Health*, Doi: 10.1080/07448481.2018.1549556

Cohen, J., McCabe, E. M., Michelli, N. M., & Pickeral, T. (2009). School climate: Research, policy, practice, and teacher education. *Teachers college record*, *111*(1), 180-213.

Cotten, S. R. & Wilson, B. (2006). Student–faculty interactions: Dynamics and determinants. *Higher education, 51*, 487-519.

Cox, B. E., Reason, R. D., Nix, S. & Gillman, M. (2016). Life happens (outside of college): Non-college life-events and students' likelihood of graduation. *Research in Higher Education, 57*, 823-844.

D'Hulst, A., Kiekens, G., Auerbach, R., Cuijpers, P., Demyttenaere, K., Ebert, D., Green, J., Kessler, R., Mortier, P. og Nock, M. (2021). Depressieve stoornis bij belgische

eerstejaarsstudenten: Voorkomen, academische impact en zorggebruik. *Tijdschrift voor Psychiatrie*, 24-31.

De Bilde, J., Vansteenkiste, M., & Lens, W. (2011). Understanding the association between future time perspective and self-regulated learning through the lens of self-determination theory. *Learning and instruction*, *21*(3), 332-344.

Deady, M., Collins, D., Johnston, D., Glozier, N., Calvo, R., Christensen, H. & Harvey, S. (2022). The impact of depression, anxiety and comorbidity on occupational outcomes. *Occupational Medicine, 72*(1), 17-24.

Deas, D., Brown, E.S. (2006). Adolescent substance abuse and psychiatric comorbidities. *J Clin Psychiatry , 67*(7), e02. Doi: 10.4088/jcp.0706e02.

Dehon, C. og Arias Ortis, E. (2008). What are the factors of success at university?: A case study in belgium. *CESifo economic studies, 54*, 121-148.

Deliens, T., Clarys, P., Van Hecke, L., De Bourdeaudhuij, I. & Deforche, B. (2013). Changes in weight and body composition during the first semester at university. A prospective explanatory study. *Appetite, 65*, 111-116.

Demery, R., Thirlaway, K., & Mercer, J. (2012). The experiences of university students with a mood disorder. *Disability & Society*, *27*(4), 519-533.

Do, Y. K., Shin, E., Bautista, M. A. & Foo, K. (2013). The associations between self-reported sleep duration and adolescent health outcomes: What is the role of time spent on internet use? *Sleep Med, 14*(2), 195-200. Doi: 10.1016/j.sleep.2012.09.004

Domínguez-Vásquez, P., Olivares, S. & Santos, J.L. (2008). Influencia familiar sobre la conducta alimentaria y su relación con la obesidad infantil [Eating behavior and childhood obesity: family influences]. *Arch Latinoam Nutr, 58(3),* 249-55.

Donaldson, E. J. (2015). Beyond a beautiful mind: Schizophrenia and bioethics in the classroom. *Disability studies quarterly, 35*(2).

Ernst, B., Wilms, B., Thurnheer, M. & Schultes, B. (2015). Eating behaviour in treatment-seeking obese subjects—influence of sex and BMI classes. *Appetite* ,95, 96–100.

Esposito-Smythers, C., Spirito, A., Kahler, C. W., Hunt, J. & Monti, P. (2011). Treatment of co-occurring substance abuse and suicidality among adolescents: A randomized trial. *J Consult Clin Psychol, 79*(6), 728-739. Doi: 10.1037/a0026074

Evans, S., Alkan, E., Bhangoo, J. K., Tenenbaum, H. & Ng-Knight, T. (2021). Effects of the covid-19 lockdown on mental health, wellbeing, sleep, and alcohol use in a uk student sample. *Psychiatry research, 298*, 113819.

Farahbakhsh, J., Hanbazaza, M., Ball, G.D.C., Farmer, A.P., Maximova, K. & Willows N.D. (2019). Food Insecure Student Clients of a University-Based Food Bank Have Compromised Health, Dietary Intake, and Academic Quality. *Nutrition and Dietetics, 74(1),* 67–73.

Fite, P. J., Wimsatt, A. R., Vitulano, M. L., Rathert, J. L., & Schwartz, S. (2012). Examination of Peer Rejection and Depressive Symptoms as Mediators of the Link between Rule-Breaking Behavior and Poor Academic Performance. *Journal of Psychopathology and Behavioral Assessment*, *34*(2), 164-171. Doi: 10.1007/s10862-011-9269-y

Flesch, B. D., Sica Cruzeiro Szortyka, A. L., Houvèssou, G. M., Neitzke Höfs, F. & Gastal Fassa, A. (2021). Major depressive episode externalizing symptoms among university students. Í *Plos one*.

Fox, K., Wang, S., Boccagno, C., Haynos, A., Kleiman, E. & Hooley, J. (2019). Comparing self-harming intentions underlying eating disordered behaviors and NSSI: Evidence that distinctions are less clear than assumed. *International Journal of Eating Disorders, 52,* 564–575. Doi:10.1002/eat.23041

Francis, D. R. (2007). Why do women outnumber man in college? *National bureau of economic research*.

Fuller-Thomson, E., West, K. J., & Baiden, P. (2019). The tide does turn: Predictors of remission from suicidal ideation and attempt among Canadians who previously attempted suicide. *Psychiatry research*, *274*, 313-321.

Gopalan, M., Linden-Carmichael, A., & Lanza, S. (2022). College Students' Sense of Belonging and Mental Health Amidst the COVID-19 Pandemic. *J Adolesc Health*, *70*(2), 228-233. Doi: 10.1016/j.jadohealth.2021.10.010

Halx, M. D. (2010). Re-conceptualizing college and university teaching through the lens of adult education: Regarding undergraduates as adults. *Teaching in higher education, 15*(5), 519-530.

Hartley, M. T. (2010). Increasing resilience: Strategies for reducing drop-out rates for college students with psychiatric disabilities. *American Journal of Psychiatric Rehabilitation, 13*(4), 295-315.

Hjemdal, O., Friborg, O., Stiles, T. C., Rosenvinge, J. H., & Martinussen, M. (2006). Resilience predicting psychiatric symptoms: A prospective study of protective factors and their role in adjustment to stressful life events. *Clinical Psychology & Psychotherapy: An International Journal of Theory & Practice*, *13*(3), 194-201.

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: a meta-analytic review. *PLoS medicine*, *7*(7), e1000316. Doi: 10.1371/journal.pmed.1000316

Horwitz, A. G., Berona, J., Czyz, E. K., Yeguez, C. E. & King, C. A. (2017). Positive and negative expectations of hopelessness as longitudinal predictors of depression, suicidal ideation, and suicidal behavior in high-risk adolescents. *Suicide Life Threat Behav, 47*(2), 168-176. Doi: 10.1111/sltb.12273

Hughes, G. & Spanner, L. (2019). The university mental health charter. *Leeds: Student Minds*.

Husson, F., Le, S. and Pagés, J. (2010). Exploratory multivariate analysis by example using r (2nd ed., pp. 262). Chapman and Hall/CRC.

Indicators, O. (2020). Education at a glance 2022. OECD Publishing.

Johnson, E., & Tversky, A. (1983). Affect, Generalization, and the Perception of Risk. *Journal of Personality and Social Psychology*, *45*, 20-31. Doi: 10.1037/0022-3514.45.1.20

Johnson, S. R., Blum, R. W., & Cheng, T. L. (2014). Future orientation: a construct with implications for adolescent health and wellbeing. *Int J Adolesc Med Health*, *26*(4), 459-468. Doi: 10.1515/ijamh-2013-0333

Kang, K., Ortiz Lopez, C. F., Fear, B. S., & Granko, R. P. (2019). Tactics to improve resilience and well-being among pharmacy students. *Am J Health Syst Pharm*, *76*(18), 1374-1376. Doi: 10.1093/ajhp/zxz143

Kecojevic, A., Basch, C. H., Sullivan, M. & Davi, N. K. (2020). The impact of the covid-19 epidemic on mental health of undergraduate students in new jersey, cross-sectional study. *PloS one, 15*(9), e0239696.

Kenwood, M. M., Kalin, N. H. & Barbas, H. (2022). The prefrontal cortex, pathological anxiety, and anxiety disorders. *Neuropsychopharmacology, 47*(1), 260-275. doi: 10.1038/s41386-021-01109-z

Kernan, W. D., Wheat, M. E., & Lerner, B. A. (2008). Linking learning and health: a pilot study of medical students' perceptions of the academic impact of various health issues. *Academic Psychiatry*, *32*, 61-64.

Kessler, R. C., Chiu, W. T., Demler, O., Merikangas, K. R. & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-month dsm-iv disorders in the national

comorbidity survey replication. *Arch Gen Psychiatry, 62*(6), 617-627. Doi: 10.1001/archpsyc.62.6.617

Kessler, R. C., Chiu, W. T., Jin, R., Ruscio, A. M., Shear, K. & Walters, E. E. (2006). The epidemiology of panic attacks, panic disorder, and agoraphobia in the national comorbidity survey replication. *Arch Gen Psychiatry, 63*(4), 415-424. Doi: 10.1001/archpsyc.63.4.415

Kessler, R. C., Foster, C. L., Saunders, W. B., & Stang, P. E. (1995). Social consequences of psychiatric disorders, I: Educational attainment. *American journal of psychiatry*, *152*(7), 1026-1032.

Khan, S. I., Zada, R. & Ismael, D. S. (2022). Effect of healthy eating habits on the academic performance of graduating students. *Asia Pacific Journal of Health Management, 17*(2), 1-8.

Kiekens, G., Bruffaerts, R., Nock, M. K., Van de Ven, M., Witteman, C., Mortier, P., Demyttenaere, K. & Claes, L. (2015). Non-suicidal self-injury among dutch and belgian adolescents: Personality, stress and coping. *Eur Psychiatry, 30*(6), 743-749. Doi: 10.1016/j.eurpsy.2015.06.007

Kiekens, G., Claes, L., Demyttenaere, K., Auerbach, R. P., Green, J. G., Kessler, R. C., Mortier, P., Nock, M. K. & Bruffaerts, R. (2016). Lifetime and 12-month nonsuicidal self-injury and academic performance in college freshmen. *Suicide Life Threat Behav, 46*(5), 563-576. Doi: 10.1111/sltb.12237

Kim, D. S. & Kim, H. S. (2010). Early initiation of alcohol drinking, cigarette smoking, and sexual intercourse linked to suicidal ideation and attempts: Findings from the 2006 korean youth risk behavior survey. *Yonsei Med J, 51*(1), 18-26. Doi: 10.3349/ymj.2010.51.1.18

Kim, J. & Gorman, J. (2005). The psychobiology of anxiety. *Clinical Neuroscience Research, 4*(5-6), 335-347.

Klonsky, E. D., Victor, S. E. & Saffer, B. Y. (2014). Nonsuicidal self-injury: What we know, and what we need to know. *Can J Psychiatry, 59*(11), 565-568. Doi: 10.1177/070674371405901101

Komarraju, M., Musulkin, S. & Bhattacharya, G. (2010). Role of student–faculty interactions in developing college students' academic self-concept, motivation, and achievement. *Journal of college student development, 51*(3), 332-342.

Kotzé, M., & Kleynhans, R. (2013). Psychological well-being and resilience as predictors of first-year students' academic performance. *Journal of psychology in Africa*, *23*(1), 51-59.

Kruse, A. K. & Oswal, S. K. (2018). Barriers to higher education for students with bipolar disorder: A critical social model perspective. *Social Inclusion, 6*(4), 194-206.

Kundakovic, M. & Rocks, D. (2022). Sex hormone fluctuation and increased female risk for depression and anxiety disorders: From clinical evidence to molecular mechanisms. *Front Neuroendocrinol, 66*, 101010. Doi: 10.1016/j.yfrne.2022.101010

Kutner, M., Neter, J., Nachtsheim, C. and Li, W. (2004). *Applied linear statistical models* (5th Edition útgáfa). McGraw- Hill Irwin.

LaBelle, S., & Johnson, Z. D. (2018). Student-to-student confirmation in the college classroom: the development and validation of the Student-to-Student Confirmation Scale. *Communication Education*, *67*(2), 185-205. Doi: 10.1080/03634523.2018.1427879

Lardier Jr, D. T., Bermea, A. M., Pinto, S. A., Garcia-Reid, P. & Reid, R. J. (2017). The relationship between sexual minority status and suicidal ideations among urban hispanic adolescents. *Journal of LGBT issues in counseling, 11*(3), 174-189.

Lesdéma, A., Fromentin, G., Daudin, J.J., Arlotti, A., Vinoy, S., Tome, D. & Marsset-Baglieri, A. (2012). Characterization of the Three-Factor Eating Questionnaire scores of a young French cohort. *Appetite, 59(2),* 385-90. Doi: 10.1016/j.appet.2012.05.027

Locke, A. B., Kirst, N. & Shultz, C. G. (2015). Diagnosis and management of generalized anxiety disorder and panic disorder in adults. *Am Fam Physician, 91*(9), 617-624.

Löffler, A., Luck, T., Then, F.S., Sikorski, C., Kovacs, P. & Böttcher, Y. (2015). Eating behaviour in the general population: an analysis of the factor structure of the German version of the Three-Factor-EatingQuestionnaire (TFEQ) and its association with the body mass index. *PLoS One, 31,* 1–11.

Long covid. (2022). https://www.gezondbelgie.be/nl/gezondheidstoestand/overdraagbare-aandoeningen/long-covid

Martin, P. (2003). The epidemiology of anxiety disorders: A review. *Dialogues Clin Neurosci, 5*(3), 281-298. Doi: 10.31887/DCNS.2003.5.3/pmartin

Matingwina, T. (2018). Health, academic achievement and school-based interventions. *Health and academic achievement*, 143.

McAdams, D. P. & Bryant, F. B. (1987). Intimacy motivation and subjective mental health in a nationwide sample. *J Pers, 55*(3), 395-413. Doi: 10.1111/j.1467-6494.1987.tb00444.x

McKnight-Eily, L. R., Eaton, D. K., Lowry, R., Croft, J. B., Presley-Cantrell, L., & Perry, G. S. (2011). Relationships between hours of sleep and health-risk behaviors in US adolescent students. *Preventive medicine*, *53*(4-5), 271-273.

Mercy, J. A. og Steelman, L. C. (1982). Familial influence on the intellectual attainment of children. *American Sociological Review*, 532-542.

Moeller, R. W., Seehuus, M. & Peisch, V. (2020). Emotional intelligence, belongingness, and mental health in college students. *Front Psychol, 11*, 93. Doi: 10.3389/fpsyg.2020.00093

Mondimore, F. M. (2014). *Bipolar disorder: A guide for patients and families*. JHU Press.

Mortier, P., Demyttenaere, K., Auerbach, R. P., Green, J. G., Kessler, R. C., Kiekens, G., Nock, M. K. & Bruffaerts, R. (2015). The impact of lifetime suicidality on academic performance in college freshmen. *J Affect Disord, 186*, 254-260. 10.1016/j.jad.2015.07.030

Nesse, R. M. (1994). Fear and fitness: An evolutionary analysis of anxiety disorders. *Ethology and sociobiology, 15*(5-6), 247-261.

Nutt, D. J., Ballenger, J. C., Sheehan, D. & Wittchen, H. U. (2002). Generalized anxiety disorder: Comorbidity, comparative biology and treatment. *Int J Neuropsychopharmacol, 5*(4), 315-325. Doi: 10.1017/S1461145702003048

O'Neill, S., McLafferty, M., Ennis, E., Lapsley, C., Bjourson, T., Armour, C., ... & Murray, E. (2018). Socio-demographic, mental health and childhood adversity risk factors for self-harm and suicidal behaviour in College students in Northern Ireland. *Journal of affective disorders*, *239*, 58-65.

Ostaszewski, K., & Zimmerman, M. A. (2006). The effects of cumulative risks and promotive factors on urban adolescent alcohol and other drug use: A longitudinal study of resiliency. *American journal of community psychology*, *38*, 237-249.

Paiva, T., Gaspar, T. & Matos, M. G. (2015). Sleep deprivation in adolescents: Correlations with health complaints and health-related quality of life. *Sleep Med, 16*(4), 521-527. Doi: 10.1016/j.sleep.2014.10.010

Palmisano, G. L., Innamorati, M., Susca, G., Traetta, D., Sarracino, D. & Vanderlinden, J. (2018). Childhood traumatic experiences and dissociative phenomena in eating

disorders: Level and association with the severity of binge eating symptoms. *Journal of Trauma & Dissociation, 19(1),* 88–107. Doi:10.1080/15299732.2017.1304490

Patrick, H., Ryan, A. M., & Kaplan, A. (2007). Early adolescents' perceptions of the classroom social environment, motivational beliefs, and engagement. *Journal of Educational Psychology*, *99*, 83-98. Doi: 10.1037/0022-0663.99.1.83

Pedersen, D. E. (2020). Bipolar disorder and the college student: A review and implications for universities. *J Am Coll Health, 68*(4), 341-346. Doi: 10.1080/07448481.2019.1573173

Perrotta, G. (2019). Bipolar disorder: Definition, differential diagnosis, clinical contexts and therapeutic approaches. *J Neuroscience and Neurological Surgery, 5*(1).

Peter, R.R., Bridget, F. & Sierra, R.B. (2020). The influence of eating habits on the academic performance of university students. *Journal of American College Health*, *64(4)*, 1- 7.

Provencher, V., Drapeau, V., Tremblay, A., Despres, J.P. & Lemieux S. (2003). Eating behaviors and indexes of body composition in men and women from the Quebec Family Study. *Obes Res, 11*, 783–792.

Ramsdal, G. H., Bergvik, S. og Wynn, R. (2018). Long-term drop-out from school and work and mental health in young adults in norway: A qualitative interview-based study. *Cogent Psychology, 5*(1), 1455365.

Randall, J. R., Nickel, N. C. & Colman, I. (2015). Contagion from peer suicidal behavior in a representative sample of american adolescents. *J Affect Disord, 186*, 219-225. Doi: 10.1016/j.jad.2015.07.001

Roberts, R. E., Roberts, C. R. & Duong, H. T. (2009). Sleepless in adolescence: Prospective data on sleep deprivation, health and functioning. *J Adolesc, 32*(5), 1045-1057. Doi : 10.1016/j.adolescence.2009.03.007

Rola, A. J. & Ahlam, B. E. (2021). Dietary Habits, BMI, and Demographic Characteristics affect the Academic Performance of University Students in Saudi Arabia: A Cross-sectional Study. *Journal of Food and Nutrition Research, 9(3),* 136-41.

Roy-Byrne, P. P., Craske, M. G. & Stein, M. B. (2006). Panic disorder. *Lancet, 368*(9540), 1023-1032. Doi: 10.1016/S0140-6736(06)69418-X

Russell, G. & Topham, P. (2012). The impact of social anxiety on student learning and well-being in higher education. *J Ment Health, 21*(4), 375-385. Doi: 10.3109/09638237.2012.694505

Russell, K., Allan, S., Beattie, L., Bohan, J., MacMahon, K. & Rasmussen, S. (2019). Sleep problem, suicide and self-harm in university students: A systematic review. *Sleep Med Rev, 44*, 58-69. Doi: 10.1016/j.smrv.2018.12.008

Saha ,S., Lim, C.C., Degenhardt, L., Cannon, D.L., Bremner, M., Prentis, F., Lawrence, Z., Heffernan, E., Meurk, C., Reilly, J., McGrath, J.J. (2022). Comorbidity between mood and substance-related disorders: A systematic review and meta-analysis. *Aust N Z J Psychiatry, 56*(7):757-770. Doi: 10.1177/00048674211054740.

Salamonson, Y., Everett, B., Koch, J., Andrew, S. og Davidson, P. M. (2012). The impact of term-time paid work on academic performance in nursing students: A longitudinal study. *International journal of nursing studies, 49*(5), 579-585.

Samuolis, J., Griffin, K., Mason, M. J. & Dekraker, N. (2017). Connectedness to campus and likelihood of help-seeking for suicidality among college women. *Journal of College Student Psychotherapy, 31*(3), 238-246. Doi: 10.1080/87568225.2017.1312176

Sawaya, S.M. (2006). Malnutrition and poor academic performance: critical contributions. *Estudos Avancados, 20(58),* 133–146. Doi:10.1590/S0103-40142006000300015

Schilling, E. A., Aseltine Jr, R. H., Glanovsky, J. L., James, A. & Jacobs, D. (2009). Adolescent alcohol use, suicidal ideation, and suicide attempts. *Journal of Adolescent Health, 44*(4), 335-341.

Schmidt, U., Adan, R., Böhm, I., Campbell, I. C., Dingemans, A., Ehrlich, S., Elzakkers, I., Favaro, A., Giel, K. & Harrison, A. (2016). Eating disorders: The big issue. *The Lancet Psychiatry, 3*(4), 313-315.

Schonert-Reichl, K. A. & Lawlor, M. S. (2010). The effects of a mindfulness-based education program on pre-and early adolescents' well-being and social and emotional competence. *Mindfulness, 1*, 137-151.

Serra, R., Kiekens, G., Vanderlinden, J., Vrieze, E., Auerbach, R.P., Benjet, C., Claes, L., Cuijpers, P., Demyttenaere, K., Ebert, D.D., Tarsitani, L., Green, J.G., Kessler, R.C., Nock, M.K., Mortier, P. & Bruffaerts, R. (2020). Binge eating and purging in first-year college students: Prevalence, psychiatric comorbidity, and academic performance. *Int J Eat Disord, 53(3),* 339-348. Doi: 10.1002/eat.23211

Son, C., Hegde, S., Smith, A., Wang, X. & Sasangohar, F. (2020). Effects of covid-19 on college students' mental health in the united states: Interview survey study. *Journal of medical internet research, 22*(9), e21279.

Stein, M. B. & Stein, D. J. (2008). Social anxiety disorder. *Lancet, 371*(9618), 1115-1125. Doi: 10.1016/S0140-6736(08)60488-2

Storrie, K., Ahern, K. & Tuckett, A. (2010). A systematic review: Students with mental health problems—a growing problem. *International journal of nursing practice, 16*(1), 1-6.

Strahan, E. & Conger, A. J. (1998). Social anxiety and its effects on performance and perception. *J Anxiety Disord, 12*(4), 293-305. Doi: 10.1016/s0887-6185(98)00016-4

Strahan, E. Y. (2003). The effects of social anxiety and social skills on academic performance. *Personality and individual differences, 34*(2), 347-366.

Talbot, L. S., McGlinchey, E. L., Kaplan, K. A., Dahl, R. E. & Harvey, A. G. (2010). Sleep deprivation in adolescents and adults: Changes in affect. *Emotion, 10*(6), 831-841. Doi: 10.1037/a0020138

Tilli, V., Suominen, K. & Karlsson, H. (2012). Panic disorder in primary care: Comorbid psychiatric disorders and their persistence. *Scand J Prim Health Care, 30*(4), 247-253. Doi: 10.3109/02813432.2012.732471

Tinto, V. (1975). Drop-out from higher education: A theoretical synthesis of recent research. *Review of educational research, 45*(1), 89-125.

Topham, P. & Russell, G. (2012). Social anxiety in higher education. *The Psychologist, 25*(4), 280-282.

Tyrer, P., & Baldwin, D. (2006). Generalised anxiety disorder. *The Lancet*, *368*(9553), 2156-2166.

Valladares, M., Durán, E., Matheus, A., Durán-Agüero, S., Obregón, A.M. & Ramírez-Tagle, R. (2016). Association between Eating Behavior and Academic Performance in University Students. *Journal of the American College of Nutrition*. Doi: 10.1080/07315724.2016.1157526

Van Ameringen, M., Mancini, C. & Farvolden, P. (2003). The impact of anxiety disorders on educational achievement. *J Anxiety Disord, 17*(5), 561-571. 10.1016/s0887-6185(02)00228-1

Venville, A., Street, A., & Fossey, E. (2014). Student perspectives on disclosure of mental illness in post-compulsory education: displacing doxa. *Disability & Society*, *29*(5), 792-806.

Wade, D.T., O'Shea, A. & Shafran, R. (2016). Perfectionism and eating disorders. In: Sirois MF, Molnar SD, eds. Perfectionism, Health, and Well-Being. *Switzerland: Springer International Publishing,* 205–222.

Watkins, L.E., Patton, S., Drexler, K., Rauch, S.A.M. & Rothbaum, B.O. (2022). Clinical Effectiveness of an Intensive Outpatient Program for Integrated Treatment of Comorbid Substance Abuse and Mental Health Disorders, *Cognitive and Behavioral Practice.* Doi: 10.1016/j.cbpra.2022.05.005.

Williamson, T. J., Thomas, K. S., Eisenberger, N. I. & Stanton, A. L. (2018). Effects of social exclusion on cardiovascular and affective reactivity to a socially evaluative stressor. *Int J Behav Med, 25*(4), 410-420. Doi:10.1007/s12529-018-9720-5

Wilson, S., Gore, J., & Williamson, B. (2020). The impact of employment and university connectedness on the academic success of college students taking varying numbers of online courses. *Online Journal of Distance Learning Administration*, *23*(2), n2.

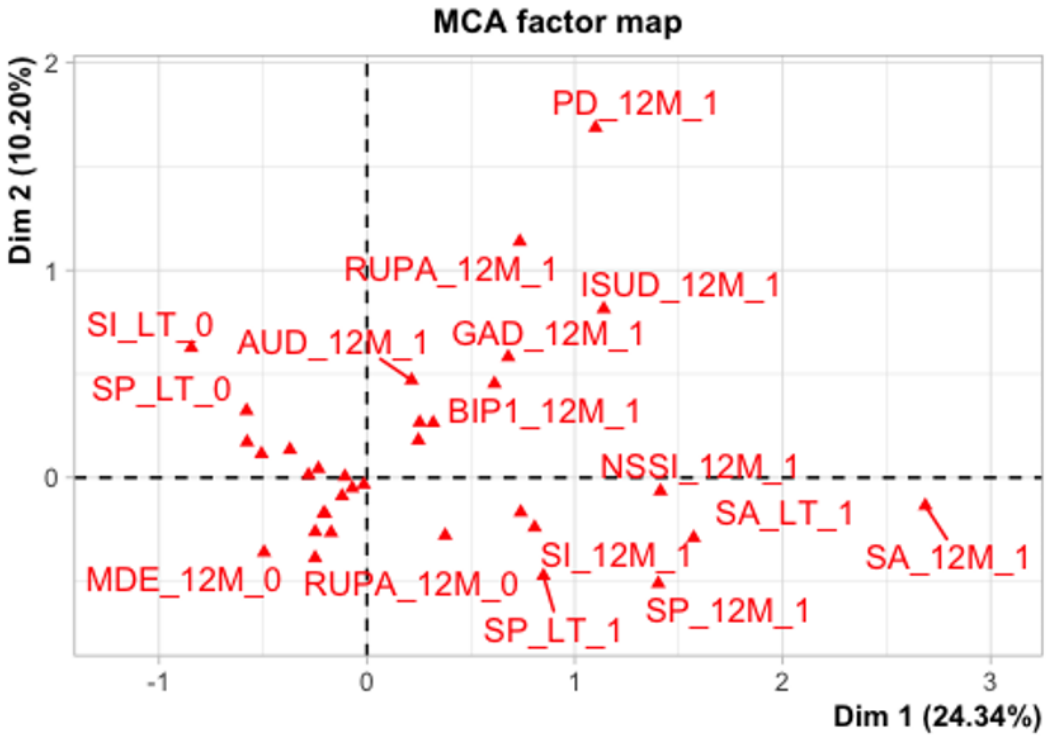
World Health Organization: WHO. (2022). Mental health. *www.who.int*. https://www.who.int/en/news-room/fact-sheets/detail/mental-health-strengthening-our-response

York, T. T., Gibson, C. & Rankin, S. (2015). Defining and measuring academic success. *Practical assessment, research, and evaluation, 20*(1), 5.

Zhang, W., Chen, L., Yu, F., Wang, S., & Nurmi, J. E. (2015). Hopes and fears for the future among Chinese adolescents. *Journal of Research on Adolescence*, *25*(4), 622-629.

Zukerman, G., Yahav, G. & Ben-Itzchak, E. (2019). Diametrically opposed associations between academic achievement and social anxiety among university students with and without autism spectrum disorder. *Autism Res, 12*(9), 1376-1385. Doi: 10.1002/aur.2129

Appendix



Supplemental Figure 1: MCA factor map showing that higher values of the first dimension are linked to the presence of disorders, with the highest contribution for SA, SP, SI and NSSI.

Supplemental Table 1: Full model used before model selection based on AIC to determine the association between the mental disorders and AYP.

	Estimate	Std Error	p-value
(Intercept)	56.6396	1.1998	< 2e-16
MDE_12M	0.6530	1.5321	0.670061
BIP1_12M	-4.5647	2.0363	0.025290
GAD_12M	1.3394	1.8307	0.464634
RUPA_12M	1.0447	2.2577	0.643683
PD_12M	-1.7967	2.9273	0.539560
SAS_12M	-1.9791	1.4484	0.172242
AUD_12M	0.1909	2.8788	0.947134
ISUD_12M	-11.4153	3.3282	0.000638
SA_12M	-5.1092	4.6910	0.276460
SP_12M	-1.2372	2.6774	0.644164
SI_12M	-0.7542	2.0844	0.717564
NSSI_12M	1.8832	2.4467	0.441727
AEDS_12M	-3.9468	1.4911	0.008304
SA_LT	0.1445	2.7702	0.958424
SP_LT	1.7590	2.2138	0.427114
SI_LT	-0.7151	1.9665	0.716222
NSSI_LT	-2.0811	1.8818	0.269147

Supplemental Table 2: Full model used before model selection based on AIC to determine the association between the mental disorders and drop-out.

	Estimate	Std Error	p-value
(Intercept)	-1.275047	0.149072	< 2e-16
MDE_12M	-0.141705	0.189521	0.454640
BIP1_12M	0.430273	0.230039	0.061423
GAD_12M	0.213262	0.216610	0.324848
RUPA_12M	-0.053460	0.278213	0.847620
PD_12M	0.168383	0.341915	0.622386
SAS_12M	-0.002866	0.175665	0.986984
AUD_12M	-0.360182	0.363152	0.321285
ISUD_12M	1.192591	0.346970	0.000588
SA_12M	0.458922	0.507831	0.366160
SP_12M	-0.240924	0.321545	0.453695
SI_12M	0.226583	0.253494	0.371407
NSSI_12M	-0.042237	0.291661	0.884857
AEDS_12M	0.304926	0.176546	0.084135
SA_LT	0.735178	0.306010	0.016285
SP_LT	-0.171407	0.267171	0.521156
SI_LT	0.054135	0.244514	0.824783
NSSI_LT	-0.095089	0.231971	0.681867

Supplemental Table 3: Full model used before model selection based on AIC to determine the association between the mental disorders and CSE.

	Estimate	Std Error	p-value
(Intercept):1	-1.68410	0.14812	< 2e-16
(Intercept):2	-1.03483	0.13931	1.1e-13
MDE_12M	-0.07293	0.17720	0.68067
BIP1_12M	0.39566	0.21638	0.06747
GAD_12M	0.06883	0.20626	0.73858
RUPA_12M	-0.22078	0.26726	0.40876
PD_12M	0.37372	0.32442	0.24934
SAS_12M	0.08496	0.16363	0.60361
AUD_12M	-0.13836	0.32714	0.67233
ISUD_12M	1.18396	0.32142	0.00023
SA_12M	0.45688	0.47466	0.33578
SP_12M	-0.12151	0.29990	0.68534
SI_12M	0.30965	0.24092	0.19869
NSSI_12M	0.10432	0.27169	0.70102
AEDS_12M	0.26124	0.16572	0.11494
SA_LT	0.53660	0.29237	0.06646
SP_LT	-0.15796	0.25377	0.53365
SI_LT	-0.12604	0.23255	0.58783
NSSI_LT	-0.08485	0.21836	0.69758

Supplemental Table 4: Full model used before model selection based on AIC to determine the association between the mental disorders, AYP and background variables.

	Estimate	Std Error	p-value
(Intercept)	50.397199	5.377777	< 2e-16
MDE_12M	0.114690	1.490729	0.938697
BIP1_12M	-3.076582	1.979483	0.120575
GAD_12M	0.791303	1.773026	0.655516
RUPA_12M	1.477272	2.176883	0.497602
PD_12M	-2.184107	2.815252	0.438119
SAS_12M	-1.982981	1.409485	0.159901
AUD_12M	0.708726	2.784189	0.799142
ISUD_12M	-11.122930	3.214238	0.000571
SA_12M	-5.383376	4.541904	0.236309
SP_12M	-0.200716	2.612156	0.938773
SI_12M	-1.037608	2.035028	0.610299
NSSI_12M	3.559428	2.362616	0.132369
AEDS_12M	-3.918272	1.452863	0.007165
SA_LT	-0.695652	2.682869	0.795484
SP_LT	0.976045	2.142902	0.648905
SI_LT	-0.911416	1.900697	0.631719
NSSI_LT	-2.747758	1.836610	0.135072
Sex F	4.604018	1.731311	0.008008
Age	0.016765	0.116085	0.885212
Education mother	1.885959	0.744122	0.011476
Education Healthcare	-1.709492	1.915297	0.372403
Education Management	1.143041	1.980154	0.563955
Education Technology	-0.138516	2.914947	0.962113
Education Welfare	0.238387	1.703355	0.888738
Generation Student No	2.953650	1.768636	0.095358

Supplemental Table 5: Full model used before model selection based on AIC to determine the association between the mental disorders, drop-out and background variables.

	Estimate	Std Error	p-value
(Intercept)	-0.59652	0.58152	0.304981
MDE_12M	-0.01831	0.19462	0.925030
BIP1_12M	0.35451	0.23701	0.134706
GAD_12M	0.17412	0.22257	0.434025
RUPA_12M	-0.03815	0.28531	0.893627
PD_12M	0.17334	0.34909	0.619513
SAS_12M	0.03921	0.18120	0.828690
AUD_12M	-0.33921	0.36592	0.353919
ISUD_12M	1.24601	0.35702	0.000483
SA_12M	0.59405	0.52463	0.257502
SP_12M	-0.37791	0.33302	0.256450
SI_12M	0.34074	0.26111	0.191904
NSSI_12M	-0.07668	0.30032	0.798472
AEDS_12M	0.32183	0.18299	0.078631
SA_LT	0.72369	0.31501	0.021598
SP_LT	-0.16391	0.27274	0.547851
SI_LT	0.06399	0.25026	0.798180
NSSI_LT	-0.04768	0.23850	0.841548
Sex F	-0.21656	0.21730	0.318949
Age	0.02984	0.01349	0.026966
Education mother	-0.21031	0.09485	0.026604
Education Healthcare	-0.11100	0.21988	0.613681
Education Management	-0.48640	0.28494	0.087818
Education Technology	0.16165	0.36652	0.659189
Education Welfare	-0.36576	0.23319	0.116771
Generation Student No	-0.72031	0.17525	3.95e-05

Supplemental Table 6: Full model used before model selection based on AIC to determine the association between the mental disorders, CSE and background variables.

	Estimate	Std Error	p-value
(Intercept):1	-0.57055	0.55153	0.300917
(Intercept):2	0.10239	0.55077	0.852519
MDE_12M	0.09375	0.18117	0.604836
BIP1_12M	0.27386	0.22173	0.216797
GAD_12M	0.07426	0.21083	0.724684
RUPA_12M	-0.25794	0.27382	0.346184
PD_12M	0.43846	0.33050	0.184618
SAS_12M	0.08985	0.16781	0.592360
AUD_12M	-0.14666	0.33028	0.657011
ISUD_12M	1.21317	0.32977	0.000234
SA_12M	0.57703	0.48717	0.236234
SP_12M	-0.24922	0.30917	0.420183
SI_12M	0.35019	0.24709	0.156412
NSSI_12M	0.04241	0.27835	0.878888
AEDS_12M	0.27013	0.17110	0.114389
SA_LT	0.52462	0.29999	0.080323
SP_LT	-0.11979	0.25801	0.642448
SI_LT	-0.12134	0.23721	0.608983
NSSI_LT	-0.01008	0.22402	0.964107
Sex F	-0.34559	0.20101	0.085562
Age	0.01028	0.01314	0.433917
Education mother	-0.20774	0.08912	0.019755
Education Healthcare	0.06846	0.20430	0.737547
Education Management	-0.23881	0.25969	0.357779
Education Technology	0.17546	0.34618	0.612266
Education Welfare	-0.34714	0.22089	0.116045
Generation Student No	-0.75106	0.16338	4.28e-06

Supplemental Table 7: Multivariate analysis including the moderating effect of student-wellbeing correlates on the relation between mental health and drop-out, corrected for background variables.

	Connectedness with the school			**Connectedness with other students**		
	Estimate	Std Error	p-value	Estimate	Std Error	p-value
intercept	-0.850912	0.8268627	0.304470	-0.75001	0.91105	0.41037
SA_LT	0.978413	1.316549	0.457382	-0.83113	1.69914	0.62474
Connectedness	0.006328	0.159323	0.968318	-0.01251	0.19503	0.94885
BIP1_12M	1.250968	1.324226	0.344823	0.98305	1.55087	0.52617
ISUD_12M	4.786933	2.439338	0.049717	3.85741	2.17869	0.07664
Age	0.028376	0.015084	0.059943	0.02446	0.01527	0.10913
Education_mother	-0.230084	0.110927	0.038061	-0.21800	0.11053	0.04858
Generation Student	-0.698745	0.198578	0.000434	-0.64738	0.19889	0.00113
Interaction with SA	-0.088310	0.328739	0.788212	0.39620	0.44914	0.37771
Interaction with BIP1	-0.212577	0.333627	0.524016	-0.15609	0.41429	0.70634
Interaction with ISUD	-0.916362	0.645232	0.155548	-70.72891	0.61352	0.23480
	Connectedness with the lectors			**Resilience**		
	Estimate	Std Error	p-value	Estimate	Std Error	p-value
intercept	-0.41968	0.84145	0.6180	-1.34990	0.65606	0.03963
SA_LT	1.18189	1.89285	0.5324	0.70628	0.91932	0.44233
Connectedness	-0.13890	0.19821	0.4834	0.20443	0.12995	0.11570
BIP1_12M	0.02531	1.54109	0.9869	1.76999	1.54825	0.04810
ISUD_12M	3.12143	2.58160	0.2266	1.59782	1.54825	0.30207
Age	0.02890	0.01500	0.0540	0.02495	0.01529	0.10275
Education_mother	-0.21345	0.11065	0.0537	-0.22973	0.10924	0.03546
Generation Student	-0.64919	0.19735	0.0010	-0.63762	0.19697	0.00121
Interaction with SA	-0.18473	0.55626	0.7398	-0.02173	0.33133	0.94772
Interaction with BIP1	0.10148	0.44296	0.8188	-0.48701	0.31919	0.12708
Interaction with ISUD	-0.54375	0.78134	0.4865	-0.07639	0.57955	0.89513
	Caring school climate			**Positive future orientation**		
	Estimate	Std Error	p-value	Estimate	Std Error	p-value
intercept	-0.08580	1.05299	0.9351	-0.66043	0.64297	0.30434
SA_LT	-1.24044	1.92666	0.5197	0.49199	0.79530	0.53617
Connectedness	-0.30594	0.20099	0.1280	-0.07023	0.10159	0.48941
BIP1_12M	-0.75712	2.07178	0.7148	0.81700	0.72216	0.25791
ISUD_12M	2.54993	2.69907	0.3448	1.12785	1.01384	0.26594
Age	0.04302	0.01804	0.0171	0.02870	0.01475	0.05170
Education_mother	-0.18409	0.14303	0.1981	-0.21302	0.10912	0.05093
Generation Student	-0.62118	0.24933	0.0127	-0.64714	0.91514	0.00091
Interaction with SA	0.38014	0.49410	0.4417	0.033317	0.24742	0.89334
Interaction with BIP1	0.24257	0.51628	0.6385	-0.13743	0.22333	0.53831
Interaction with ISUD	-0.30417	0.71422	0.6702	0.07151	0.34545	0.83599

Supplemental Table 8: Multivariate analysis including the moderating effect of student-wellbeing correlates on the relation between mental health and CSE, corrected for background variables.

	Connectedness with the school			**Connectedness with other students**		
	Estimate	Std Error	p-value	Estimate	Std Error	p-value
(intercept):1	0.40165	0.71721	0.57547	0.007305	0.806573	0.99277
(intercept):2	1.05649	0.71758	0.14094	0.668930	0.806518	0.40688
SA_LT	0.34174	1.14784	0.76591	-0.309833	1.443286	0.83002
Connectedness	-0.22097	0.14685	0.13240	-0.113470	0.190119	0.55062
AEDS_12M	-1.16143	0.93674	0.21502	0.147452	1.051014	0.88843
ISUD_12M	5.15246	1.90646	0.00688	5.907265	2.084860	0.00461
Sex F	-0.26451	0.18814	0.15975	-0.342667	0.186217	0.06575
Education_mother	-0.20355	0.09115	0.02554	-0.204627	0.090498	0.02375
Generation Student	-0.69224	0.15946	1.42e-05	-0.671158	0.159063	2.45e-05
Interaction with SA	0.08554	0.28589	0.76479	0.276847	0.387219	0.47463
Interaction with AEDS	0.37378	0.23105	0.10571	0.047273	0.278901	0.86541
Interaction with ISUD	-1.03803	0.50660	0.04046	-1.326937	0.590837	0.02471
	Connectedness with the lectors			**Resilience**		
	Estimate	Std Error	p-value	Estimate	Std Error	p-value
(intercept):1	0.23924	0.78667	0.7610	-0.91079	0.56513	0.1070
(intercept):2	0.91102	0.78675	0.2469	-0.23213	0.56391	0.6420
SA_LT	1.40764	1.63841	0.3903	1.15481	0.75685	0.1271
Connectedness	-0.21195	0.19704	0.2821	0.17800	0.12740	0.1624
AEDS_12M	-0.20229	1.01848	0.8426	1.17348	0.55282	0.0338
ISUD_12M	4.53908	2.42583	0.0613	1.15195	1.21041	0.3412
Sex F	-0.32770	0.187078	0.0788	-0.32878	0.18766	0.0798
Education_mother	-0.19461	0.09082	0.0321	-0.21460	0.08966	0.0167
Generation Student	-0.62879	0.15942	8.01e-05	-0.62114	0.15707	7.61e-05
Interaction with SA	-0.24271	0.48272	0.6151	-0.17408	0.27737	0.5303
Interaction with AEDS	0.15844	0.29363	0.5895	-0.30825	0.19180	0.1080
Interaction with ISUD	-0.98233	0.73519	0.1815	0.04477	0.44834	0.9205
	Caring school climate			**Positive future orientation**		
	Estimate	Std Error	p-value	Estimate	Std Error	p-value
(intercept):1	-0.15101	0.88970	0.86522	-0.41119	0.52326	0.4320
(intercept):2	0.59928	0.88941	0.50044	0.24203	0.52260	0.6433
SA_LT	1.19899	1.57884	0.44761	0.79924	0.63849	0.2107
Connectedness	-0.09191	0.187136	0.62331	-0.01281	0.097689	0.8957
AEDS_12M	0.44275	1.17640	0.70665	0.63648	0.49230	0.1961
ISUD_12M	1.34674	2.29340	0.55705	0.91527	0.86566	0.2904
Sex F	-0.26157	0.23044	0.25633	-0.30933	0.18513	0.0947
Education_mother	-0.19449	0.11393	0.08780	-0.19974	0.08979	0.0261
Generation Student	-0.57956	0.19478	0.00293	-0.63740	0.15697	4.9e-05
Interaction with SA	-0.24108	0.41053	0.55704	-0.03450	0.20130	0.8639
Interaction with AEDS	-0.05965	0.29868	0.84171	-0.10911	0.14833	0.4620
Interaction with ISUD	-0.01603	0.61064	0.97905	0.15065	0.29558	0.6103

Creatief project

Link naar online spelbord: https://www.flippity.net/bg.php?k=1suH6m1Uj0q4tR-lsTWtJakO7m65106YmIJ_UfyK8sAQ

Spelinfo

Speltype: online dobbelspel
Aantal spelers: 2-4
Leeftijd: vanaf 12 jaar
Speelduur: ± 20 minuten
Tactiek O O O O O Geluk

Spelmateriaal

Via volgende QR-code vind je het online spelbord. Hierop zal je ook een dobbelsteen zien, de verschillende pionnen alsook twee hoopjes met kaarten.
Eerste dobbelsteen: ogen van 1-6
Tweede dobbelsteen: ogen van 2-6

Doel van het spel

Als student is het niet altijd makkelijk om het academiejaar succesvol af te ronden. Probeer zo snel mogelijk je diploma te halen. Wie dit als eerste lukt mag zichzelf de "Valedictorian" noemen!

Spelverloop

De pionnen worden willekeurig verdeeld, waarbij er aan elke kleur een bepaalde mentale aandoening vasthangt. Volgende mentale aandoeningen horen bij de kleur:

- Rood = illegaal substantie gebruik
- Oranje = eetstoornis
- Groen = bipolaire stoornis
- Blauw = sociale angststoornis

De jongste speler mag beginnen en zet zijn pion op vakje 1, hierna volgen de anderen met de wijzers van de klok mee. Als een speler aan de beurt is, klikt hij of zij op de eerste dobbelsteen en zet zijn of haar pion zoveel vakjes vooruit als de dobbelsteen aangeeft. Verschillende aandoeningen kunnen gelijktijdig voorkomen bij eenzelfde student. Onderzoek wees uit dat wanneer een student met meer dan één mentale aandoening kampt dit een effect heeft op zijn/haar studies. Hoe meer aandoeningen een student gelijktijdig heeft, hoe zwaarder dit effect. Indien je doorheen het spel lijdt aan meer dan 1 aandoening, moet je tijdens het verplaatsen de hoeveelheid verschillende aandoeningen aftrekken van het aantal geworpen ogen. Dit geldt iedere beurt zolang je meer dan 1 aandoening hebt.

Komt je pion op een hoofdvakje (2 gekleurde hoofden) of gebeurtenis vak (meisje met handen in het haar) dan volgt er een instructie. Klik bij de hoofdvakken en gebeurtenis vakken op het info icoon dat erlangs staat. Hier zal uitgelegd worden wat je moet doen. Bepaalde gebeurtenissen zijn enkel van toepassing voor studenten met een bepaalde aandoening. De opdrachten moeten - voor zover mogelijk - direct uitgevoerd worden.

Onderweg kan je ook enkele wist-je-datjes vakken tegenkomen, ook hier zal het info icoon terug te vinden zijn. De informatie op deze vakjes mag je luidop met de groep delen.

Op één vak mogen meerdere pionnen tegelijk staan, iemand "eraf gooien" is er niet bij.

Als er een 6 gegooid wordt, mag men niet nog een keer gooien.

Gebeurtenissen

Hieronder staan de gebeurtenissen opgesomd, deze informatie vind je ook terug in de icoontjes op het bord:

3 – Je vertrekt op een langverwachte excursie. Terwijl medestudenten enthousiast aan het inpakken zijn, vullen de gedachten van iemand met sociale angststoornis zich met angst en bezorgdheid. Ondanks dat hij/zij het liefst wilt deelnemen en plezier wil hebben met medestudenten, beslist de student **uiteindelijk om de excursie te vermijden.** Studenten met **een sociale angststoornis** gaan **terug naar start**. Andere studenten leren véél bij en gaan twee stapjes vooruit.

6 – De universiteit investeert in bewustwording omtrent mentaal welzijn. Trek een **"help" kaartje** en lees luidop.

10 – De stress van het studentenleven, zoals deadlines, examens en sociale druk kunnen de symptomen van **bipolaire stoornis** verergeren. De **onvoorspelbaarheid van stemmingen** en het gevoel van overweldiging maakten het de voorbije periode moeilijk om de leerstof bij te houden. Bij een tussentijdse praktische laboproef was je overmatig zelfverzekerd, en door **risicovol gedrag** brak je dure spullen. Studenten met **bipolaire stoornis** gaan **10 stappen achteruit**.

15 – Het is een dappere stap om psychische hulp te zoeken. Je vindt een brochure omtrent mentaal welzijn in de agora. Je raapt alle moed bijeen en beslist om meer informatie te verzamelen. **Neem een "help" kaartje** en lees de boodschap luidop voor.

19 – Dobbelsteen: ben je hier met een "3" of "4" gekomen, dan mag je nog een keer gooien en verder gaan.

23 – De norse professor biologie gaat met pensioen en zijn collega neemt het roer over. De nieuwe professor stelt zich zéér vriendelijk op, moedigt studenten aan en staat open voor vragen. **Studenten die een verbondenheid voelen** met hun lectoren presteren **gemiddeld beter**, ongeacht de mentale status. Je mag voortaan de tweede dobbelsteen gebruiken (ogen 2-6).

Deze verbondenheid heeft volgens onderzoek in het bijzonder effect op personen die **illegale substanties misbruiken.** Hoewel studenten zonder deze eigenschap het nog steeds beter doen, worden de negatieve effecten ervan beduidend gemedieerd. Indien studenten die illegale substanties misbruiken na deze gebeurtenis **op vakje 26 komen,** moeten ze **slechts 5 vakjes achteruit.**

26 – Drugs kunnen de **hersenfunctie verstoren,** zoals het vermogen om te concentreren en informatie te onthouden. Je hebt minder concentratievermogen tijdens studietijd. Dit brengt jou in de problemen tijdens een presentatie. Jouw verhaal was niet altijd duidelijk en onvolledig. Studenten die **illegale substanties** gebruiken **gaan 10 vakjes terug.**

31 – Put: De laatste loodjes wegen het zwaarste, helaas heb je een terugval gekregen en moet je even een stapje terugzetten. Ga terug naar vak 30 en neem een kaart van de **"help" stapel,** lees de boodschap voor aan heel de groep.

37 – Gelijktijdig lijden aan verschillende stoornissen noemt men comorbiditeit. Onderzoek toont aan dat de comorbiditeit van verschillende mentale aandoeningen nefast zijn voor de academische prestaties. Er vindt vandaag een tussentijds examen plaats. Indien je op dit moment **lijdt aan meer dan drie verschillende stoornissen, behaal je geen voldoende.** Ga in dat geval **20 passen achteruit.**

43 – Een **eetstoornis** kan een negatieve impact hebben op het academisch functioneren van studenten. Ondervoeding, wat gepaard kan gaan met een eetstoornis, kan namelijk leiden tot concentratieproblemen en taalkundige tekortkomingen. Studenten met een eetstoornis **gaan 10 vakjes achteruit.**

Finish – Proclamatie tijd! Het is je gelukt, ondanks de moeilijkheden onderweg heb je met succes het academiejaar afgerond.

Hoofdvakken:
Passeer je een hoofdvakje, dan stopt je beurt en trek je een kaart van de denk stapel. Bij deze kaarten krijg je vragen die samenhangen met bepaalde mentale aandoeningen. Beantwoord je deze juist, dan gebeurt er niks en mag je blijven staan. Indien je een fout antwoord geeft zal je deze aandoening krijgen bovenop de eventuele aandoeningen die je al hebt. Bijvoorbeeld: je bent gestart aan het spel met een angststoornis en de vraag over drugs heb je foutief ingevuld, dan zal je verder doorheen het spel gaan met zowel een angststoornis als een verslaving. Bij een foutief antwoord zal er ook een QR-code verschijnen die je dan moet scannen. je komt op een website met informatie. Neem deze even door en vertel aan de anderen wat deze aandoening nu precies inhoudt.

Einde van het spel

Het spel eindigt, zodra één van de pionnen vakje 45 bereikt (eventuele extra ogen van de dobbelsteen vervallen).
De speler van deze pion is dus de winnaar en mag zichzelf de "Valedictorian" noemen.

Bijlagen

1. Wist-je-datjes

- Niet-generatiestudenten behalen over het algemeen betere resultaten op hogescholen en universiteiten. Dit zijn studenten die al een eerdere opleiding hebben gedaan of reeds een job hebben uitgevoerd.

- Studenten uit een gezin met een goede socio-economische status behalen hogere resultaten.

- Studenten met mentale aandoeningen gooien sneller de handdoek in de ring tijdens studies.

- Vrouwelijke studenten scoren gemiddeld hoger op hogescholen en universiteiten.

- Studenten kampen vaker met depressies sinds de corona pandemie.

2. Helpkaartjes

1) Er heerst nog steeds een stigma rondom psychische aandoeningen. Mensen kunnen bang zijn voor negatieve reacties of onbegrip van leeftijdsgenoten. De obstakels kunnen overweldigend lijken waardoor mensen aarzelen om hulp te zoeken. Psychische hulp is echter een teken van kracht en zelfzorg! **Je onderneemt stappen en mag een aandoening naar keuze verwijderen.**

2) Psychotherapie is een vorm van behandeling door een therapeut. De therapeut is getraind om aandoeningen te identificeren en inzicht te krijgen in de gedachten en emoties van cliënten. Simpel gezegd is er sprake van een probleem en is het doel van psychotherapie het probleem dragelijk/leefbaar te maken, en indien mogelijk op te lossen. **Je onderneemt stappen en mag een aandoening naar keuze verwijderen.**

3. Denk-stapel kaartjes

1) Welke van de volgende situaties kan een symptoom zijn van een paniekstoornis?

A) Het ervaren van intense angst en paniek zonder aanwijsbare reden.
B) Het hebben van een specifieke fobie, zoals angst voor spinnen.
C) Het voelen van nervositeit en onrust in sociale situaties.
D) Het ervaren van somatische klachten, zoals hoofdpijn of buikpijn.

Antwoord: A. Dit is een veelvoorkomend symptoom van paniekstoornis, waarbij mensen plotseling en onverwacht intense angst en paniek ervaren, vaak gepaard met fysieke symptomen zoals hartkloppingen, kortademigheid en duizeligheid. Optie C verwijst naar sociale angststoornis.

Juist: Trek een hulpkaart
Fout: episodes van ernstige depressies treden op

2) Welke van de volgende situaties kan een symptoom zijn van sociale angststoornis?

A) Het vermijden van sociale situaties, zoals feestjes of bijeenkomsten.
B) Het hebben van hoog zelfvertrouwen en comfortabel zijn in alle sociale interacties.
C) Het ervaren van fysieke symptomen, zoals blozen, zweten of trillen, tijdens sociale situaties.
D) Het hebben van specifieke fobieën, zoals angst voor spreekbeurten of telefoneren.

Antwoord: A. Het vermijden van sociale situaties, zoals feestjes of bijeenkomsten is. Dit gedrag is een veelvoorkomend symptoom van sociale angststoornis. Hoewel C en D ook eigenschappen van sociale angststoornis kunnen zijn, is optie A de voornaamste.

Koos je A: trek een hulpkaart
Koos je C of D: het spel gaat door
Koos je B: je kampt met episodes van ernstige depressies

3) Welke van de volgende kenmerken is typerend voor bipolaire stoornis?

A) Voortdurende stabiliteit van stemming en emoties.
B) Abrupte stemmingswisselingen en het vermogen van een persoon om te functioneren zonder duidelijke reden.
C) Een chronisch gevoel van verdriet dat niet verandert over de tijd.
D) Angst die het dagelijks functioneren beïnvloedt.

Antwoord: B. Mensen met bipolaire stoornis ervaren periodes van manie, gekenmerkt door verhoogde energie, prikkelbaarheid, impulsief gedrag en een verhoogd gevoel van eigenwaarde.

Juist: trek een hulpkaartje
Fout: je kampt met episodes van ernstige depressies

4) Welk van de volgende kenmerken is vaak geassocieerd met anorexia?

A) Vreetbuien.
B) Een angst voor gewichtstoename en het beperken van voedselinname.
C) Een ongecontroleerde drang om voedsel te consumeren.
D) Een angst voor bepaalde voedingsmiddelen of voedselgroepen.

Antwoord: B. Anorexia wordt gekenmerkt door een angst voor gewichtstoename en een verstoord lichaamsbeeld, wat leidt tot ondervoeding en gewichtsverlies. Mensen met anorexia hebben vaak een obsessie met dun zijn, zelfs als ze al ondergewicht hebben.

Juist: neem een hulpkaartje
Fout: je hebt last van ernstige depressie-episoden.