The Relationship between Mental and Physical Health: A Longitudinal Analysis with British Students

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The Relationship between Mental and Physical Health: A Longitudinal Analysis with British Students

Purpose: Previous studies in the field have highlighted a bidirectional link between mental health and physical health. Students may be at a higher risk of both mental and physical health problems due to unhealthy lifestyle behaviours and the commencement of university occurring at the same mean age of onset for many psychiatric disorders. The present study aims to examine how physical health variables influence changes in mental health symptoms, and vice versa, over time, in a sample of British undergraduate students.

Study Design/Methodology: A longitudinal design over a one-year time period. A national sample of 430 British undergraduate students completed measures of mental health and physical health online at up to four time-points across their first two years of university.

Findings: General physical health and energy and fatigue predicted more severe depression, anxiety, stress and poorer general mental health over time. Depression and stress predicted poorer physical functioning over time. Greater anxiety predicted poorer general health and more severe pain over time. General mental health was not predictive of general physical health. Overall, poor general physical health appears to exacerbate mental health symptoms in students to a greater extent than mental health problems lead to a deterioration in physical health.

Originally/Value: This study adds a longitudinal design to a field which is usually cross-sectional, as well as a lack of consideration of how this relationship may differ within student samples. Early interventions should integrate physical and mental wellbeing rather than focus on any single health-related behaviour.

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Key words: Mental Health, Physical Health, Students

Introduction

Previous literature in the field has highlighted a relationship between mental health disorders and co-occurring general physical health problems. Individuals living with serious mental illnesses (SMI) report higher rates of general medical problems in comparison to the general population, across a range of physical health conditions including obesity, diabetes mellitus, cardiovascular disease and cancer (Annamalai, Kosir and Tek, 2017; Correll et al., 2017; Zhuo et al., 2017). For instance, meta-analytic findings reveal an increased risk of having at least two chronic physical health conditions among those diagnosed with psychotic disorders (Rodrigues et al., 2021); thus, unsurprisingly individuals suffering from SMI display a 15–20 year reduction in lifespan, with nearly half of these mortalities due to preventable natural causes or modifiable risk factors (Walker et al., 2015). Moreover, a greater severity of depressive and psychotic symptoms has been found to be associated with more severe medical comorbidity and overall poorer physical health (Chwastiak et al., 2006), elucidating a possible dose-response relationship between physical and mental aspects of health. Conversely, individuals with physical illnesses are at a higher risk of comorbid anxiety, depression and substance abuse disorders (Chou, Huang, Goldstein & Grant, 2013), suggesting the relationship is not unidirectional.

Students may be particularly susceptible to both mental health and physical health problems due to unhealthy lifestyle behaviours. Students have been found to have worse sleep quality, diets comprised of more processed food and less fruits/vegetables and increased alcohol and substance use; all correlates of poor mental and physical wellbeing (Beaudry et al., 2019; Carpi et al., 2022; Hoying et al., 2020). Burnout in students is associated with increased depressive and anxiety symptoms, fatigue and reduced sleep quality, whilst poorer self-perceived physical and mental health are predictors of burnout (Haghighi & Gerber, 2019; Ilić Živojinović et al., 2020; Schramer et al., 2019), indicating the existence of a vicious cycle of poor physical and mental health. Moreover, Reavley et al. (2012)

commented that university may represent a 'high-risk time' for students, with the commencement of university occurring at the same mean age of onset for many psychiatric disorders; yet despite this, research examining the relationship between physical and mental health in students is largely lacking.

To date, the main methodological limitations with research in this area concern a reliance on cross-sectional methods resulting in a limited ability to ascertain causality, as well as little has been researched in students specifically. The current study aims to address these limitations by examining longitudinally the relationship between mental health and physical health in a sample of British undergraduate students.

Method

Design

The current study utilises data from a prospective cohort study examining tuition fees amount and mental health in students (Richardson, Elliott & Roberts, 2015). The same data set has also been reviewed in relation to loneliness, psychosis and eating disorder risk (Richardson, Elliott, Waller & Bell, 2015; Richardson et al., 2017; Richardson et al., 2018). A longitudinal design was used to explore whether physical health variables influence changes in mental health symptoms, and vice versa, over a one-year time period, in British undergraduate students, across their first two years at university. Ethical approval was granted by the University of Southampton.

Measures

The following self-reported validated standardised measures were used due to being freely available and brief. Cronbach's alpha (α) are given for the current sample at T1. For all measures of mental health, higher scores represent more severe symptoms/worse mental health.

Clinical Outcomes Routine Evaluation- General Population Version (CORE-GP) (Sinclair et al., 2005). A 14-item measure of global mental health in terms of functioning, problems and subjective wellbeing (α = .90), with questions such as *"I have felt unable to cope when things go wrong"*.

7 Item Generalized Anxiety Disorder Questionnaire (GAD-7) (Spitzer et al., 2006). A measure of the frequency of general anxiety symptoms over the past two weeks, such as *"not being able to stop or control worrying"* (α = .92).

Centre for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977). A 20-item scale assessing how frequently depressive symptoms are experienced in the past week in the general population, such as *"feeling lonely or hopeless"* (α = .95).

Perceived Stress Scale (PSS) (Cohen et al., 1983). A 10-item questionnaire assessing global perceived stress during the last month, using items inquiring how often individuals felt *"stressed or nervous"* or *"could not cope with all the things they had to do"* (α =.91).

Family Affluence Scale (FAS II) (Currie et al., 2008) assesses the socio-economic status of the student's home environment, via four questions regarding unshared bedroom, car and computer ownership and number of holidays.

RAND-36 Item Health Survey (Hays & Morales, 2001) was used as a measurement of physical health, assessing health-related quality of life, with questions such as *"compared to one year ago, how would you rate your health in general now?"*. There are eight subscales. The current study scored only the physical health subscales: physical functioning (α =.86), role limitations caused by physical health problems (α =.87), energy/fatigue (α =.81), pain and general health perceptions (α =.83). Items queried whether the individuals' health or pain limited their activities, from exercising to daily tasks such as hoovering and socialising.

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Participants and Procedure

The study was advertised broadly as examining how factors such as demographics and finances impact mental health in students. Measures were completed online at baseline and three follow-up time points across just over a year, during participants' first two years at university. Each time point was 3–4 months apart. For more details on specific times point and how many universities took part in the survey, please refer to Richardson, Elliott & Roberts (2015).

A total of 430 participants who completed the survey at a minimum of two time points were included in the analysis; 39.1% (n=168) completed all four time points, 26.7% (n=115) completed three time points and 34.2% (n=147) completed two time points. The sample was 77.2% (n=332) female and 89.5% (n=384) white ethnicity. Ages ranged from 17 to 57 with a mean age of 19.8 years. A disability was reported by 8.6% (n=37) of participants and 10.5% (n=45) identified themselves as mature students.

Results

Individual missing items were replaced with the mode. Scores on all standardised measures used were normally distributed.

Baseline Physical Health and Follow-up Mental Health

A hierarchical multiple linear regression was carried out to examine whether physical health (RAND-36 subscales) at baseline predicted later mental health, after controlling for initial baseline mental health and demographic variables (displayed in Table 1). The demographic variables of gender, disability, mature student, family affluence, age and ethnicity were not significantly related to any of the variables at any time point.

After controlling for demographics and baseline mental health, role limitations due to physical health problems predicted more severe depression and poorer general mental health at T4. Energy and fatigue predicted more severe depression, higher anxiety, higher stress and poorer general mental health at T2, as well as higher anxiety and stress at T3. General health predicted higher stress and poorer general mental health at T2, more severe depression, anxiety, stress and poorer general mental health at T4.

Baseline Mental Health and Follow-up Physical Health

The final linear regression model examining the impact of baseline mental health (CES-D, GAD-7, PSS and CORE-GP) on follow-up physical health after controlling for baseline physical health and demographics are shown in Table 2.

Male gender predicted poorer physical functioning, role limitations due to physical health and more pain at T2. Having a disability predicted poorer physical functioning, role limitations due to physical health, general health and more pain at T2. Being a mature student predicted poorer physical functioning, role limitations due to physical health, energy and fatigue at T2. Family affluence predicted poorer physical functioning, energy and fatigue, general health and more severe pain at T4. There was no effect of age and ethnicity on any of the variables.

The only significant variables for baseline mental health predicting follow-up physical health were more severe depression and stress predicting poorer physical functioning at T2. Greater anxiety predicted poorer general health at T4 and more severe pain at T2.

Discussion

Overall, poor physical health appeared to exacerbate mental health symptoms in students to a greater extent than mental health problems led to a deterioration in physical health. Poorer general health and lack of energy and fatigue predicted worse general mental health and greater severity of depression, anxiety and stress over time. Whilst commonly a symptom of mental health problems themselves, lack of energy and fatigue also predicted more severe symptoms, consistent with the literature demonstrating the vicious cycle of burnout negatively affecting students' physical and mental health (Haghighi & Gerber, 2019; Ilić Živojinović et al., 2020). The impact of general physical health on later mental health highlights the emotional strain of health problems and could be amplified due to changes in the level of social support for physical health concerns, especially for students living away from home for the first time. In contrast, depression and stress were not predictive of general physical health, only poorer physical functioning; perhaps unsurprisingly considering difficulty performing daily tasks and reduced interest in usual activities are common symptoms of mental health disorders. Anxiety predicted poorer physical health at T4, which plausibly aligns with the end of term assessment periods and could be accounted for by findings that students report less healthy diets (increased caffeine and fast-food consumption), reduced sleep, less exercise and increased smoking during exams (Elsalem et al., 2020). Family affluence was found to be risk factor for poor physical health. Lower family affluence is associated with less frequent physical activity, lower fruit/vegetable and higher sweets and soft drink consumption, and increased alcohol/tobacco use; all lifestyle behaviours linked to increased odds of physical health problems ((Dierckens et al., 2022).

As far as the authors' knowledge, the present study is the first of its kind to examine this relationship longitudinally, within the student population of interest and highlights the bidirectional relationship between physical and mental health deteriorating over time. This is consistent with previous findings conducted cross-sectionally that have reported that physical health problems are associated with an increased the risk of mental health disorders (Chou et al., 2013), as well as mental

health problems being associated with greater odds of comorbid physical health conditions (Rodrigues et al., 2021).

Students have been reported to exhibit more unhealthy lifestyle behaviours, such as less nutritious diets, higher alcohol consumption and insufficient physical activity (Beaudry et al., 2019; Bennasar-Veny et al., 2020) and combined with the mean onset age for many psychiatric disorders occurring around the start of university (Reavley et al. 2012), the present findings come as no surprise. The results highlight the value of integrating teaching on psychological wellbeing and general health lifestyle behaviours in interventions promoting physical and mental health. A greater awareness of this interrelationship in professionals working with students in both physical and mental health care settings is needed, as well as work to establish links for effective liaising across services. Moreover, better support and earlier interventions for students during the transition to university life and more stressful times such as assessment periods, could help prevent the downward spiral of both physical and mental health. Computer-based therapies may be particularly applicable within student populations.

It is important to acknowledge the limitations of this study. The sample was self-selected, with the majority of participants female, thus this may not be representative of the UK student population as a whole. Likewise, with student population being significantly younger than the general population, they are likely to be more physically healthy and as a result, findings may not have captured the true strength of the relationship in other populations such as older adults. Furthermore, the impact of the end of year examination period around T4 was an unforeseen factor and was not controlled for in the analysis.

Future research needs to be conducted within non-student populations, as well as a more gender balanced sample to determine whether this relationship extrapolates to wider populations. Leading on from this, research should investigate the underlying psychological links underpinning this relationship and develop programs simultaneously addressing physical and mental wellbeing rather than any single health-related behaviour.

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Table 1. *Final regression models of Physical Health and follow-up Depression, Anxiety, Stress and General Mental Health*

Physical Health Predicting Mental Health

	CES-D (Depression)			GAD-7 (Anxiety)			PSS (Stress)			CORE-GP (General Mental Health)		
	T2	T3	T4	T2	T3	T4	T2	T3	T4	T2	T3	T4
Overall Model												
n	367	246	218	366	242	217	362	245	216	379	258	221
F (df)	26.75*** (16,350)	15.48*** (16,229)	8.43*** (16, 201)	24.75*** (16,349)	15.01*** (16, 225)	8.36*** (16, 200)	24.22*** (16,345)	13.03*** (16, 228)	9.86*** (16, 199)	30.28*** (16,362)	13.63*** (16, 241)	9.91*** (16, 204)
R Squared	.55	.52	.35	.53	.52	.40	.53	.48	.44	.53	.48	.44
Individual Predictors (*β*)												
Female vs. Male	.01	-.06	.01	-.05	-.08	-.03	-.06	-.13	-.02	.03	-.01	.03
Disability vs. No Disability	.04	-.03	-.04	.06	-.04	-.04	.07	.04	.02	.03	-.07	-.07
Mature Student vs. Not Mature Student	.06	-.03	-.03	.03	.05	-.04	.08	.01	.02	.06	-.05	-.02
Family Affluence Scale	-.02	-.04	-.05	-.04	.03	-.04	-.05	-.06	-.07	-.03	-.07	-.10
Age												
20-29 vs. 17-19	-.02	.03	.04	-.04	-.05	.03	-.05	-.01	.04	-.07	.01	-.01
30+ vs. 17-19	-.04	.07	.05	.02	-.01	.01	-.01	.05	.00	-.06	.00	.01
Ethnicity												
Ethnicity: White vs. Other	.04	.02	.04	.05	-.01	.07	.03	.03	.11	.07	.04	.03
Ethnicity: White vs. Mixed	.05	-.01	-.02	.02	-.03	-.06	.02	.04	.01	.03	-.04	-.01
Ethnicity: White vs. Asian	.01	-.02	-.03	.00	-.03	-.04	.00	-.03	-.05	-.02	-.04	-.03
Ethnicity: White vs. Black	.02	-.06	-.05	.02	-.05	-.05	.03	-.04	-.06	.04	-.05	-.08
RAND 36												
Physical Functioning	.04	.07	.12	.03	.04	.06	.05	.09	.05	.03	.10	.11

Table 1. *Final regression models of Physical Health and follow-up Depression, Anxiety, Stress and General Mental Health*

|												
Role Limitations due to Physical Health	-.04	-.04	**-.16***	-.05	-.11	-.11	-.04	-.03	-.04	-.00	-.02	**-.18***
Energy and Fatigue	**-.17***	-.07	.00	**-.19****	**-.16***	-.03	**-.20***	**-.21***	-.14	**-.14***	-.10	-.13
General Health	-.03	-.06	**-.20***	-.02	-.06	**-.15***	**-.11***	-.10	**-.15***	**-.10***	-.08	**-.20***
Pain	-.06	-.11	-.05	-.04	-.02	-.14	-.02	-.04	-.06	-.05	-.08	.00
Baseline mental health measure score	.54***	.59***	.47***	.52***	.54***	.43***	.45***	.42***	.40***	.55***	.52***	.38***

Note. $*=p<.05$, $**p<.01$, $***p<.001$

Separate regressions were conducted for each mental health scale (CES-D, GAD-7, PSS and CORE-GP) and for time 2, 3 and 4.
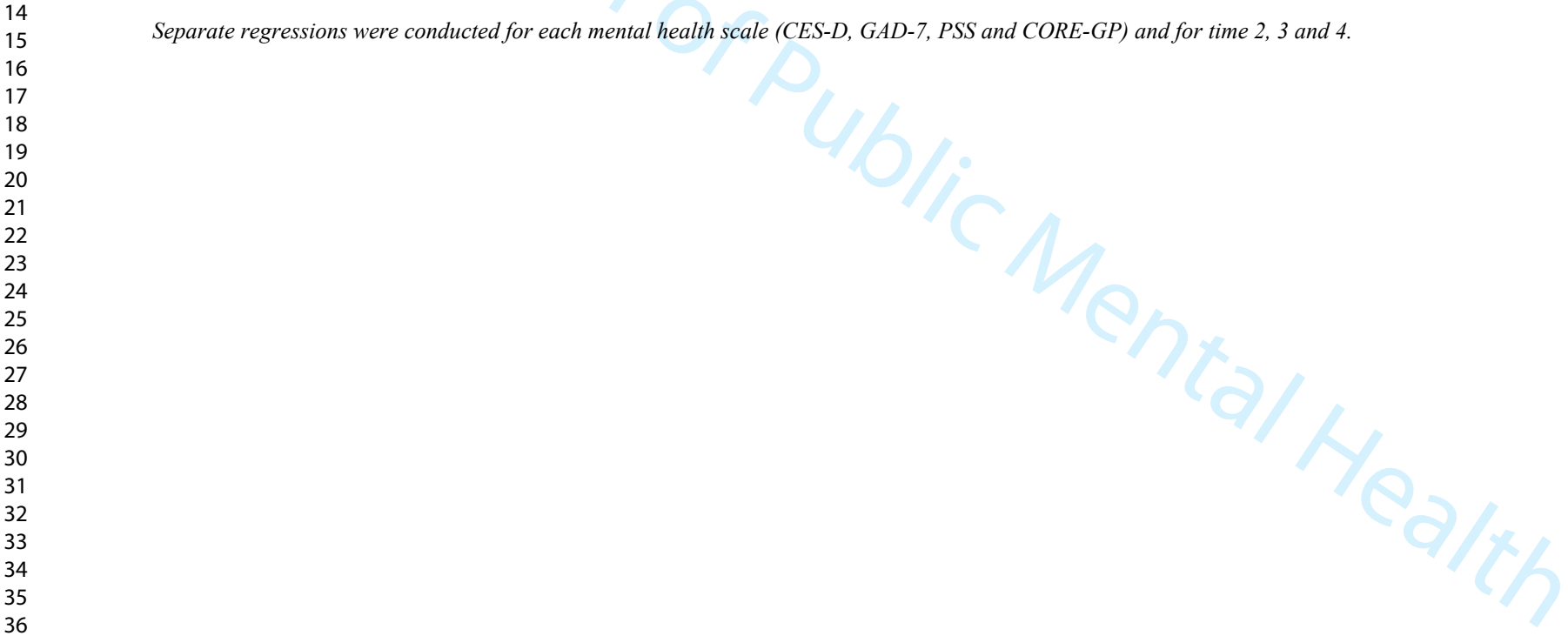
Table 2: Final regression models of Mental Health (Depression, Anxiety, Stress, and General Mental Health) and follow-up Physical Health (RAND-36) subscales

Mental Health Predicting Physical Health

	RAND 36- Physical Functioning			RAND 36 – Role Limitations due to Physical Health			RAND 36 – Energy and Fatigue			RAND 36 – General Health			RAND 36 – Pain		
	T2	T3	T4	T2	T3	T4	T2	T3	T4	T2	T3	T4	T2	T3	T4
Overall Model															
n	348	216	210	348	216	210	348	216	210	348	216	210	348	216	210
F (df)	35.96*** (16,331)	2.18** (16,199)	8.10*** (16,193)	6.88*** (16, 331)	.93 (16,199)	2.84*** (16, 193)	20.97*** (16, 331)	3.62*** (16, 199)	10.19*** (16,193)	37.69*** (16,331)	3.72*** (16,199)	10.87*** (16, 193)	8.19*** (16,331)	1.76** (16,199)	3.53*** (16,193)
R Squared	.64	.15	.40	.25	.07		.50	.23	.46	.65	.23	.47	.28	.12	.23
Individual Predictors (β)															
Female vs. Male	**.07***	-.00	.12	**.14****	.03	.02	.06	.07	-.03	.02	-.01	.02	**.14****	.03	.13
Disability vs. No Disability	**-.13****	.01	-.03	**-.23****	.01	.00	-.03	.05	.01	**-.08***	.03	-.01	**-.17****	.10	-.10
Mature Student vs. Not Mature Student	**-.15****	-.02	-.12	**-.22****	-.20	-.08	**-.17****	-.09	-.15	-.07	-.03	-.09	-.03	.03	-.09
Family Affluence Scale	.04	-.01	**.16***	.05	-.02	.13	.04	-.04	**.14***	.06	-.01	**.13***	.12*	.12	**.15***
Age															
20-29 vs. 17-19	.06	-.01	-.01	.10	.11	.09	.08	.02	.06	.01	.08	.03	.01	-.09	-.05
30+ vs. 17-19	.08	.01	.02	.03	.05	.05	.09	.08	.05	-.01	.04	.04	.03	.08	.03
Ethnicity															
Ethnicity: White vs. Other	-.00	-.02	.00	.03	-.02	.04	-.06	-.04	-.01	.01	-.03	-.02	.04	-.02	-.04
Ethnicity: White vs. Mixed	-.02	-.06	.00	-.00	.06	-.10	-.03	.04	.00	-.01	.06	.02	-.01	-.11	-.05

Table 2: Final regression models of Mental Health (Depression, Anxiety, Stress, and General Mental Health) and follow-up Physical Health (RAND-36) subscales

Ethnicity: White vs. Asian	.03	-.12	.01	.02	-.05	-.00	.00	-.07	.06	.01	-.09	.02	-.00	.04	.03
Ethnicity: White vs. Black	-.01	.01	.02	.01	.00	-.00	-.01	.06	.01	-.00	.03	.04	.01	.03	.06
Mental Health Measures															
CES-D	**-.19***	-.12	.16	-.21	-.11	.08	-.04	-.02	-.09	-.16	-.14	-.16	-.05	-.11	.15
CORE gp	.02	-.06	-.08	.10	-.02	.06	.01	-.25	-.02	.06	-.16	.06	.06	.08	-.01
GAD	-.08	.01	.01	-.04	-.09	-.14	-.06	-.12	-.03	.04	-.08	**.22***	**-.18***	-.07	-.16
PSS	**.15***	-.00	-.01	.07	.13	.02	-.03	.19	.09	.02	.22	.01	.02	-.00	-.11
Baseline physical health measure score	**.68***	**.29***	**.56***	**.23***	.12	**.38***	**.57***	**.34**	**.45***	**.71***	**.40***	**.63***	**.31***	**.25**	**.28***

*Note. *=p<.05, **=p<.01, ***=p<.001*

A separate regression was conducted for each of the RAND-36 physical subscales (Physical Functioning, Role Limitations due to Physical Health, Energy and Fatigue, General Health and Pain), and for time 2, 3 and 4