# Understanding the Consequences of Undergraduate Financial Concern and its Implications for Academic Outcomes

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## Declaration

This thesis conforms to an 'article format' in which the middle chapters consist of discrete articles written in a style that is appropriate for publication in peer-reviewed journals in the field. The first and final chapters present synthetic overviews and discussions of the field and the research undertaken.

Chapter 2 is written in a style suitable for submission to the *Journal of Experimental Psychology: Applied*.

The author contributions are as follows: Matthew Reid was responsible for all of the data collection, data analysis, and writing of the manuscript. Donna Jessop and Eleanor Miles were responsible for providing feedback on study design and corrections to the manuscript. Matthew Reid, Donna Jessop, and Eleanor Miles were collectively responsible for the initial conception of the research.

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Chapter 4 is written in a style suitable for submission to the *Journal of Experimental Social Psychology*.

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I hereby declare that this thesis has not been and will not be, submitted in whole or in part to another University for the award of any other degree.

Signature:……

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## Summary

Existing literature links poorer financial circumstances with negative outcomes among undergraduate students, including worse academic outcomes. The research presented in this thesis aimed to (i) examine consequences of financial concern among undergraduate students, and (ii) identify variables mediating the relationships between financial concern and academic outcomes.

Study 1 ($N$ = 101) investigated whether an experimental manipulation of financial concern salience affected undergraduates' cognitive function, assessed in terms of working memory and inhibitory control. Contrary to prediction, there was no apparent effect of financial concern salience on cognitive function. Study 2 ($N$ = 197) demonstrated that the experimental manipulation effectively influenced the salience of financial concern, suggesting that the absence of effects in Study 1 was unlikely to be attributable to manipulation failure.

Study 3 ($N$ = 516) assessed mediators of the cross-sectional association between undergraduates' financial concern and academic performance. Path analysis identified students' sense of belonging at university, stress, and self-control as mediating variables. In Study 4, an independent sample ($N$ = 2794) successfully validated the path model developed in Study 3. Further, Study 4 ($N$ = 453) investigated mediators of the longitudinal associations between undergraduates' financial concern and academic outcomes. Financial concern was found to predict detrimental changes in intrinsic academic motivation over time, as mediated by a decreased sense of belonging at university and increased stress.

Study 5 ($N$ = 239) assessed whether an experimental manipulation of financial concern salience affected undergraduates' sense of belonging at university. Contrary to

prediction, there was no impact of financial concern salience on students' sense of belonging at university.

Together, the present findings integrate much existing literature, and provide important insights in to the consequences of undergraduate financial concern. Yet, the null experimental findings highlight that further research is required before firm claims regarding causal relations are supported.

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# Chapter 1. Introduction and Literature Review

## Chapter Overview

The research presented in this thesis aimed to identify consequences of financial concern among university students, and to examine mediating variables underlying the apparent influence of financial concern on academic outcomes. This introductory chapter provides an overview of the literature that is relevant to this programme of research.

This chapter begins with an outline of recent changes to the way that higher education is funded in England, and of the implications of the present funding arrangements for the financial circumstances of undergraduate students. Theory and evidence concerning the influence of financial circumstances on cognitive function is then critically evaluated, and design and measurement issues relating to examining the impact of financial concern on cognitive function are discussed. Following, evidence suggesting that impairments in cognitive function could account for the relation between poor financial circumstances and worse academic outcomes at university is reviewed. Issues concerning the measurement of students' financial circumstances and academic outcomes are additionally considered. Subsequently, this chapter evaluates evidence for a number of other potential mediators of the link between financial circumstances and academic outcomes. The implications of using correlational (including cross-sectional and longitudinal) and experimental designs are then discussed. Finally, the programme of research presented in this thesis is summarised, and an overview is given of the content of each subsequent chapter of the thesis.

# Higher Education Funding and the Financial Circumstances of Undergraduate Students in England

In recent years the cost of higher education in England has been increasingly transferred from the state to the individual student and their family. Policy reforms in 2012 saw tuition fees increase from £3,290 to £9,000 per year (representing the largest ever one-year increase in the cost of higher education anywhere in the world; Bolton, 2012), and introduced above-inflation interest rates on student loans (Department for Business, Innovation and Skills, 2011). This increase in the cost of tuition was intended to compensate for the widespread reduction in teaching grants provided to universities by the government (Crawford & Jin, 2014). Students' financial circumstances have also worsened due to the abolition of maintenance grants and the National Scholarship Programme in 2015 (HM Treasury, 2013; HM Treasury, 2015), as well as reductions in the amount of financial support provided to students by universities (Dearden, Hodge, Jin, Levine, & Williams, 2014).

The current system of higher education funding in England means that students graduate with average debt in excess of £50,000, increasing to £57,000 for students who are from the poorest 40% of families (Belfield, Britton, Dearden, & van der Erve, 2017). This level of student debt is estimated to be the largest in the world, even when compared to the average debt accrued by students at private institutions in the United States (US; Kirby, 2016).

The financial burden placed on English undergraduate students appears to represent an important source of concern for them, with 77% of those surveyed in 2015 reportedly either 'worried' or 'very worried' about the debt they had, or the debt they would have accrued by the end of their studies (National Union of Students, 2015). Further, students' concerns do not appear to be limited to the issue of graduate debt,

with 50% of English undergraduates surveyed in 2012 additionally indicating they were worried about being unable to afford basic living expenses such as rent and utility bills (National Union of Students, 2012).

## Financial Circumstances and Cognitive Function

Theorising on the cognitive consequences of resource scarcity posits that poor financial circumstances may have a detrimental impact on cognitive function. Specifically, experiencing the scarcity of a given resource is argued to focus cognitive and attentional capacity on attempting to deal with the scarcity (Mullainathan & Shafir, 2013). For example, poor financial circumstances may consume cognitive and attentional resources by forcing people to balance competing demands and make difficult tradeoffs (Gennetian & Shafir, 2015). On the basis that such cognitive and attentional resources are finite, it is claimed that the load placed on these resources by the experience of scarcity can result in temporary cognitive impairments in other areas of life (Gennetian & Shafir, 2015; Mullainathan & Shafir, 2013; Schilbach, Schofield, & Mullainathan 2016).

Poor financial circumstances might also impair cognitive function because of concerns relating to identity and one's position in society. For instance, a person's financial situation is argued to constitute a central part of their self-identity (Northern, O'Brien, & Goetz, 2010), and experiencing financial difficulties may therefore cause a person to question their self-worth (i.e., their view of themselves as a competent and successful person; Sheehy-Skeffington & Haushofer, 2014). In turn, such perceived threats to the self are claimed to be distracting, and to cause decrements in cognitive ability (Levy, Heissel, Richeson, & Adam, 2016; Schmader & Jons, 2003). Indeed, Destin and Svoboda (2018) suggest that the financial burden of university could impair cognitive function because it generates identity conflict with students' desired

financially secure future selves. Following, Destin and Svoboda (2018) report an experiment in which US undergraduates were randomly allocated to conditions in which they were either prompted to think only about the financial burden of university, or prompted to think about the financial burden of university as an investment leading to a desired successful future identity. The authors found that participants in the latter condition displayed significantly better inhibitory control (the ability to manage attention, thoughts, and actions to overcome a more automatic response [Diamond, 2013]; measured using a Stroop task), and the authors attributed this improvement to the resolution of identity conflict.

**Experimental Evidence**

**S**upporting the position that poor financial circumstances can have a detrimental impact on cognitive function, Mani, Mullainathan, Shafir, and Zhao (2013) report a series of experiments. Participants (adults recruited in a US mall) were asked to describe how they would deal with a number of hypothetical scenarios outlining financial problems. In one condition the scenarios involved relatively high-cost financial problems that were intended make financial concerns salient. In another condition the scenarios entailed relatively low-cost financial problems. All participants then completed cognitive tasks assessing their fluid intelligence (the capacity for abstract thought and reasoning [Cattell, 1963]; measured using Raven's Progressive Matrices), and inhibitory control (measured using a spatial incompatibility task). Mani et al. (2013) found that richer participants performed equally well on the cognitive tasks regardless of which experimental condition they were in. However, for lower-income participants, the high-cost financial problems evoking financial concerns caused a significant decrement in cognitive function.

Similar evidence is provided by Spears (2011) who had participants (casual labourers in India) complete an economic game that involved choosing between different items to receive. Participants were randomly assigned to either a 'rich' condition where they had a relatively larger budget, or a 'poor' condition where they had a smaller budget. All participants then completed a Stroop task assessing inhibitory control. Spears (2011) hypothesised that, because making the economic decision with a smaller budget would be more difficult, it would consume more cognitive resources and therefore impair participants' subsequent cognitive function. Indeed, Spears (2011) found that participants in the 'poor' (vs. 'rich') condition displayed significantly worse inhibitory control.

Dang et al. (2016) also conducted an experiment investigating the impact of the salience of financial concerns on cognitive function in a sample of Chinese university students. Participants in the experimental condition were presented with an adapted version of the high-cost financial scenarios used by Mani et al. (2013). Participants in the control condition were not presented with any hypothetical scenarios. Following the manipulation, all participants completed an information-integration categorisation task (Waldron & Ashby, 2001) intended to assess cognitive function in terms of proceduralised learning processes that do not require deliberate and conscious attention. Dang et al. (2016) found that poorer participants actually performed better on the cognitive task when financial concerns had been made salient. Importantly, however, such proceduralised learning processes are found to be better when other cognitive functions, such as attentional capacity and working memory, are impaired (DeCaro, Thomas, & Beilock, 2008). Thus, Dang et al.'s (2016) findings do not appear to conflict with the position that poor financial circumstances can impair cognitive

function, but nevertheless highlight that any such impairments are unlikely to be uniform across all aspects of cognitive function.

While such experimental research is useful in answering questions regarding causality, the ecological validity of the findings is questionable. A person's financial circumstances are likely to affect many different aspects of their life, and it could be difficult to capture this experience fully within such relatively brief and artificial manipulations. Accordingly, it is possible that the effects of financial circumstances on cognitive function may be different within less artificial settings. Thus, the following section provides a review of evidence examining how naturally occurring differences and changes in financial circumstances relate to cognitive function.

**Quasi-experimental and Correlational Evidence**

Additional evidence concerning the link between financial circumstances and cognitive function comes from a natural experiment conducted by Mani et al. (2013). Tests of cognitive function were administered to a sample of Indian farmers before and after their harvest, when their financial circumstances were poorer and better, respectively. Cognitive function was assessed in terms of fluid intelligence (using Raven's Progressive Matrices) and inhibitory control (using a numerical Stroop task). Mani et al. (2013) found that cognitive performance on both tasks was significantly worse before (compared to after) the farmers' harvest. The authors argue against calendar and training effects, and differences in physical exertion, anxiety, stress, and nutrition, as explanations for their findings. Instead they attribute the difference in cognitive function to the hypothesised heightened cognitive load accompanying the relatively greater financial pressures the farmers faced before their harvest.

Butterworth, Cherbuin, Sachdev, and Anstey (2012) provide further correlational evidence of the relation between financial circumstances and cognitive

function. Butterworth et al. (2012) assessed cognitive function in a sample of middle-aged Australian males using a composite measure of working memory (the ability to temporarily store and manage information [Diamond, 2013]; assessed using the Digit Span Backwards task [Wechsler, 2008]), episodic memory (the ability to remember specific events [Tulving, 2002]; assessed using an immediate recall task), and processing speed (the speed with which one is able to complete a mental task [Kail & Salthouse, 1994]; assessed using the Symbol-Digit Modalities Test [Smith, 1982]). Controlling for a number of socio-demographic variables, including socioeconomic status, the authors found that experiencing recent financial hardship (assessed in terms of having lacked basic goods and opportunities due to limited financial resources in the past year) was cross-sectionally associated with poorer cognitive function.

Previous research has also drawn links between the experience of poor financial circumstances during childhood and reduced cognitive function (Blair & Raver, 2016). For instance, correlational evidence indicates that poorer financial circumstances during childhood predict worse working memory ability among young adults in the US (Evans & Fuller-Rowell, 2013; Evans & Schamberg, 2009). Poor financial circumstances during childhood are also associated with worse performance in terms of a host of other cognitive abilities, including executive functions (mental processes employed when having to concentrate on an effortful task, including, for example, inhibitory control, cognitive flexibility, and working memory [Diamond, 2013]; Farah et al., 2005; Hackman, Gallop, Evans, & Farah, 2015; Noble, Norman, & Farah, 2005). Importantly, however, the exact processes through which childhood financial circumstances affect cognitive function are likely to be different to those underlying the links between financial circumstances and cognitive function during adulthood. Indeed, the association between childhood poverty and cognitive function is argued to be, at least in

part, due to observed relations between financial circumstances and brain development (Hanson, Chandra, Wolfe, & Pollak, 2011; Holz et al., 2015; Luby et al., 2013), which could not account for the impact of financial circumstances on cognitive function as an adult. Moreover, the link between childhood financial circumstances and cognitive function is inevitably confounded with socioeconomic status, which could affect cognitive function via factors not directly related to financial circumstances (such as parental support and environmental stimulation; Duncan & Magnuson, 2012).

**Null Findings**

Nevertheless, research on the link between financial circumstances and cognitive function has not been entirely consistent. Graves (2015) conducted an experiment using a sample of Tanzanian fishers, aiming to assess the impact of financial concern salience on cognitive function. In the treatment condition – which was intended to make financial concerns highly salient – participants were presented with a hypothetical financial problem and asked to describe how they would deal with it. In the control condition participants were presented with a non-financial hypothetical problem. All participants then completed measures of cognitive function assessing their fluid intelligence (using Raven's Progressive Matrices), inhibitory control (using a numerical Stroop task), and basic mathematic ability (using an adapted version of Niederle and Vesterlund's [2007] Productivity test). Yet, Graves (2015) found no evidence that the experimental manipulation influenced subsequent cognitive function. Nor was there any evidence that participants' material wealth moderated any effect of the experimental manipulation on cognitive function.

Additional null findings are presented by Carvalho, Meier, and Wang (2016) who examined the relations between short-term variation in financial resources and a range of cognitive outcomes. The authors surveyed a large sample of low-income

adults in the US either before or after their payday. Participants were assessed in terms of their working memory ability (using a measure in which participants had to recall increasingly large sequences of colours) and inhibitory control (using the Flanker task [Zelazo et al., 2013], the Cognitive Reflection Test [Frederik, 2005], and a numerical Stroop task). Participants also completed economic decision-making tasks assessing intertemporal choice and risk aversion. The authors anticipated that, because participants would be under greater financial strain before (compared to after) their payday, cognition function and the quality of participants' economic decisions would be worse. Yet, Carvalho et al. (2016) found no significant differences in either cognitive function or decision-making quality.

There are a number of potential explanations for this mixed evidence. Firstly, the inconsistent findings could be due to differences in the specific methods that researchers used. For example, Graves' (2015) manipulation of financial concern salience was considerably briefer than that used by Mani et al. (2013), and so may have been less effective. Also, while Mani et al. (2013) observed changes in financial circumstances and cognitive function over a period of months in their natural experiment, Carvalho et al. (2016) did so over a period of only seven days at the most. Thus, Carvalho et al. (2016) might not have observed people over a long enough period to detect any influence of financial circumstances on cognitive function.

Alternatively, these mixed findings might have occurred if the effects of financial circumstances on cognitive function are not uniform across different populations and/or contexts. For instance, that an effect of financial concern salience was found in a community sample of adults in the US (Mani et al., 2013), but not among rural workers in Tanzania (Graves, 2015), could potentially indicate cultural differences in responses to financial concerns. Further, that natural changes in financial

circumstances were linked with concomitant changes in cognitive function in Indian farmers (Mani et al., 2013), but not US adults (Carvalho et al., 2016), might suggest that objective financial circumstances have a greater impact on cognitive function in poorer populations.

**Financial Circumstances and Cognitive Function in University Students**

Given the large financial burden currently placed on university students in many countries (Kirby, 2016), students are a population for whom any detrimental impact of poor financial circumstances on cognitive function has substantial implications. However, no existing research (aside from Dang et al. [2016], where the authors examined an aspect of cognitive function unlikely to be impaired by financial concern) has investigated the links between financial circumstances and cognitive function specifically among university students. Further, there are inconsistencies in the literature suggesting that the effects of financial circumstances on cognitive function may vary by population and context (e.g., Carvalho et al. 2016; Graves, 2015). Accordingly, following the design employed by Mani et al. (2013), the initial study conducted in the current programme of research (reported in Chapter 2) aimed to examine whether an experimental manipulation of financial concern salience impacted cognitive function in a sample of undergraduate students.

**Manipulations of Financial Concern Salience**

Mani et al.'s (2013) manipulation of financial concern salience involved presenting participants with four hypothetical scenarios outlining financial problems (e.g., having to replace a kitchen appliance). After reading each scenario participants described how the financial problem would affect them and how they would deal with it. In one condition the amounts of money involved were relatively small; in the other condition, intended to make financial concerns salient, the scenarios were identical yet

involved much larger amounts of money. In contrast, Graves' (2015) manipulation of financial concern salience presented participants with only one hypothetical scenario. In the condition designed to make financial concerns salient the scenario involved a costly financial problem, yet – and again, unlike in Mani et al. (2013) – the scenario in the control condition involved a problem that was unrelated to finances.

Given the possibility that Graves' (2015) null findings may have occurred as a result of manipulation failure arising from these differences, the manipulation of financial concern salience used in the current programme of research was based on that employed by Mani et al. (2013). However, due to concerns over whether university students would be able to relate to the original scenarios (e.g., having to replace a kitchen appliance), the scenarios were adapted so they were more relevant to students (e.g., buying new textbooks). Notably, in one previous experiment that manipulated the salience of financial concern in a sample of university students (in which the authors observed an impact of the manipulation on pain tolerance), the manipulation made references to concerns specifically relevant to university students (Chou, Parmar, & Galinsky, 2016).

As the manipulation of financial concern used in the current programme of research had not been used previously, the effectiveness of the manipulation in affecting the salience of financial concern was additionally investigated. Specifically, in a separate study (also reported in Chapter 2) the impact of the experimental manipulation on the cognitive accessibility of financial concern (assessed using a word fragment completion task) in a sample of university students was examined.

**Measurement of Cognitive Function**

The effects of financial circumstances on cognitive function are argued to be wide-ranging. For instance, Gennetian and Shafir (2015) posit that the cognitive load

imposed by the experience of poor financial circumstances impacts the broad areas of attentional capacity (focusing on certain elements of one's environment whilst ignoring others), cognitive capacity (problem-solving and logical reasoning abilities, such as fluid intelligence), and executive function. Yet, it appears unlikely that different aspects of cognitive function will be affected uniformly by financial circumstances. Indeed, Dang et al.'s (2016) findings highlight that some aspects of cognition, such as proceduralised learning processes, may even be *improved* by experiencing distracting financial concerns. Accordingly, which aspects of cognitive function are assessed, and how they are measured, are important considerations.

Aspects of cognitive function previously found to be affected by experimental manipulations of financial variables include fluid intelligence (Mani et al., 2013) and inhibitory control (Mani et al., 2013; Spears, 2011). Further, naturally occurring changes in financial circumstances have been linked with concomitant changes in inhibitory control (Mani et al., 2013), and cross-sectional associations have been found between financial hardship and working memory, episodic memory, and processing speed (Butterworth et al., 2013). However, null findings have also been reported for fluid intelligence, inhibitory control, and working memory (Carvalho et al., 2016; Graves, 2015). Accordingly, the existing literature appears to give no clear indication of what specific aspects of cognitive function may be more or less susceptible to any detrimental impact of financial circumstances.

Similarly, there appears to be no clear picture regarding what measures of cognitive function are best suited to detect any influence of financial circumstances. Both Mani et al. (2013) and Graves (2015) assessed fluid intelligence using Raven's Progressive Matrices and found conflicting results. Further, while Mani et al. (2013) and Spears (2011) assessed inhibitory control using Stroop tasks and found evidence of

the impact of financial circumstances, Graves (2015) and Carvalho et al. (2016) similarly assessed inhibitory control using Stroop tasks and found no effects. Although, whereas Butterworth et al. (2013) found an association between financial hardship and cognitive function where working memory was assessed using a Digit Span task, Carvalho et al. (2016) found no link between financial circumstances and working memory when assessed using a measure in which participants had to recall increasingly large sequences of colours. This could potentially indicate that performance on Digit Span tasks may be more sensitive to the influence of financial circumstances than are other measures of working memory.

In the initial experiment within the current programme of research cognitive function was assessed in terms of two aspects of executive function: inhibitory control and working memory. These were chosen because – alongside having been used successfully in previous research to demonstrate the negative impact of financial circumstances on cognitive function (e.g., Butterworth et al., 2012; Mani et al., 2013; Spears, 2011) – both inhibitory control and working memory are considered core cognitive abilities that provide the basis for a host of more complex functions (Diamond, 2013). Accordingly, any impact of financial circumstances on either of these variables would be likely to have important downstream consequences for students' outcomes. Inhibitory control was assessed using a Stroop task: a well established measure of inhibitory control and one used successfully in previous related research (Mani et al., 2013; Spears, 2011). Working memory was assessed using the Operation Span task (Unsworth, Heitz, Schrock, & Engle, 2005), as a similar numerical span task had been utilised with success by Butterworth et al. (2012).

Later in the current programme of research (in the studies reported in Chapter 3) cognitive function was assessed only in terms of working memory and using a Digit

Span Sequencing task (Wechsler, 2008). This was because cognitive function was being assessed alongside a large number of other variables, therefore limiting the amount of data on cognitive function that was able to be collected. Further, the use of a different online survey platform meant that the Digit Span Sequencing task was able to be implemented more effectively than the Operation Span task (Unsworth et al., 2005) used in the experiment reported in Chapter 2.

## Cognitive Function and Academic Outcomes

Cognitive function is considered to be an important determinant of success within many areas of life (Diamond, 2013), including within academic settings (Blair, 2002; Kaya, Juntune, & Stough, 2015; Kuncel & Hezlett, 2010). Indeed, a large body of research indicates that various aspects of cognitive function (including, for example, working memory, inhibitory control, verbal and non-verbal reasoning, and fluid intelligence) are able to predict academic attainment in terms of test scores among adolescents (Deary, Strand, Smith, & Fernandes, 2007; Furnham, Monsen, & Ahmetoglu, 2009; Gathercole, Pickering, Knight, & Stegmann, 2004; Karbach, Gottschling, Spengler, Hegewald, & Spinath, 2013; St Clair-Thompson & Gathercole, 2006). Cognitive function is additionally supported as a predictor of academic outcomes at university level. For example, Higgins, Peterson, Pihl, and Lee (2007) provide evidence that cognitive function (assessed in terms of a battery of cognitive tasks measuring, for example spatial and non-spatial learning, working memory, and inhibitory control) predicted the average marks received by undergraduate students in the US. Similarly, Ruffing, Wach, Spinath, Brünken, and Karbach (2015) found that a composite measure of cognitive function (assessing verbal, spatial, and reasoning abilities, and perceptual speed) was cross-sectionally associated with examination performance among German undergraduates. Further, two studies provide meta-

analytic evidence that general cognitive ability is linked with average marks at university (Kuncel, Hezlett, & Ones, 2004; Richardson, Abraham, & Bond, 2012). Moreover, in a prospective longitudinal study of British undergraduates, Chamorro-Premuzic and Arteche (2008) found that a measure of fluid intelligence administered at the beginning of university was able to significantly predict average examination grades over the following four years of university. Finally, in a separate study, Chamorro-Premuzic, Furnham, and Ackerman (2006) provide evidence that cognitive ability at the beginning of university (assessed in terms of fluid and crystallized intelligence, and visual-spatial ability) was associated with average marks across the subsequent three years among undergraduate students in the United Kingdom (UK).

Thus, it appears that any impact of students' financial circumstances on cognitive function could subsequently affect academic outcomes. Indeed, impairments in cognitive function could potentially account for the observed links between university students' financial circumstances and their academic outcomes (e.g., Harding, 2011; Ross, Cleland, & MacLeod, 2006).

## Financial Circumstances and Academic Outcomes

Following is a review of evidence concerning the relations between financial circumstances and academic outcomes among university students. Issues pertaining to the measurement of financial circumstances and academic outcomes are also discussed.

### Correlational Evidence

Much existing literature indicates that poorer financial circumstances are linked with worse academic outcomes in higher education. For example, in a prospective longitudinal study Harding (2011) assessed UK undergraduates at the beginning of their first year of university, and again at the beginning of their second year. Harding (2011) found that students who started university in a better financial position (in terms of the

amount of savings and debt they had) were more likely to pass all of their first-year modules. Additionally, experiencing financial difficulties at the beginning of university in the form of a delayed student loan payment was associated with a lower average first-year mark and a reduced likelihood of students passing all modules, and these effects remained statistically significant even when controlling for prior academic performance. Similarly, in a study of undergraduate medical students at a Scottish University, Ross et al. (2006) found that worrying about money predicted poorer average examination performance for the academic year. Furthermore, Andrews and Wilding (2004) examined the longitudinal relations between financial circumstances and academic performance in UK undergraduate students. During the middle of their second year of university participants were asked whether they had experienced financial difficulties in the form of either a major financial crisis or being unable to afford basic living expenses. The authors found that experiencing such financial difficulties was associated with a negative change in examination performance from the first to the second year of university.

Importantly, however, the previously reviewed literature on the relations between financial circumstances and academic outcomes among UK students was all conducted between 2000 and 2007. Given the substantial changes to higher education funding in the UK that have occurred since then (Bolton, 2012), these findings should be applied to the present-day context with caution.

Research on US students also indicates a link between financial circumstances and academic outcomes. For example, Joo, Durband, and Grable (2008) found that financial stress (assessed using a single item measure) was associated with an increased likelihood of dropping out of university for a semester. Further, in a large sample of undergraduate students from 19 different institutions (including private, public, and

community colleges), Letkiewicz et al. (2014) examined the relation between financial stress and whether students expected to graduate from university within four years. The authors found that, controlling for demographic variables, greater financial stress (as measured using items relating to concerns about, e.g., monthly finances, paying for education, one's financial future) predicted an increased likelihood of expecting to take more than four years to graduate from university. Finally, in a prospective longitudinal study, Destin and Svoboda (2018) found that – controlling for demographic variables including family income – the amount of student debt accumulated in the first year of university predicted a negative change in self-reported average marks between the first and final years of university.

**Qualitative Evidence**

Further evidence concerning the relations between financial circumstances and students' academic outcomes is provided by qualitative research. For instance, in a study sampling undergraduate students from seven different universities in the UK, Brennan, Duaso, Little, Callender, and van Dyke (2005) found that 49% of students believed that financial concerns were having a detrimental impact on their academic performance. More recently, a survey conducted by the National Union of Students (2012) found that only 42% of English undergraduates were reportedly able to concentrate on their studies without worrying about financial problems, and 49% of students cited financial difficulties as a reason for considering leaving university.

**Financial Aid Research**

Research on the influence of financial aid additionally indicates links between students' financial circumstances and academic outcomes. In a quasi-experimental study Dynarski (2000) looked at the university attendance rates in the state of Georgia (US) both before and after the introduction of a state-wide scholarship programme.

Using neighbouring states as a control group, Dynarski (2000) found that the introduction of the scholarship was associated with a significant increase in attendance. Using a similar empirical strategy, Dynarski (2003) examined the impact of the discontinuation of a nationwide scholarship programme in the US that provided aid to students with a deceased parent. Dynarski (2003) found that the elimination of the scholarship predicted a significant decrease in attendance rates, along with a reduced likelihood of graduating from university. Similarly, controlling for a number of background variables including parental income and level of education, Chen and DesJardins (2008) found that receipt of a need-based grant was associated with a reduced likelihood of dropping out of university among US students. Further, Harrison, Baxter, and Hatt (2007) examined the effects of a need-based grant among low-income students at a UK university and found that, in comparison to students with similar backgrounds, receipt of the grant was able to predict better overall degree performance and a reduced likelihood of dropping out of university.

However, one issue with examining naturally occurring variation in the receipt of financial aid is that other systematic differences between those who receive aid and those who do not could potentially confound the results. For instance, the grant investigated by Harrison et al. (2007) was not automatically awarded to students from low-income backgrounds but had to be applied for. Accordingly, it is possible that any apparent effects of grant-receipt may instead have been due to potential pre-existing differences between those students who did and did not apply for the grant, such as differences in motivation or organisation.

Notably, avoiding the problem of potential confounds, two randomised controlled trials have assessed the impact of financial aid on academic outcomes. Brock and Richburg-Hayes (2006) investigated the effects of a grant for low-income parents at

community college in the state of Louisiana (US). Eligible students were randomly assigned to conditions where they either received, or did not receive, the grant. Brock and Richburg-Hayes (2006) found that receipt of the grant had a positive impact on the number of courses passed and students' average marks. Additionally, Goldrick-Rab, Harris, Kelchen, and Benson (2012) examined the effects of a need-based grant in 13 public universities in the US, and found that grant receipt, which was randomly assigned among eligible students, reduced the likelihood that students would drop out of university and improved students' average marks.

**Null and Mixed Findings**

Yet, research on the links between students' financial circumstances and academic outcomes is mixed, with some studies having produced null findings. For instance, in a study on university students in New Zealand, Zhang and Kemp (2009) found no evidence of a cross-sectional association between the amount of debt students held and their average marks for the academic year. Similarly, Ross et al. (2006) found there was no significant relation between the total amount of debt students had accrued and examination performance in a sample of undergraduates at a Scottish university. Further, while Dwyer, McCloud, and Hodson (2012) found that higher levels of educational debt predicted a reduced likelihood of graduating from university in the US, the amount of debt students held was actually positively associated with graduation rates at lower levels of debt (below approimately $10,000).

Thus, the relation between students' financial circumstances and academic outcomes appears to be nuanced. Indeed, both 'financial circumstances' and 'academic outcomes' are broad terms and it is probable that the nature of the relations between them depend, in part, on the operationalisation of each.

**Measurement of Students' Financial Circumstances**

Students' financial circumstances may be operationalised in a number of different ways. More objective indicators of financial circumstances include, for example, the amount of debt students currently have, how much debt students expect to have accrued upon graduating, and whether students have experienced specific financial difficulties (such as being unable to pay bills). In contrast, more subjective indicators of financial circumstances include, for example, the amount of concern, stress, or worry that students experience regarding their financial situation.

The existing literature indicates that both objective and subjective financial indicators are linked with academic outcomes (e.g., Harding, 2011; Letkiewicz et al., 2014). Yet, there is some evidence suggesting that students' subjective appraisals of their financial circumstances may be more closely linked with academic outcomes than are more objective financial variables. For example, although Hixenbaugh, Dewart, and Towell (2012) found no association between final degree outcome and the amount of debt held in a sample of UK undergraduates, better degree outcomes were associated with experiencing less concern over one's financial circumstances. Additionally, while Ross et al. (2006) found no evidence of a link between examination marks and the amount of debt held in a sample of undergraduates at a Scottish university, poorer examination marks were correlated with greater worry about finances. Accordingly, in the two studies reported in the current programme of research in which the relations between students' financial circumstances and their academic outcomes were assessed (both reported in Chapter 3), the subjective experience of financial concern was utilised as the independent variable.

**Measurement of Academic Outcomes**

As with financial circumstances there are a number different ways in which academic outcomes may be operationalised. Previous research on the links between financial circumstances and academic outcomes has assessed such varied outcomes as, for example, average marks (Harding, 2011), dropping out of university (Joo et al., 2008), attendance rates (Dynarski, 2003), and the number of courses passed (Brock & Richburg-Hayes, 2006). Additionally, academic outcomes may be operationalised in terms of psychological outcomes such as academic self-efficacy and motivation (e.g., Reed & Hurd, 2016).

It appears unlikely that the effects of students' financial circumstances will be uniform across all such academic outcomes. Further, it is plausible that different academic outcomes may be more or less sensitive to any influence of students' financial circumstances. Average marks may be considered a key indicator of achievement within academic contexts, and are also relatively well established as an outcome linked with students' financial circumstances (Andrews & Wilding, 2004; Brock & Richburg-Hayes, 2006; Destin & Svoboda, 2018; Goldrick-Rab et al., 2012; Harding, 2011). Accordingly, the primary academic outcome assessed within the current programme of research was chosen to be students' average marks. Constraints on data collection meant that average marks were self-reported. While such self-report measures are inevitably subject to measurement error, a meta-analysis conducted by Kuncel, Credé, and Thomas (2005) found a very high correlation between self-reported and actual academic performance among university students (see also Sticca et al., 2017).

In the second study reported in Chapter 3 students' intrinsic academic motivation was additionally assessed, which may be defined as motivation driven by the inherent satisfaction of achieving goals (Dev, 1997). While there appears to be no

existing research directly linking students' financial circumstances with intrinsic academic motivation, there is previous literature indicating that experiencing financial difficulties may have a detrimental impact on intrinsic motivation generally (Dupuis & Newby-Clark, 2016). Further, qualitative research among Australian undergraduates suggests that better financial circumstances may be linked with improvements in academic motivation (Reed & Hurd, 2016). Moreover, intrinsic academic motivation is argued to be an important determinant of students' achievement at university (Dev, 1990; Gottfried, 1990; Spinath, Spinath, Harlaar, & Plomin, 2006), and has indeed been found to predict academic performance at university (Kusurkar, Ten Cate, Vos, Westers, & Croiset, 2013; Richardson et al., 2012).

## Other Potential Mediators

While the existing literature provides convincing evidence that students' financial circumstances are linked with academic outcomes, very little research appears to have investigated potential mediating pathways underlying this relation. As previously discussed, one potential mediator is cognitive function. Yet, there is additional evidence indicating that the link between students' financial circumstances and academic outcomes could be mediated by stress, belonging and social identification at university, mental and physical health, working alongside studying, and self-regulation variables. This section provides a review of the evidence for each of these potential mediating pathways. For each potential mediator evidence relating to the impact of (i) financial circumstances on the potential mediator, and (ii) the potential mediator on academic outcomes, is reviewed. For mental health direct evidence concerning mediation is also presented.

## Stress

**The impact of financial circumstances on stress.** Poor financial circumstances can be an important source of stress. Indeed, in a study on hospital staff in the US, Bailey, Woodiel, Turner, and Young (1998) found that half of the variance in overall self-reported stress could be accounted for by the experience of financial difficulties. Additionally, a natural experiment on low-income Kenyans provides evidence that negative income shocks lead to higher self-reported stress, as well as heightened levels of the hormone cortisol (indicative of a stress response; Chemin, de Laat, & Haushofer, 2013). Similarly, Steptoe, Brydon, and Kunz-Ebrecht (2005) found that improvements in the experience of financial strain over a three year period were associated with a significant concomitant reduction in cortisol levels in British adults. Further, in a sample of adult Australian males, Butterworth et al. (2012) provide evidence that experiencing recent financial hardship (in terms of lacking access to basic goods and opportunities) was associated with structural differences in the brain that were consistent with a stress response (such as smaller hippocampal and amygdalar volumes).

Poor financial circumstances are also highly prevalent as a source of stress among university students. For example, in a national sample of graduate students in the US, El-Ghoroury, Galper, Sawaqdeh, and Bufka (2012) found that 64% of students cited ‘finances or debt’ as a stressor that at least moderately disrupted their personal or professional functioning. El-Ghoroury et al. (2012) additionally found that ‘cost’ was the second most commonly cited barrier against using various coping strategies to deal with stress. Similarly, in a large sample of students from multiple institutions in the US, Heckman, Lim, and Montalto (2014) found that 71% of participants reported experiencing stress resulting from their personal financial circumstances. Likewise,

71% of undergraduate students at a US university cited financial difficulties as a source of stress (Ross, Neibling, & Heckert, 1999). Moreover, Norvilitis et al. (2006) found evidence of a cross-sectional association between the amount of credit-card debt held and self-reported stress in a multi-institution sample of university students in the US. Finally, in a sample of British undergraduates, Richardson, Elliot, Roberts, and Jansen (2017) found that greater financial difficulties (assessed using an eight item measure investigating, for example, whether students had missed mortgage or rent payments in the past six months due to a shortage of money) predicted greater self-reported stress cross-sectionally.

**The impact of stress on academic outcomes.** In turn, stress is considered an important determinant of academic outcomes at university. For example, in a cross-sectional survey of medical students in the US, Linn and Zeppa (1984) found that higher self-reported stress predicted poorer performance in examinations. Similarly, greater reported stress is found to correlate cross-sectionally with worse average grades among medical students in both Korea (Park et al., 2012) and Pakistan (Sohail, 2013), while a meta-analysis conducted by Richardson et al. (2012) found that general stress had a significant negative relation with university students' average grades. Additionally, Huang, Lv, and Wu (2016) provide evidence that higher self-reported stress is cross-sectionally associated with lower intrinsic academic motivation among Chinese undergraduate students.

Experimental evidence also indicates that stress can influence academic outcomes at university. Lumley and Provenzano (2003) investigated the effects of a stress-management intervention involving written emotional disclosure. Participants (US undergraduate students reporting symptoms of ill physical health) were randomly allocated to conditions where they either completed the emotional disclosure

intervention, or wrote about time management (the control condition). Lumley and Provenzano (2003) found that, controlling for average grades at baseline, participants who completed the stress-management intervention showed significantly higher average marks over the subsequent semester. Keogh, Bond, and Flaxman (2006) provide similar experimental evidence that a stress-management intervention (based on the principles of cognitive behavioural therapy) had a positive impact on the examination performance of British secondary school students.

## Belonging and Social Identification

Sense of belonging at university may be defined as the extent to which students feel accepted and supported by others (Goodenow, 1993), while social identification with other students is the awareness of, and investment in, a shared social identity (Bliuc, Ellis, Goodyear, & Hendres, 2011). These variables are closely aligned with others such as integration and engagement at university. Indeed, belonging has been conceptualised as students' subjective sense of integration within the social and academic systems of their institution (Hausmann, Schofield, & Woods, 2007; Hoffman, Richmond, Morrow, & Salomone, 2002), and of their engagement in both social and academic activities (Thomas, 2012). Accordingly, alongside belonging and social identification, this section also reviews evidence concerning students' integration and engagement at university.

**The impact of financial circumstances on belonging and social identification.** Prior research indicates that students' financial circumstances play a role in determining variables such as their sense of belonging and social identification at university. For example, in a study sampling graduate students at a US institution, Ostrove, Stewart, and Curtin (2011) found that greater self-reported financial difficulties (assessed using a single-item measure) were cross-sectionally associated with a lower

sense of belonging at university. Additionally, in a qualitative study conducted with Australian undergraduates, interviews revealed that the receipt of financial aid was linked with an enhanced sense of belonging at university, reported to have occurred because of the greater availability of time for socialising and connecting with peers (Reed & Hurd, 2016). Further, cross-sectional research on US undergraduates has found that the experience of financial strain correlates with lower social and academic integration (assessed in terms of, e.g., social isolation, familiarity with campus; Adams, Meyers, & Beidas, 2016) and being in debt is associated with lower levels of engagement in social activities with peers (Quadlin & Rudel, 2015). Two quasi-experimental studies have also examined the influence of financial circumstances on student engagement among university students in the US. Hu (2008) found that receipt of a scholarship was linked with greater academic and social engagement in terms of, for example, working with students and faculty outside of classes, participation in extra-curricular activities. Similarly, Boatman and Long (2016) provide evidence that the receipt of a scholarship was associated with greater student engagement in terms of contact with peers and involvement in on- and off-campus activities.

**The impact of belonging and social identification on academic outcomes.** A large body of research additionally links students' sense of belonging and level of social identification at university, along with related variables, to a range of academic outcomes (for reviews see Cohen and Garcia [2008], Parkes [2014], and Thomas [2012]). Experimental evidence for the impact of belonging on academic outcomes is provided in a series of studies by Walton and colleagues. Walton and Cohen (2007) induced a low sense of belonging among university students using a manipulation which led students to question how many friends they had within their academic field. The authors found that, compared to a control condition, the inducement of low

belonging caused ethnic minority students to feel they had less potential to succeed at university. Walton and Cohen (2007) also examined the impact of an intervention intended to mitigate low belonging, in which potential doubts about belonging were portrayed as common to students from all types of backgrounds. The authors found that the intervention had a beneficial effect on ethnic minority students' belief in their potential to succeed in their studies, increased students' contact with faculty and the amount of time spent studying, and improved average marks over the subsequent semester. Additionally, Walton and Cohen (2011) investigated the effects of a manipulation whereby students were encouraged to view adversity as temporary and common to all students, instead of as an indicator that they did not belong at university. The authors found the intervention served to increase the average marks of ethnic minority students, and the effects remained evident over the following three years at university. Finally, Walton, Logel, Peach, Spencer, and Zanna (2015) administered an intervention informing students that, while it was common for many students to have initial doubts about whether they belong, most students go on to develop a strong sense of belonging at university. Among women enrolled on typically 'male-dominated' courses, the authors found that the intervention improved students' confidence that they could succeed on their course, and improved their average first-year marks.

Much cross-sectional research conducted among undergraduates in the US also links belonging with academic outcomes. For instance, associations have been found between students' sense of belonging and average marks (Ostrove & Long, 2007; Pittman & Richmond, 2007; Zumbrunn, McKim, Buhs, & Hawley, 2014), academic self-efficacy (Freeman, Anderman, & Jensen, 2007; Pittman & Richmond, 2007; Zumbrunn et al., 2014), academic self-concept (Ostrove et al., 2011), and academic motivation (Freeman et al., 2007; see also Suhlmann, Sassenberg, Nagengast, &

Trautwein, 2018). Further, in a prospective longitudinal study, a low sense of belonging has been associated with significant decreases in average marks over the following three semesters among US undergraduate students (Layous et al., 2017). Additionally, in a sample of undergraduate psychology students in Romania, Bliuc et al. (2011) found that greater social idenficiation with other psychology students was a significant predictor of students' final mark for their course. In a longitudinal study of German undergraduate students, Janke, Rudert, Marksteiner, and Dickhäuser (2017) similarly found that, controlling for prior academic performance, higher levels of social identification at university predicted positive changes in test anxiety and satisfaction with studying over time. Cross-sectional associations between social identification at school and test performance have also been found among younger students aged 11 to 16 (Reynolds, Lee, Turner, Bromhead, & Subasic, 2017; see also Maxwell, Reynolds, Lee, Subasic, & Bromhead, 2017). Further, higher levels of social integration at university (assessed in terms of the amount of informal contact with peers and faculty) are associated with a lower likelihood of dropping out of university among US students (Napoli & Wortman, 1998). Similarly, among students at a UK institution, Hixenbaugh et al. (2012) found that a lower sense of integration at university was associated with considering dropping out.

## Mental and Physical Health

**The impact of financial circumstances on mental and physical health.** The link between poorer financial circumstances and worse health is well established in non-student populations (for reviews see Fitch, Chaplin, Trend, and Collard [2007] and Turunen and Hiilamo [2014]). Bridges and Disney (2010) found that self-reported financial stress was cross-sectionally associated with a higher risk of depression among British adults. Similarly, in a large sample of adults in England, Meltzer, Bebbington,

Brugha, Farrell, and Jenkins (2012) provide evidence that, controlling for a number of demographic and economic factors, experiencing financial difficulties (in the form of having missed either rent, mortgage payments, or utility bills) is a risk factor for a number of common mental disorders, including depression, anxiety, OCD, and panic disorders. Additionally, among US adults, being in debt and experiencing greater economic hardship are found to cross-sectionally predict anxiety, and economic hardship is additionally correlated with increased depressive symptoms (Drentea & Reynolds, 2015). A meta-analysis of 65 studies conducted by Richardson, Elliot, and Roberts (2013) further indicates that significant relationships exist between personal unsecured debt and depression, suicide rates, and neurotic and psychotic disorders. Moreover, in terms of physical health, a longitudinal study conducted by Lynch, Kaplan, and Shema (1997) found that the number of times US adults experienced economic hardship (defined as having a total household income less than twice the federal poverty level) over a 17 year period predicted difficulties in completing daily activities. Finally, controlling for factors including socioeconomic status and prior physical health, poorer financial circumstances (assessed in terms of the ratio of personal debt to available assets) have been found to predict worse self-reported general health among US adults (Sweet, Nandi, Adam, & McDade, 2013).

The relationships between financial circumstances and health also hold among university students. For instance, Carney (2000) found that the amount of debt accrued by students at a Scottish university was cross-sectionally associated with poorer health in terms of both the mental and physical health composite subscales of the Short Form 36 Health Survey (SF-36; Jenkinson, Layte, Wright, & Coulter, 1996). Additionally, in a sample of British undergraduate students, Cooke, Barkham, Audin, Bradley, and Davy (2004) found that those students who reported experiencing greater financial concerns

and worry about debt displayed significantly poorer mental health (in terms of a composite measure of psychological functioning, problems, and well-being), and that these relationships held across all three years of university. Further, Northern et al. (2010) discovered correlations between a 22-item measure of financial stress and poorer mental and physical health among students at a British university, as indicated on a number of subscales of the SF-36. Similarly, in a sample of British undergraduates, Roberts, Golding, Towell, and Weinreb (1999) found that considering leaving university due to financial reasons was predictive of poorer mental and physical health in term of psychiatric disturbance and SF-36 subscales including general health perceptions, bodily pain, and physical functioning (see also Roberts et al., 2000). Jessop, Herberts, and Solomon (2005) conducted a cross-sectional study on British and Finnish undergraduate students. The authors found that financial concern (assessed using a six-item self-report measure) predicted the following subscales of the SF-36: physical functioning, role limitations due to emotional problems, social functioning, mental health, energy/vitality, pain, and general health perceptions. Moreover, where the amount of debt students held predicted poorer health, this appeared to be mediated by the subjective experience of financial concern. Finally, in a study on US undergraduates, Adams et al. (2016) found that financial strain (assessed in terms of whether students believed they had enough money to live on, and how their financial situation compared to their peers) was cross-sectionally associated with the likelihood of experiencing a range of psychological symptoms.

Research utilising longitudinal designs also indicates that financial circumstances may negatively influence students' health. For instance, in a study assessing British undergraduate students at four time points throughout an academic year, Richardson et al. (2017) found that greater subjective stress about debt predicted

detrimental changes in both anxiety and global mental health over time. Further, Reid, Jessop, and Solomon (2018) discovered that self-reported financial concern among students at a UK university was associated with negative changes on a number of indicies of mental and physical health (including, for example physical health problems, social functioning, mental health, and general health perceptions) across an eight week period. Finally, Richardson, Yeebo, Jansen, Elliot, and Roberts (2018) assessed UK undergraduates at three time points across their first academic year. Controlling for demographic variables, including socioeconomic status, Richardson et al. (2018) found that experiencing financial difficulties at baseline predicted an increase in the risk of psychosis over time.

**The impact of mental and physical health on academic outcomes.** In turn, health is considered to be an important determinant of success within academic settings (Novello, Degraw, & Kleinman, 1992; Powney, Malcolm, & Lowden, 2000). For example, among university students in the UK, experiencing health complaints and sleep problems are found to predict lower average marks cross-sectionally (El Ansari & Stock, 2010), and poorer physical health (assessed using the SF-36) is associated with an increased likelihood of considering dropping out of university (Hixenbaugh et al., 2012). Additionally, in a study on US undergraduates, Weissman et al. (2016) reports that poorer psychological health was cross-sectionally associated with considering dropping out of university and poorer attendance rates. Further, utilising cross-sectional data from a large sample of university students across 26 countries, Peltzer and Pengpid (2014) found that better mental health (in terms of either depressive symptoms or sleep problems) predicted better self-reported academic performance. Research also indicates that greater depressive symptoms are correlated with poorer average marks among undergraduate students in the US (DeRoma, Leach, & Leverett, 2009), Jordan (Al-

Qaisy, 2011), and Mexico (Morales et al., 2013). Moreover, a longitudinal study conducted by Eisenberg, Golberstein, and Hunt (2009) found that greater depression and anxiety among US undergraduates was associated with negative changes in average marks over time, and that greater depression was additionally associated with an increased risk of dropping out of university.

**Evidence of mediation.** Importantly, two studies provide evidence indicating that one aspect of mental health, depression, serves to mediate the link between university students' financial circumstances and their academic performance. Andrews and Wilding (2004) conducted a longitudinal study on UK undergraduate students. The authors found that depressive symptoms during the middle of students' second year of university mediated the relation between financial difficulties at the beginning of university and a negative change in examination performance from the first to the second year. Further, in a sample of minority students recruited from five universities in the US, Keels, Durkee, and Hope (2015) found that depressive symptoms mediated the cross-sectional association between financial distress (assessed in terms of self-reported difficulty in paying bills, and concern over not being able to afford things) and students' average marks.

## Working Alongside Studying

**The impact of financial circumstances on working alongside studying.** Existing literature indicates that students' financial circumstances may influence the extent to which they work in paid employment alongside studying. For example, in a cross-sectional study on undergraduate students at two universities in the UK, Aldrovandi, Wood, Maltby, and Brown (2015) found that the amount of debt students believed they had relative to their peers predicted students' intentions to undertake paid employment. Moreover, Broton, Goldrick-Rab, and Benson (2016) report the results of

an experiment sampling US students from low-income backgrounds, in which the receipt of financial aid (in the form of a non-repayable grant) was randomly allocated among eligible students. The authors found that financial aid caused students to be less likely to work in paid employment alongside studying, and to work fewer hours. Similarly, in a quasi-experimental study on US undergraduates, DesJardins, McCall, Ott, and Kim (2010) provide evidence that the receipt of financial aid is associated with working fewer hours in paid employment. Additionally, among UK undergraduates, those from less privileged backgrounds (assessed in terms of whether students went to private or state schools) are found to be more likely to work alongside studying at university (Humphrey, 2006), and those students from poorer economic backgrounds are also found to work significantly more hours in paid employment in both the UK (National Union of Students, 2012) and the US (Soria, Weiner, & Lu, 2014).

**The impact of working alongside studying on academic outcomes.** Research additionally shows that working alongside studying may have a detrimental impact on academic outcomes at university. In a large sample of undergraduate students from multiple UK institutions Callender (2008) found that, controlling for prior academic performance, working alongside studying cross-sectionally predicted lower attendance, lower average marks, and worse overall degree outcomes. Similarly, Brennan et al. (2005) conducted a study on final year undergraduate students across seven universities in the UK. Controlling for previous academic performance, the authors found evidence of a significant association between the number of hours students worked in paid employment during term-time and their academic performance, in terms of both students' average mark for the year and their final degree outcome. Additionally, in a representative national sample of undergraduates studying in the US, Mendoza (2012)

found that working more than 30 hours a week in paid employment was cross-sectionally associated with taking longer to graduate from university.

It has been suggested that working alongside studying may affect academic outcomes primarily because it can reduce the amount of time available for academic activities (e.g., DesJardins et al., 2010; Goldrick-Rab, Harris, & Trostel, 2009). In line with this, Brennan et al. (2005) found more than 80% of their sample of UK undergraduates who worked alongside studying believed they spent less time studying because of their paid employment. Further, Callender (2008) found that working alongside studying was associated with spending fewer hours studying.

## Self-regulation and Self-control

### The impact of financial circumstances on self-regulation and self-control.

Previous research suggests that poor financial circumstances may impair university students' ability to self-regulate, which can be defined as making goal-directed changes to thought and behaviour (Vohs & Baumeister, 2011), including the ability to exert self-control (inhibiting otherwise automatic thoughts and actions [Baumeister, Vohs, & Tice, 2007]). The link between financial circumstances and self-regulatory ability could exist for a number of reasons. Firstly, self-control has been conceptualised as a limited resource, whereby exertion is followed by a phase of reduced capacity and therefore a higher likelihood of self-regulatory failure (Muraven, Tice, & Baumeister, 1998). Accordingly, on the basis that poor financial circumstances often force people to make difficult decisions and tradeoffs that can require self-control, it is suggested they can effectively reduce the capacity for self-regulation (Spears, 2011; Vohs, 2013).

Secondly, basic cognitive abilities – such as executive functions – are argued to provide the foundation for self-regulatory behaviour (Hofmann, Schmeichel, & Baddeley, 2012). Indeed, Hofmann, Gschwendner, Friese, Wiers, and Schmitt (2008)

found that individual differences in working memory capacity predicted differences in self-regulatory behaviour (in terms of sexual behaviour and food consumption) among German undergraduate students. Further, inhibitory control is considered to provide the foundation for exerting self-control (Hofmann et al., 2012). Thus, given that poorer financial circumstances are supported as having a negative influence on aspects of cognitive function such as working memory and inhibitory control (e.g., Butterworth et al., 2012; Mani et al., 2013), it therefore appears that such effects could subsequently impact self-regulatory behaviour.

Finally, experiencing stress has been claimed to impair the ability to self-regulate (Muraven & Baumeister, 2000). Drawing again on the limited resource model of self-control, Oaten and Cheng (2005) posit that – because experiencing stress can require, for example, suppressing emotional responses, and regulating attention – it places a high demand on self-regulatory resources. In turn, this is argued to lead to a higher likelihood of subsequent self-regulatory failure. In line with this, Oaten and Cheng (2005) provide cross-sectional evidence that university students experiencing high levels of stress (in the form of examination stress) displayed significantly poorer self-regulation, both in terms of performance on a stroop task and in day-to-day behaviour. Further, Maier, Makwana, and Hare (2015) conducted an experiment looking at the impact of an experimental inducement of stress (using a socially evaluated cold pressor task) on self-control. The authors found that the inducement of stress resulted in poorer self-control, as assessed in terms of the preference for healthy or unhealthy foods. Therefore, on the basis that poorer financial circumstances are linked with increased stress among students (e.g., Richardson et al., 2017), it appears this could also lead to impairments in self-control and self-regulation.

**The impact of self-regulation and self-control on academic outcomes.** In turn, the ability to self-regulate is considered to be an important determinant of performance within academic settings (Englert, Zavery, & Bertrams, 2017), including at university level (Cassidy, 2011). Indeed, in a sample of undergraduate students in the US, Tangney, Baumeister, and Boone (2004) found that a self-report measure of self-control was correlated with higher average marks. Similarly, controlling for academic performance prior to starting university, Honken, Ralston, and Tretter (2016) found that greater self-control predicted higher average marks for US undergraduate students' first semester. Additionally, a meta-analysis conducted by Richardson et al. (2012) indicates that the use of self-regulatory learning strategies is positively related to university students' average marks. Moreover, an experiment assessing the effects of an intervention intended to foster self-regulation among adolescents – in which students were taught how to use a number of self-regulatory skills – found that it had a positive impact on test scores (Doostian et al., 2014; see also Gagne & Nwadinobi, 2018).

## Research Designs

### Cross-sectional and Longitudinal Correlational Designs

To examine the potential mediating pathways underlying the relationship between university students' financial circumstances and academic outcomes, cross-sectional and longitudinal correlational studies (both reported in Chapter 3) were conducted. The use of cross-sectional data to analyse mediational processes is common within psychology, and cross-sectional data can provide useful information about the relations between variables at a single moment in time (MacKinnon, 2008). However, there are limitations to analysing mediation using cross-sectional data. Primarily, because one requirement of mediation is that effects occur over time, attempting to model such effects using cross-sectional data essentially results in miss-specification,

which can bias parameter estimates (Gollob & Reichardt, 1991; Maxwell & Cole, 2007). Moreover, depending on a number of factors, this bias can lead to either over- or under-estimates of the true mediational effects, and the circumstances under which dynamic mediation processes can be estimated accurately using cross-sectional data are rare (Maxwell & Cole, 2007). In contrast, because longitudinal designs allow for the statistical control of prior levels of variables they are typically less biased and produce more accurate estimates of potential causal effects (MacKinnon, 2008; Maxwell & Cole, 2007), and longitudinal designs therefore serve as a valuable complement to initial cross-sectional research. Accordingly, after the initial cross-sectional study investigating mediators of the relation between financial circumstances and academic outcomes, a follow-up longitudinal study was conducted.

**Correlational and Experimental Designs**

Correlational research is useful for exploring the relationships between variables, particularly because large amounts of data are often able to be collected. Further, because naturally occurring relations between variables are being investigated, correlational research can be argued to have good ecological validity (Field, 2009). However, although longitudinal correlational designs offer many benefits over cross-sectional designs in terms of being able to provide relatively stronger and more accurate indications of potential causal pathways, even longitudinal correlational designs are unable to provide definitive evidence of causality. Indeed, it still remains that unmeasured variables related to both the independent and dependent variables could confound the results and give rise to spurious associations (Maxwell & Cole, 2007). Therefore, while the sometimes artificial nature of experimental research means it can be argued to lack ecological validity, that experimental research is able to provide

evidence regarding causality means it represents a useful way to investigate further the relationships identified in correlational research (Miller, O'Bannon, & Melvin, 1980).

The correlational studies conducted in the current programme of research consistently identified students' sense of belonging at university as a mediator of the link between financial concern and academic outcomes. Accordingly, the final study of the current programme of research (reported in Chapter 4) was an experiment aimed at investigating one part of this mediational process: the impact of financial concern salience on students' sense of belonging at university.

## Overview of the Current Programme of Research

The programme of research presented in this thesis aimed to identify consequences of financial concern among university students, and to examine mediating variables underlying the apparent influence of financial concern on academic outcomes.

Initially, whether the experience of financial concern impacted students' cognitive function was investigated. Accordingly, Chapter 2 reports a study examining whether an experimental manipulation of financial concern salience affected inhibitory control and working memory in a sample of undergraduates at a UK university. Also reported in Chapter 2 is a supplementary experiment investigating whether the manipulation of financial concern salience used in the main study effectively influenced the cognitive accessibility of financial concern, as measured using a word fragment completion task.

Chapter 3 reports two correlational studies examining potential mediating pathways underlying the relations between students' financial circumstances and their academic outcomes. The potential mediating variables examined included cognitive function, stress, sense of belonging at university, social identification with other students, mental and physical health, the number of hours spent in paid employment,

self-regulation, and self-control. The first study reported in Chapter 3 utilised path analysis to examine potential mediators of the cross-sectional association between financial concern and academic performance among UK undergraduate students. The second study reported in Chapter 3 served two purposes. The first purpose was to provide a confirmatory test of the respecified path model developed in the first study. The second purpose was to identify and assess mediators of the longitudinal associations between financial concern and academic outcomes among UK undergraduate students.

The correlational studies provided consistent evidence that students' sense of belonging at university mediated the link between financial concern and academic outcomes. Following, the programme of research aimed to examine whether a causal link could be established between financial concern and students' sense of belonging at university. Accordingly, the study reported in Chapter 4 investigated whether an experimental manipulation of financial concern salience affected UK undergraduate students' sense of belonging at university.

Chapter 5 provides a summary of the findings presented in the thesis, together with a discussion of the theoretical and practical implications. Relevant limitations are also discussed, and potential avenues for future research are suggested.

# Chapter 2. Financial Concern and Cognitive Function in University Students

## Abstract

Financial concern has previously been shown to impair cognitive function. The present pre-registered research aimed to explore whether making financial concern salient would similarly impair working memory and inhibitory control among students. Such effects could potentially help to explain the apparent detrimental impact of student debt and associated concerns on academic performance. At baseline, participants (university students) completed measures assessing their financial circumstances, including their current amount of debt and financial concern. In the main study, participants ($N$ = 101) were randomly allocated to complete a writing task designed to induce either high or low financial concern salience. They subsequently completed Ospan and Stroop tasks, assessing working memory and inhibitory control, respectively. Contrary to findings in non-student samples, and regardless of students' financial circumstances, financial concern salience did not affect cognitive function. Further, a supplementary study ($N$ = 197) demonstrated the experimental manipulation was able to influence financial concern salience, therefore indicating the null findings in the main study were unlikely to be attributable to manipulation failure. Our findings suggest the detrimental effects of financial concern salience on cognitive function may not be uniform across different populations and applied settings.

Current undergraduate students in England are estimated to graduate with an average debt greater than £50,000 (Belfield et al., 2017), representing one of the highest levels of educational debt worldwide (Kirby, 2016). Aside from the economic consequences of this debt, research has linked worse financial circumstances to poorer academic outcomes among university students. For example, financial difficulties have been associated with worse exam performance (Andrews & Wilding, 2004) and lower average marks (Harding, 2011). Furthermore, reports of financial stress impairing studying are common (Brennan et al., 2005; Ross et al., 2006), with only 42% of UK undergraduate students surveyed in the 2011/12 academic year reporting being able to concentrate on studying without worrying about financial problems (National Union of Students, 2012).

Despite the large number of studies evidencing a relationship between students' financial circumstances and their academic performance, there is a relative lack of research exploring *how* finances might impair academic performance. Drawing on research concerning the cognitive consequences of resource scarcity, the present study investigated one potential explanation. We sought to examine whether financial concern salience might negatively impact cognitive function among university students.

**The Cognitive Consequences of Scarcity**

Experiencing scarcity of a given resource, such as money, is argued to focus cognitive and attentional resources on attempting to deal with that scarcity (Mullainathan & Shafir, 2013). This cognitive load temporarily reduces the cognitive resources available for dealing with concerns in other areas of life, such as academic work. More specifically, experiencing scarcity is argued to impair such aspects of cognition as: attention, fluid intelligence (defined as the ability to think and reason abstractly), and executive functions such as working memory (the ability to hold

information in mind and mentally work with it) and inhibitory control (the ability to control attention, behaviour, thoughts, or emotions to override a more automatic response; Diamond, 2013; Gennetian & Shafir, 2015; Mullainathan & Shafir, 2013). All of these aspects of cognitive ability have the potential to influence academic outcomes.

In support of the detrimental cognitive effects of resource scarcity, experimentally induced financial concern has been found to influence cognitive function. In a series of experiments, Mani et al. (2013) asked a sample of shoppers in a US mall to imagine how they would be affected by a series of hypothetical financial problems. In one condition the financial problems involved relatively large monetary amounts, which were intended to make financial concerns salient. In the other condition the financial problems involved relatively small amounts, which were intended to *not* evoke financial concerns. Participants then completed a measure of fluid intelligence (Raven's Progressive Matrices), and a spatial incompatibility task assessing inhibitory control. The authors found that financial concern salience led to significantly worse performance on both cognitive tasks. Importantly, however, this effect was moderated by participants' financial circumstances, such that financial concern salience only impaired cognitive function among participants with poorer financial circumstances. Further evidence for the detrimental impact of experimentally induced financial pressure on cognitive outcomes is provided by an experiment in which making difficult economic decisions impaired inhibitory control (assessed using a Stroop task; Spears, 2011).

Furthermore, naturally occurring changes in financial circumstances have also been shown to predict cognitive function. For example, Mani et al. (2013) found that fluid intelligence and inhibitory control (assessed using Raven's Progressive matrices

and a Stroop task, respectively) were demonstrably poorer when participants were under greater financial pressure. Similarly, experiencing recent financial hardship has been shown to predict poorer cognitive function in terms of memory and processing speed (Butterworth et al., 2012).

Research findings on the link between financial scarcity and cognitive function are mixed, however, with some studies producing null findings. For example, in an experiment using a sample of Tanzanian fishers, making high financial concern salient was found to have no significant impact on cognitive function (in terms of fluid intelligence and inhibitory control; Graves, 2015). Additionally, Carvalho et al. (2016) found no evidence that working memory and inhibitory control were poorer before (compared to after) participants' payday.

**Aims of the Present Research**

If financial concern salience was shown to impair aspects of cognitive function likely to be important for academic outcomes, this might help to explain the apparent association between students' financial circumstances and their academic performance (e.g., Harding, 2011). To date, however, no research appears to have explored whether making financial concern salient might have adverse consequences for cognitive function among students. Accordingly, the first aim of the present research was to explore whether experimentally manipulated financial concern salience would have negative implications for cognitive function among university students.

In addition, given that Mani et al. (2013) found a negative effect of financial concern salience on cognitive function only among participants with poorer financial circumstances, it is plausible that financial concern salience may similarly only impair cognitive function for students experiencing poorer financial circumstances. Therefore,

a second aim of the current research was to investigate whether financial circumstance moderated any impact of financial concern salience on outcomes.

## Study 1

Following a similar research design to that employed by Mani et al. (2013), Study 1 sought to explore (a) whether financial concern salience impaired cognitive function, and (b) whether any effects were moderated by students' financial circumstances. That is, we investigated both whether high financial concern salience negatively impacted working memory and inhibitory control, and whether any such effects were particularly apparent for (or restricted to) those students with poorer financial circumstances.

We elected to explore one objective indicator of students' financial circumstances (amount of debt) and one subjective indicator (baseline financial concern) as potential moderators. We used working memory and inhibitory control as indicators of cognitive function as they are both considered to be core abilities which provide the foundations for many more complex cognitive functions (Diamond, 2013). As such, impairments in working memory and inhibitory control are likely to have important and wide-ranging effects on academic outcomes (St Clair-Thompson & Gathercole, 2006).

Specifically, we predicted that:

*Hypothesis 1:* High financial concern salience would impair cognitive function, such that participants in the *high financial concern salience* condition would display poorer working memory and inhibitory control.

*Hypothesis 2:* Financial circumstance would moderate the impact of financial concern salience on cognitive function, such that the negative impact of high

financial concern salience would be greater for those students with more debt or higher baseline financial concern.

## Method

### Design and Procedure

The study employed an independent-measures design with two levels of the experimental manipulation: *low financial concern salience* and *high financial concern salience*. The whole of the present study was completed online. Prior to the main study, participants filled out a baseline survey assessing demographic information and financial circumstances. Within one week of completing the baseline survey, participants were emailed a link to the main study. When participants followed the link they were randomly allocated to either a *low financial concern salience* ($n$ = 50) or a *high financial concern salience* ($n$ = 51) condition by the host website. After completing the corresponding manipulation, all participants undertook two cognitive tasks assessing working memory and inhibitory control.

Participants were recruited via a university subject pool database, and took part in return for course credit. Before taking part, participants were informed that the study involved a financial decision-making task, followed by two 'brain training' type tasks. Ethical approval was granted from the appropriate body at the hosting university.

A sample size calculation indicated that for a linear multiple regression with three predictors a minimum sample size of 77 was required to detect a medium effect size ($f^2$ = 0.15) with 80% power. To allow for potentially unusable data we aimed to recruit a minimum of $N$ = 100.

Following the data reporting guidelines proposed by Simmons, Nelson, and Simonsohn (2012) we report all data exclusions, manipulations, and measures in the

study. The present study was pre-registered with the Open Science Framework (available at https://osf.io/34bup/).

## Participants

One hundred and seventy-nine undergraduate psychology students at a University in the south of England completed the baseline survey. Of these, 104 subsequently took part in the main study. Participants who dropped out after completing the baseline survey had significantly more debt in terms of bank overdrafts (one of eight measures of debt included in the present study) compared to those who completed the main study, $t$ (136) = 3.02, $p$ = .003, $d$ = 0.52. However, there were no other significant differences in terms of gender, age, year of study, ethnicity, whether or not students were from the UK, amount of debt, financial concern, or any of the additional indicators of financial circumstances (all $p$s $\geq$ .07).

Three participants were excluded from the analyses because they failed to complete the experimental manipulation. The final sample ($N$ = 101) comprised 85 (84.12%) women and 15 (14.85%) men (one participant did not indicate their gender). Ages ranged from 18 to 51 years ($M$ = 20.71 years, $SD$ = 5.50). Fifty-five (54.46%) participants were first-year students and 46 (45.54%) were second-year students. Eighty-four (83.17%) participants identified their ethnicity as White; 88 (87.13%) participants were from the UK, and 12 (11.88%) were international students (one participant did not indicate whether they were a UK or international student).

## Materials

### Baseline survey.

***Demographic information.*** Participants were asked to indicate their gender, age, year of study, ethnicity, and whether they were a UK or international student.

***Socioeconomic status.*** Socioeconomic status was measured using an adaptation of The MacArthur Scale of Subjective Social Status (Adler & Stewart, 2007). Possible scores ranged from 1-10, with higher scores indicating relatively higher subjective socioeconomic status.

***Baseline financial concern.*** Financial concern was assessed using a measure adapted from Jessop et al. (2005). The resultant measure comprised seven items (e.g., "I would list financial difficulties as one of the major stresses in my life at the moment"), with responses given on Likert scales ranging from *strongly disagree* [1] to *strongly agree* [7]. A mean score was calculated for each participant, with higher scores indicating greater financial concern ($\alpha = .91$).

***Current debt.*** Participants were asked to indicate how much debt they currently had by selecting from the following categories: "Less than £10,000", "£10,000 - £19,999", "£20,000 - £29,999", "£30,000 - £39,999", "£40,000 - £49,999", "£50,000 - £59,999", and "£60,000 +". The resultant categories were scored one to seven, with higher scores indicating greater debt.

***Additional indicators of financial circumstances.*** In order to attain more descriptive information about the sample, and to check for baseline differences between conditions, participants completed the following additional measures pertaining to their financial circumstances.

*Sources of debt.* Participants were asked how much debt they currently had from each of the following sources: tuition fee loans, maintenance loans, credit card debt, payday loans, bank overdrafts, and informal loans. A space was provided for participants to enter an amount from each source in Pounds Sterling.

*Anticipated graduate debt.* Participants were asked to anticipate how much debt they would have overall when they graduated from university on the same scale used to assess current debt.

*Discretionary income.* Participants were asked to indicate how much money they had left over each month after accounting for all of their essential expenses (e.g., rent, bills). A space was provided for participants to enter the amount in Pounds Sterling.

**Main study.**

***Financial concern salience.*** Following Mani et al. (2013), participants were presented with four brief hypothetical scenarios describing various financial problems. An example scenario from the *high financial concern salience* condition reads as follows: "Imagine that the money you have to live off (e.g., your maintenance loan/grant) was reduced by 30%". Participants in the *low financial concern salience* condition were asked to read equivalent scenarios where the monetary amounts involved were 10% of the amounts referenced in the *high financial concern salience* condition (e.g., "reduced by 3%" rather than "30%" in the example given). Each scenario was followed by two or three questions prompting participants to describe how the financial problems would affect them personally (e.g., "Given your situation, would you be able to maintain a similar lifestyle under those new circumstances? If not, what changes would you need to make?"). Both the scenarios and the question prompts were based closely on those used by Mani et al. (2013), but were adapted to be more relevant to a student sample.

***Working memory.*** Working memory was assessed using an automated version of the Operation span task (Ospan; Unsworth et al., 2005). This task requires participants to recall series of unrelated letters. Each letter is presented individually,

and participants have to complete a simple math operation between each letter. The series size (i.e., the number of letters participants have to remember at once) ranges between three and seven letters for each trial. The number of correctly recalled letters provides a measure of working memory.

Participants were given 4 practice trials recalling series of letters alone, 15 practice trials of math questions alone, and 3 practice trials combining both the letter and math components of the task. The actual task comprised 15 trials, and took approximately 15 minutes to complete. The outcome variable was the number of correctly recalled letters in correctly recalled trials (Unsworth et al., 2005). For example, if a participant recalled three letters in a trial with three letters, four letters in a trial of four letters, and four letters in a trial of five letters, their score for these three trials would be seven (3 + 4 + 0 = 7). Following Unsworth et al. (2005), 13 participants who answered less than 85% of the math questions correctly were excluded from analyses on this outcome variable, as their data would not provide a valid measure of working memory. One further participant was excluded as they failed to complete the Ospan task.

***Inhibitory control.*** Inhibitory control was assessed using a colour-word Stroop task (MacLeod, 1991). This task requires participants to name the actual colours that colour-words (e.g., “red”, “blue”) are printed in, where the colour-words themselves are either congruent or incongruent with the printed colour. For example, the colour-word “red” printed in red ink would be congruent, whereas the colour-word “red” printed in blue ink would be incongruent. The speed and accuracy in naming the printed colour on incongruent trials is argued to depend on inhibitory control. As such, the response times and error rates in naming printed colours provide measures of inhibitory control (Diamond, 2013).

The present Stroop task comprised 84 trials, and took approximately five minutes to complete. Congruent, incongruent, and control trials (which required participants to indicate the colour of rectangles) were sampled randomly, with equal probabilities of each being presented. The possible colours were red, green, blue, and black. The outcome variables comprised the percentage of errors made (i.e., the percentage of all trials on which participants incorrectly indicated the colour a word or rectangle was printed in), and average response times on incongruent trials. One participant was excluded from analyses on Stroop outcome variables because their average response time was more than three standard deviations longer than the average across all participants ($z = 3.60$).

## Results

### Preliminary Analyses

Descriptive financial information for the sample is provided in Table 1. T-test and chi-square analyses revealed no differences between conditions in terms of baseline financial concern, the total amount of debt participants held, the amount of debt from each individual source, anticipated graduate debt, discretionary income, socioeconomic status, gender, age, year of study, ethnicity, or whether they were a UK or international student (all $ps \geq .11$).

### Main Analyses

To determine whether financial concern salience affected cognitive function, and whether any such effect was moderated by students' financial circumstances, we conducted a series of hierarchical moderated multiple regression analyses with Ospan scores, Stroop error percentages, and Stroop response times entered in turn as the dependent variable.

Table 1

*Descriptive Financial Information for Study 1 Sample*

| | Average | *SD* | Min. | Max. | *N* |
|---|---|---|---|---|---|
| Baseline financial concern | 4.04[a] | 1.45 | 1.00 | 6.86 | 101 |
| Current debt | < £10,000[b] | - | < £10,000 | £40,000 - £49,999 | 94 |
| Tuition fee loans | £10,138[a] | £7,361 | £0 | £29,000 | 89 |
| Maintenance loans | £4,566 [a] | £5,645 | £0 | £40,000 | 84 |
| Credit card debt | £326 [a] | £1,910 | £0 | £14,000 | 81 |
| Payday loans | £0 [a] | £0 | £0 | £0 | 83 |
| Bank overdrafts | £51 [a] | £210 | £0 | £1,500 | 84 |
| Informal loans | £111 [a] | £897 | £0 | £8,000 | 80 |
| Anticipated graduate debt | £30,000 - £39,999[b] | - | < £10,000 | ≥ £60,000 | 96 |
| Discretionary income | £249 [a] | £199 | £0 | £1,000 | 85 |
| Socioeconomic status | 6.23 [a] | 1.73 | 1 | 9 | 101 |

[a] Mean. [b] mode.

For each regression, the financial concern salience manipulation (dummy coded; *low financial concern salience* = 0, and *high financial concern salience* = 1) was entered as a predictor at step one. This first step provides a test of the main effect of the experimental manipulation on the outcome in question. Either current debt or baseline financial concern (both mean-centered) were entered as a predictor at step two, and the corresponding interaction term between financial concern salience and current debt or baseline financial concern was entered at step three. This third step allowed us to explore whether either current debt or baseline financial concern moderated any impact of financial concern salience on outcomes. Controlling for participants' response times on congruent trials did not alter the pattern of findings regarding response times on incongruent trials.

**The effect of financial concern salience.** The first steps of the regression analyses were all non-significant (all $F$s $\leq 1.71$, $p$s $\geq .19$, $R^2 \leq .02$), indicating there was no main effect of the manipulation of financial concern salience on working memory or inhibitory control (see Tables 2 and 3).

**Moderation by current debt.** The regression analyses including current debt as a potential moderator are summarised in Table 2. The additional variance accounted for by the inclusion of the interaction term in the third step of these regressions failed to reach statistical significance (all $\Delta F$s $\leq 0.33$, $p$s $\geq .57$, $\Delta R^2 \leq .004$). As such, the analyses revealed no evidence that current debt moderated the effect of the financial concern salience manipulation on working memory or inhibitory control.

**Moderation by baseline financial concern.** The regression analyses including baseline financial concern as a potential moderator are summarised in Table 3. The additional variance accounted for by the inclusion of the interaction term in the third

Table 2

*Hierarchical Moderated Multiple Regression Analyses (With Current Debt as Moderator) Predicting Cognitive Function, Showing Standardised Coefficients*

| | Ospan score (*df* = 81) | | | Stroop error percentage (*df* = 92) | | | Stroop response times (*df* = 92) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Step 1 | Step 2 | Step 3 | Step 1 | Step 2 | Step 3 | Step 1 | Step 2 | Step 3 |
| Condition β | 0.08 | 0.08 | 0.08 | 0.14 | 0.13 | 0.13 | 0.02 | 0.03 | 0.03 |
| Debt β | | - 0.01 | 0.06 | | - 0.07 | - 0.09 | | 0.04 | 0.03 |
| Condition x Debt β | | | - 0.09 | | | 0.03 | | | 0.02 |
| $R^2$ | .01 | .01 | .01 | .02 | .03 | .03 | .00 | .00 | .00 |
| Model *F* | 0.49 | 0.25 | 0.27 | 1.88 | 1.15 | 0.77 | 0.04 | 0.10 | 0.07 |
| Δ $R^2$ | | .00 | .00 | | .01 | .00 | | .00 | .00 |
| Δ *F* | | 0.00 | 0.33 | | 0.43 | 0.04 | | 0.16 | 0.02 |

*Note.* None of the values reported in this table reached statistical significance at conventional levels.

Table 3

*Hierarchical Moderated Multiple Regression Analyses (With Financial Concern as Moderator) Predicting Cognitive Function, Showing Standardised Coefficients*

| | Ospan score (*df* = 86) | | | Stroop error percentage (*df* = 99) | | | Stroop response times (*df* = 99) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Step 1 | Step 2 | Step 3 | Step 1 | Step 2 | Step 3 | Step 1 | Step 2 | Step 3 |
| Condition β | 0.11 | 0.10 | 0.10 | 0.09 | 0.09 | 0.09 | 0.02 | 0.02 | 0.02 |
| Financial concern β | | - 0.13 | - 0.06 | | - 0.11 | 0.00 | | 0.04 | 0.01 |
| Condition x Financial concern β | | | - 0.20 | | | 0.16 | | | 0.03 |
| $R^2$ | .01 | .03 | .03 | .01 | .02 | .03 | .00 | .00 | .00 |
| Model *F* | 0.94 | 1.22 | 0.93 | 0.73 | 0.99 | 1.07 | 0.03 | 0.08 | 0.07 |
| Δ $R^2$ | | .02 | .00 | | .01 | .01 | | .00 | .00 |
| Δ *F* | | 1.49 | 0.37 | | 1.25 | 1.22 | | 0.13 | 0.05 |

*Note.* None of the values reported in this table reached statistical significance at conventional levels.

step of each regression was not significant (all $\Delta F$s $\leq$ 1.08, $p$s $\geq$ .30, $\Delta R^2 \leq$ .01). The analyses therefore provide no evidence that baseline financial concern moderated the effect of the financial concern salience manipulation on working memory or inhibitory control.

## Discussion

Contrary to prediction, the findings of Study 1 provided no support for the hypothesis that high financial concern salience would impair working memory and inhibitory control. Further, there was no evidence that students' financial circumstances moderated any effect of financial concern salience on either aspect of cognitive function.

One potential explanation for these null findings is that the experimental manipulation failed to influence the salience of financial concern. This could have occurred for a variety of reasons. For example, participants may have been unable to relate to the hypothetical financial problems, or they may have lacked the motivation to engage fully with the task. To rule out this potential explanation, we conducted a second study exploring whether the experimental manipulation used in Study 1 was able to influence the salience of financial concern.

## Study 2

Study 2 examined the effectiveness of the experimental manipulation used in Study 1 at inducing financial concern salience. We assessed financial concern salience by examining the cognitive accessibility of financial concern, measured using a word fragment completion task in which participants could form either words related to the target construct (financial concern) or neutral words. The number of target words formed indicates the cognitive accessibility of financial concern (Koopman, Howe,

Johnson, Tan, & Chang, 2013) and hence provides a measure of financial concern salience.

Therefore, in Study 2 we exposed participants to the financial concern salience manipulation utilised in Study 1 before asking them to complete a word fragment completion task. If participants in the high financial concern salience condition completed more fragments to form target words compared to their low financial concern salience counterparts, this would indicate that financial concern was more cognitively accessible for these individuals, and hence that the experimental manipulation was effective at inducing financial concern salience.

## Method

### Design and Procedure

The study employed an independent-measures design. The experimental manipulation was identical to that used in Study 1. Participants were randomly allocated to either the *high financial concern salience* ($n$ = 106) or the *low financial concern salience* ($n$ = 91) condition by the host website. After completing the experimental manipulation, participants completed a word fragment completion task assessing the cognitive accessibility of financial concern. Finally, participants provided demographic information, confirmed whether or not they were a fluent English speaker, provided information on their financial circumstances, and stated what they thought the purpose of the study was.

Participants were recruited by opportunistically contacting academic departments at universities and requesting they forward a recruitment email to undergraduate students within their department. The recruitment email invited recipients to take part in a study involving two simple tasks, followed by some questions about their background and circumstances. In order to encourage

participation, those who completed the study were entered into a £100 cash prize draw. Ethical approval was granted from the appropriate body at the hosting university.

A sample size calculation for a t-test – assuming a medium effect size ($d$ = .5), with 80% power and $a$ = 0.05 – indicated that we required $N$ = 102.

Following the data reporting guidelines proposed by Simmons et al. (2012) we report all data exclusions, manipulations[1], and measures in the study.

**Participants**

Two hundred and six undergraduate students from UK universities completed the study. Eight participants correctly identified the purpose of the study (i.e., the link between financial concern and word choice in the word fragment completion task), and one failed to confirm they were a fluent English speaker; these participants were not included in the analyses. The final sample ($N$ = 197) comprised 131 (66.50%) women and 62 (31.47%) men (four participants identified their gender as 'other'). Ages ranged from 18 to 50 years ($M$ = 20.32 years, $SD$ = 2.84). The majority (82.74%) identified their ethnicity as White.

**Materials**

***Financial concern salience.*** The experimental manipulation was identical to that used in Study 1.

***Cognitive accessibility of financial concern.*** The cognitive accessibility of financial concern was assessed using a word fragment completion task (Koopman et al., 2013). Participants were presented with 18 different word fragments. The order in which the word fragments were presented was randomised between participants. Eight

[1] As part of data collection for this study we also examined the effectiveness of another experimental manipulation of financial concern salience in a separate group of participants. This was in order to provide pilot data for future work.

of the word fragments (e.g., ‘p _ _ r’) could be completed to form target words related to financial concern (e.g., ‘poor’), or neutral words (e.g., ‘pear’). Cognitive accessibility scores were computed by summing the number of word fragments that participants completed with target words; thus, the possible range of scores was 0 to 8, with higher scores indicating greater cognitive accessibility of financial concern.

***Demographic information.*** Participants were asked to indicate their gender, age, and ethnicity.

***Socioeconomic status.*** As in Study 1, socioeconomic status was measured using The MacArthur Scale of Subjective Social Status (Adler & Stewart, 2007).

***Baseline financial concern.*** Financial concern was assessed using the same measure as in Study 1 ($\alpha = .87$).

***Current debt.*** Participants were asked to indicate how much debt they currently had. Responses were made using a drop-down list with options ranging from “No debt” to “£60,000+” in increments of £1,000. The resultant categories were scored 1 to 62, with higher scores indicating greater debt.

## Results

### Preliminary Analyses

Descriptive financial information for the sample is provided in Table 4. T-test and chi-square analyses revealed no differences between conditions in terms of baseline financial concern, the amount of debt currently held, socioeconomic status, gender, age, or ethnicity (all $ps \geq .08$).

### Main Analyses

The experimental manipulation had a significant effect on the cognitive accessibility of financial concern, $t\ (195) = 2.03$, $p = .044$, $d = 0.29$, with participants in the *high financial concern salience* condition forming more financial concern-related

Table 4

*Descriptive Financial Information for Study 2 Sample*

| | Average | *SD* | Min. | Max. |
|---|---|---|---|---|
| Baseline financial concern | 3.71[a] | 1.41 | 1.00 | 7.00 |
| Current debt | £0[b] | - | £0 | £60,000+ |
| Socioeconomic status | 5.93[a] | 1.53 | 2 | 10 |

[a] Mean. [b] mode.

words (*M* = 2.54, *SD* = 1.43) than those in the *low financial concern salience* condition (*M* = 2.12, *SD* = 1.46).

## Discussion

The findings of Study 2 revealed that participants in the high (vs. low) financial concern salience condition demonstrated increased cognitive accessibility of financial concern. This indicates that the experimental manipulation utilised in Study 1 is capable of influencing the salience of financial concern in a student sample.

## General Discussion

The present research aimed to explore the effects of financial concern salience on cognitive function among university students. Contrary to prediction, Study 1 found no evidence that making high financial concern salient impaired either working memory or inhibitory control, irrespective of students' current levels of debt or baseline financial concern. Further, a supplementary experiment (Study 2) found the experimental manipulation successfully influenced the salience of financial concern, indicating that the null findings from Study 1 were unlikely to be due to manipulation failure.

Previous research has found large detrimental effects of high financial concern salience on cognitive function (Mani et al., 2013; Spears, 2011). Nonetheless, the

present null findings, along with those of other existing research (Carvalho et al., 2016; Graves, 2015), indicate that such effects might not be consistent across different applied settings and populations. Thus, it should not be assumed that financial concern salience affects different groups of people in a uniform manner, and caution should therefore be exercised when evidence of detrimental effects is generalised to other populations and contexts.

The mixed findings across the literature could also reflect differences in the operationalisation and measurement of cognitive function. For example, whereas Mani et al. (2013) used a spatial incompatibility task to assess inhibitory control, the present research used a Stroop task (as did both Graves [2015] and Carvalho et al. [2016]). Further, unlike Mani et al. (2013) and Spears (2011), the present study (and Carvalho et al. [2016]) assessed working memory. This highlights the possibility that measures of specific aspects of cognitive function may differ in their sensitivity to any impact of financial concern salience, and/or that financial concern salience may impair only certain aspects of cognitive function, rather than having the more general effects claimed by Mullainathan and Shafir (2013).

One potential limitation of the present research concerns the effectiveness of the experimental manipulation in making high financial concern salient. While Study 2 found that the experimental manipulation had a statistically significant impact on the cognitive accessibility of financial concern, whereby the *high* (vs. *low*) *financial concern salience* condition led to greater cognitive accessibility of financial concern, the magnitude of this effect was relatively small. As such, a more powerful manipulation of financial concern salience could still affect students' cognitive function. Nonetheless, it remains that the detrimental effects of financial concern salience

demonstrated by Mani et al. (2013) do not appear to apply comparably to university students.

Given that financial concern does not appear to have uniform effects on cognitive function across different settings and populations, it would be valuable for future research to determine the specific environmental and individual factors that serve as moderating variables. Additionally, future research should aim to examine which aspects of cognitive function are most susceptible to any detrimental effects of financial concern salience. Further, it would be interesting for future research to investigate what aspects, and specific types, of financial concern are most impactful. For example, it would be of interest to know whether – and if so, how – the consequences of financial concern vary depending on whether the concern arises from the dissatisfaction of absolute needs (e.g., being unable to pay rent) or relative needs (e.g., being unable to afford a house as large as one's neighbour's).

In sum, the present research found no evidence that financial concern salience influenced either working memory or inhibitory control among university students. Thus, despite previous research having found large detrimental effects of financial concern salience on various aspects of cognitive function (Mani et al., 2013; Spears, 2011), our findings indicate that such effects may not apply uniformly across different contexts, populations, or cognitive outcomes. Accordingly, research into potential moderating variables (both at the environmental and individual level) will afford a greater understanding of the specific conditions under which financial concern salience influences cognitive function.

# Chapter 3. Explaining the Negative Impact of Financial Concern on Undergraduates' Academic Outcomes: Evidence for Stress and Belonging as Mediators


## Abstract

Poorer financial circumstances among undergraduate students predict worse academic outcomes, yet there is a lack of research examining mediators. Accordingly, the present research aimed to identify mediating variables, knowledge of which could eventually help to minimise the negative influence of finances on academic outcomes. In Study 3, cross-sectional data were collected from UK undergraduates ($N$ = 516). Controlling for background variables, path analysis indicated that stress, sense of belonging at university, working memory, and self-control mediated the negative relationship between financial concern and academic performance. In Study 4, an independent sample ($N$ = 2794) was used to successfully validate the respecified model developed in Study 3. Additionally, longitudinal data were collected from UK undergraduates ($N$ = 453) at three time points in an academic year. Controlling for background variables, financial concern predicted subsequent changes in intrinsic academic motivation, as mediated by changes in stress and sense of belonging at university. Together, this research provides consistent evidence for stress and belonging as mediators of the impact of finances on academic outcomes. Our findings afford a more complete understanding of how financial concern may affect students' experience at university, highlight potential negative consequences of funding systems that place a financial burden on students, and could serve to inform interventions aimed at mitigating the detrimental influence of financial concern on academic outcomes.

Research indicates that poorer financial circumstances are associated with worse academic outcomes in higher education. In particular, experiencing financial difficulties has been found to predict lower average marks (Harding, 2011), poorer performance in examinations (Andrews & Wilding, 2004), taking longer to graduate (Letkiewicz et al., 2014), and an increased risk of dropping out of university (Joo et al., 2008). Further, it is common for students to report that financial difficulties have impaired their ability to study (Brennan et al., 2005; Ross et al., 2006), with only 42% of UK undergraduates surveyed in the 2011/12 academic year reportedly able to concentrate on studying without worrying about financial problems (National Union of Students, 2012).

Another academic outcome apparently influenced by finances is motivation. For instance, qualitative research indicates that the alleviation of financial difficulties through financial aid increases students' academic motivation (Reed & Hurd, 2016). More generally, Sheehy-Skeffington and Rea (2017) claim that poor financial circumstances diminish the motivation to achieve one's goals, which in educational settings could equate to reduced academic motivation. Further, experimental evidence indicates that greater anticipated financial hardship undermines satisfaction of the psychological needs for competence and autonomy in university students, which from a self-determination theory perspective may impair students' intrinsic motivation (defined as motivation driven by the satisfaction inherent in achieving intellectual or personal goals, as opposed to any external incentives or disincentives [Dev, 1997]; Dupuis & Newby-Clark, 2016). In turn, intrinsic motivation has important implications for academic success (Kusurkar et al., 2013; Richardson et al., 2012).

The influence of undergraduate students' finances on academic outcomes such as performance and intrinsic motivation could be mediated by a number of variables,

including stress, sense of belonging at university, social identification with other students, mental and physical health, cognitive function, hours in paid employment, self-control, and self-regulation. However, few studies have attempted to examine these potential mediating pathways, much less explore the relative contributions of these variables to mediation. Yet, an understanding of the mediating paths involved would aid efforts to mitigate the negative influence of finances on academic outcomes. Accordingly, the present research aimed to assess the relative importance of the variables listed above in mediating the relationships between financial concern and academic outcomes among UK undergraduate students. Initially, we present an overview of the evidence for each potential mediator, detailing (a) evidence that the mediator is influenced by financial circumstances, (b) evidence that it impacts academic outcomes, and (c), where available, evidence that it mediates the relationship between finances and academic outcomes.

**Stress**

Financial circumstances can be an important source of stress for university students. Indeed, finances were found to be the second most prevalent reported stressor in a sample of graduate students in the United States (El-Ghoroury et al., 2012), and experiencing financial difficulties has been shown to predict greater perceived stress among UK undergraduates (Richardson et al., 2017; see also Linn & Zeppa, 1984; Struthers, Perry, & Menec, 2000).

Self-reported stress, in turn, has been found to predict both academic motivation and performance at university (Huang et al., 2016; Park et al., 2012; Richardson et al., 2012). Further, a stress-management intervention has been shown to improve undergraduate students' academic performance (Lumley & Provenzano, 2003).

To date, however, no research has directly assessed whether stress mediates the relationships between finances and academic outcomes.

**Belonging and Social Identification**

Experiencing financial difficulties might also reduce students' sense of belonging at university (defined as feeling accepted and valued by others [Goodenow, 1993]), and their level of social identification with other students (defined as having an awareness of, and an emotional investment in, a shared group identity [Bliuc et al., 2011]). For instance, poor financial circumstances are found to predict reduced social integration at university (in terms of interaction with other students and engagement in extra-curricular activities; Adams et al., 2016; Engle & Tinto, 2008; Quadlin & Rudel, 2015), which appears likely to have attendant negative implications for both sense of belonging at university and social identification with other students.

Further, research indicates that sense of belonging at university and social identification with other students are determinants of academic performance (Bliuc et al., 2011; Walton & Cohen, 2007; Walton & Cohen, 2011), and sense of belonging has additionally been found to predict intrinsic academic motivation at university (Freeman et al., 2007; see also Gillen-O'Neel and Fuligni [2013] and Goodenow and Grady [1993] for similar evidence in younger students).

As yet, however, whether or not sense of belonging or social identification mediate the influence of finances on academic outcomes appears to remain untested empirically.

**Mental and Physical Health**

A large body of research indicates that poorer financial circumstances predict worse outcomes in terms of many aspects of both mental and physical health among university students (Adams et al., 2016; Cooke et al., 2004; Jessop et al., 2005;

Richardson et al., 2017; Walsemann, Gee, & Gentile, 2015; Wege, Muth, Li, & Angerer, 2016).

Additionally, health is considered an important antecedent to good performance within academic settings (Ding, Lehrer, Rosenquist, & Audrain-McGovern, 2009; Novello et al., 1992), and poor mental and physical health are linked with an increased risk of dropping out of university (Hixenbaugh et al., 2012). Moreover, one aspect of mental health – depressive symptoms – has been found to predict changes in academic motivation over time in adolescent students (Elmelid et al., 2015).

In terms of evidence for mediation, two studies provide evidence that one aspect of mental health – depressive symptoms – mediates the link between university students' financial circumstances and their academic performance (Andrews & Wilding, 2004; Keels et al., 2015). However, no existing research appears to have explored whether mediation exists regarding any other measures of mental health, or indeed any measures of physical health.

**Cognitive Function**

Experiencing the scarcity of a given resource, such as money, is argued to drain cognitive and attentional resources, resulting in the temporary impairment of cognitive function (Mullainathan & Shafir, 2013; see also Gennetian & Shafir, 2015; Schilbach et al., 2016). Supporting this, experiencing recent financial hardship is found to predict poorer cognitive performance (Butterworth et al., 2012), as is the experimental inducement of high financial concern salience (Mani et al., 2013). In particular, poor financial circumstances are argued to impair a group of cognitive abilities referred to as 'executive functions', which include abilities such as working memory (defined as the ability to hold information in mind and mentally work with it [Diamond, 2013]; Gennetian & Shafir, 2015; Mullainathan & Shafir, 2013).

In turn, basic cognitive abilities such as executive functions are considered to provide an essential foundation for success in many areas of life, including achievement within academic settings (e.g., Best, Miller, & Naglieri, 2012; Diamond, 2013).

However, to the best of our knowledge, research has not examined whether cognitive function serves to mediate the impact of students' finances on academic outcomes.

**Hours in Paid Employment**

Poor financial circumstances could mean that students have to work more hours in paid employment. Indeed, research indicates that students from poorer backgrounds, and those experiencing financial concerns, are more likely to work alongside studying, both in the UK and the United States (Humphrey, 2006; National Union of Students, 2012; Soria et al., 2014). Further, in a sample of UK undergraduate students the most frequently cited reasons for working were found to be financial (e.g., avoiding debt, affording essential living costs; Purcell & Elias, 2010).

In addition, it has been suggested that working more hours in paid employment could result in less time being available for academic activities, in turn impairing students' academic performance (DesJardins et al., 2010; Humphrey, 2006). Indeed, the number of hours worked in paid employment predicts poorer academic outcomes in terms of marks and degree outcomes (Callender, 2008), the likelihood of degree completion (Mendoza, 2012), and the number of credits earned (Darolia, 2014). Moreover, a quasi-experimental study found that undertaking paid employment resulted in Swedish students taking longer to graduate (Avdic & Gartell, 2015).

To date, however, there appear to have been no empirical tests of whether the impact of finances on academic outcomes is mediated by the number of hours in paid employment.

**Self-control and Self-regulation**

A number of the potential mediators discussed previously could influence academic outcomes by affecting self-control (defined as inhibiting impulsive thoughts and behaviour [Baumeister et al., 2007]) and the related concept of self-regulation (defined as making goal-directed changes to thoughts and behaviour [Vohs & Baumeister, 2011]). For example, experiencing high levels of stress is argued to reduce the ability to exert self-control (Maier et al., 2015; Muraven & Baumeister, 2000; Oaten & Cheng, 2005). Additionally, basic aspects of cognitive function are considered to provide the basis for higher-order cognitive abilities, such as self-control and self-regulation (Hofmann et al., 2012), and so impairments in basic cognitive functions are likely to undermine self-control and self-regulation.

Furthermore, both self-control and self-regulation are found to be determinants of academic performance in university students (Richardson et al., 2012; Tangney et al., 2004), and an intervention designed to foster self-regulatory capacity has been found to boost academic motivation among adolescents (Doostian et al., 2014). Therefore, in a form of secondary (or 'double') mediation, it is possible that increases in stress, and impairments in basic cognitive function, resulting from poor financial circumstances could affect academic performance by disrupting students' capacity for self-control and self-regulation.

Yet, no existing research appears to have directly examined whether either self-control or self-regulation serve to mediate the relationships between finances and academic outcomes.

**Previous Evidence for Mediation**

While the above review provides indirect evidence suggesting that each variable could potentially mediate the detrimental effect of students' financial circumstances on

academic outcomes, very few studies have attempted to test for mediation. As highlighted previously, two studies provide evidence that one aspect of mental health – depressive symptoms – serves to mediate the relation between financial circumstances and academic performance among university students (Andrews & Wilding, 2004; Keels et al., 2015). However, to our knowledge, no other studies have directly tested the other potential mediating pathways, and no research has assessed the relative importance of different potential pathways within the same analysis.

**The Present Research**

To summarise, the existing literature indicates that university students' finances are related to various academic outcomes, and this could be accounted for by a number of potential mediating variables. As yet, however, the majority of these potential mediating pathways remain untested. Accordingly, the present research aimed to address this gap in the literature by examining whether the links between university students' financial concern and academic outcomes are mediated by the following variables: stress, sense of belonging at university, social identification with other students, mental health, physical health, cognitive function (assessed in terms of working memory), hours in paid employment, self-control, and self-regulation.

The present research comprises two studies, both of which were pre-registered with the Open Science Framework. Study 3 utilised path analysis to explore mediation of the cross-sectional association between students' financial concern and academic performance. Study 4 provided a confirmatory test of the path model developed in Study 3, which served to demonstrate the replicability of the model. Study 4 additionally assessed mediation of the longitudinal associations between students' financial concern and academic outcomes, therefore allowing stronger claims to be made regarding potential causal relations.

The extant literature on finances and academic outcomes has assessed a range of different financial variables, including the experience of financial difficulties (Harding, 2011), the amount of debt held (Dwyer et al., 2013), and financial concern (Letkiewicz et al., 2014; Joo et al., 2008). In both present studies we focused our analysis on the experience of financial concern. This was because such subjective appraisals of financial circumstances appear to be more closely linked with (and hence more important predictors of) academic outcomes among university students than more objective financial variables (see Hixenbaugh et al., 2012).

## Study 3

Study 3 sought to use path analysis to examine whether the cross-sectional relationship between undergraduate students' financial concern and academic performance (assessed in terms of self-reported average marks) was mediated by the following variables: stress, sense of belonging at university, social identification with other students, mental health, physical health, working memory (as an indicator of cognitive function), hours in paid employment, self-control, and self-regulation.

## Method

### Design and Procedure

Study 3 employed a cross-sectional, correlational design. Participants were recruited opportunistically. Emails were sent to administrators at approximately 226 academic departments (from a total of 24 universities in the UK) asking them to forward the recruitment email to undergraduate students. The recruitment email indicated that the study was exploring links between students' financial circumstances and their experience of university, and contained a link to the online questionnaire. The first page of the questionnaire informed participants that the study would include questions about their background, personality, experience of university, and financial

circumstances, along with a short 'brain training'-type task. Data were collected via online questionnaire in June 2016, and participation was incentivised with entry into a £100 (approximately US$130) cash prize draw. In line with Kline's (2011) recommendation regarding the number of cases typically required to achieve accurate parameter estimates within structural equation modelling, we set a minimum required sample size of 200 participants. Data collection ended when responses to the questionnaire had become infrequent. The study was pre-registered at https://osf.io/2qya3/.

**Participants**

Participants ($N$ = 516) were a sample of undergraduate students from 14 UK universities. Eight hundred and twenty-three students responded to the questionnaire. The path analysis conducted in the present study required a complete dataset, and so 268 participants with missing data were not included in the analyses. A further 39 participants were excluded because they represented outliers, as indicated by $z$-scores greater than three on any variables to be included in the path analysis.

The final sample comprised 384 (74.42%) females and 132 (25.58%) males. Ages ranged from 18 to 31 years ($M$ = 20.51, $SD$ = 1.78). One hundred and sixty-eight participants (32.56%) were first-year students, 179 (34.69%) were second-year students, 128 (24.81%) were third-year students, and 41 (7.95%) were in their fourth year. Four hundred and thirty-four participants (84.12%) were UK students, and 82 (15.89%) were international students. Four hundred and thirty participants (83.33%) identified their ethnicity as 'White', 49 (9.50%) identified as 'Asian / Asian British', 25 (4.84%) identified as 'mixed/multiple ethnic groups', 8 (1.55%) identified as 'Black / African / Caribbean / Black British', and 4 (0.78%) identified as 'other ethnic group'.

In terms of age, ethnicity, and whether participants were UK or international students, the sample appeared to be representative of the UK undergraduate population (Higher Education Statistics Agency, 2018). However, the sample comprised a substantially larger proportion of female students, who in the 2015/16 academic year made up 55.53% of the UK undergraduate population (Higher Education Statistics Agency, 2018).

## Materials

Participants completed an online questionnaire including the measures detailed below. Measures are ordered based on their relevance to the focus of the present study, rather than in the order they appeared in the questionnaire. In addition to the following measures, participants completed a measure of personality (Rammstedt & John, 2007). This was included solely as an incentive for participation (personality feedback was given to students at the end of the questionnaire) and is therefore not reported below.

**Financial concern.** Financial concern was assessed using a measure adapted from Jessop et al. (2005). The adapted measure comprised seven items (e.g., "I would list financial difficulties as one of the major stresses in my life at the moment" and "I often worry about the debt I will have when I finish my degree at university"). Responses were made using Likert scales ranging from *strongly disagree* [1] to *strongly agree* [7]. A mean score was calculated for each participant, with higher scores indicating greater financial concern ($\alpha$ = .90).

**Stress.** Stress was assessed using Cohen and Williamson's (1988) 10-item Perceived Stress Scale (e.g., "In the last month, how often have you felt nervous and stressed?"). Responses were made using Likert scales ranging from *never* [1] to *very often* [5]. A mean score was calculated for each participant, with higher scores indicating greater stress ($\alpha$ = .89).

**Sense of belonging.** Participants' sense of belonging at university was assessed using Walton and Cohen's (2007) 17-item measure of sense of social and academic fit (e.g., "People at my university accept me"). Responses were made using Likert scales ranging from *strongly disagree* [1] to *strongly agree* [5]. A mean score was calculated for each participant, with higher scores indicating greater belonging ($\alpha$ = .89).

**Social identification.** Social identification with other students was assessed using Doosje, Ellemers, and Spears' (1995) four-item group identification measure (e.g., "I feel strong ties with [name of institution] students"). The name of each participant's institution was inserted in to these items. Responses were made using Likert scales ranging from *strongly disagree* [1] to *strongly agree* [7]. A mean score was calculated for each participant, with higher scores indicating greater social identification ($\alpha$ = .84).

**Mental and physical health.** Mental and physical health were assessed using the 12-item short form health survey (SF-12; Ware, Kosinski, & Keller, 1996). Separate summary scores were computed for mental and physical health. Scores may range from 0-100 for both mental and physical summaries, with higher scores indicating better health (mental health $\alpha$ = .80; physical health $\alpha$ = .61).

**Working memory.** Working memory was assessed using an automated version of the Digit Span Sequencing task (Wechsler, 2008). Participants were presented with sequences of single-digit numbers. Each number was presented for one second. After each sequence, participants had to recall the sequence in ascending order. In example, if participants were presented with the sequence "5, 8, 3", they were required to recall these numbers in the order "3, 5, 8". The task began with two sequences of three numbers, with sequence size increasing by one number every other sequence until participants were presented with two sequences of nine numbers. Participants were

given two practice sequences. Numbers could be presented more than once in the same sequence, and where this happened participants were instructed to recall the number the same number of times it appeared (as was demonstrated in one of the practice trials).

The sizes of sequences that had been correctly recalled in ascending order were summed to create a score for each participant. However, if a participant was unable to recall two sequences of the same size, correct responses to larger sequences were not included in their score. For example, if a participant correctly recalled two sequences of three numbers, one sequence of four numbers, one sequence of five numbers, neither sequence of six numbers, and one sequence of seven numbers, their score would be (3 + 3 + 4 + 5 = 15; the sequence of seven numbers not being counted because the participant failed to correctly recall both sequences of six numbers). Higher scores indicated better working memory.

**Hours in paid employment.** Participants were asked to indicate whether or not they had a paid job (or jobs) during term-time, and if so, approximately how many hours they worked in this job (or these jobs) each week.

**Self-control.** Self-control was assessed using Tangney et al.'s (2004) 13-item Brief Self-Control Scale (e.g., "I am good at resisting temptation"). Responses were made using Likert scales ranging from *not at all* [1] to *very much* [5]. A mean score was calculated for each participant, with higher scores indicating greater self-control ($\alpha$ = .84).

**Self-regulation.** Self-regulation was assessed using Schwarzer, Diehl, and Schmitz's (1999) 10-item Self-Regulation Scale (e.g., "I can concentrate on one activity for a long time, if necessary"). Responses were made using Likert scales ranging from *not at all true* [1] to *exactly true* [4]. A mean score was calculated for each participant with higher scores indicating greater self-regulation ($\alpha$ = .83).

**Academic performance.** Participants were asked to indicate the average percentage mark awarded for assessments completed in the current academic year. Meta-analysis indicates that self-reported performance correlates highly with actual performance among university students (Kuncel et al., 2005).

**Socio-demographic information.** Participants were asked to indicate their gender (dummy coded; 0 = male, 1 = female), age, year of study, ethnicity, whether or not they were a UK or international student (dummy coded; 0 = UK, 1 = international), and which university they attended. Socioeconomic status was measured using an adaptation of The MacArthur Scale of Subjective Social Status (Adler & Stewart, 2007). Scores could range from 1-10, with higher scores indicating relatively higher subjective socioeconomic status.

**Additional indicators of financial circumstances.** The following measures were administered in order to attain further descriptive information about participants' financial circumstances.

***Total current debt.*** Participants were asked to indicate how much overall debt they currently had. Responses were made using a drop-down list with options ranging from "No debt" to "£60,000 +" in increments of £1000.

***Debt from individual sources.*** Participants were asked to indicate how much debt they currently had from each the following sources: tuition fee and maintenance loans; credit cards; bank overdrafts; and loans from partners, family and friends. Responses were requested in Pounds Sterling.

***Anticipated graduate debt.*** Participants were asked to indicate how much overall debt they anticipated they would have when graduating from university. Responses were made using a drop-down list with options ranging from "No debt" to "£60,000+" in increments of £1000.

***Discretionary income.*** Participants were asked to indicate how much money they had left over each month after accounting for all of their essential expenses (e.g., rent, bills). Responses were requested in Pounds Sterling.

**Statistical Analyses**

Path analysis was conducted using full-information maximum likelihood estimation in AMOS 23.0 (Arbuckle, 2014). Model fit was evaluated using the Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI). RMSEA values $\geq .10$ are considered to indicate unacceptable fit, whereas values $\leq .05$ indicate good fit (Browne & Cudeck, 1993). CFI and TLI values $\geq .95$ indicate good fit (Hu & Bentler, 1999).

The process of model respecification was conducted in accordance with published guidelines (e.g., Byrne, 2010; Kenny, 2011; Kline, 2011), and was based on theoretical concerns, the statistical significance of path estimates, and modification indices. Modification indices highlight paths that, if included, would improve the overall fit of the model (based on a reduction in the value of the chi-square statistic; Kline, 2011).

Indirect effects were estimated using bootstrapping (with 2000 samples) and bias-corrected 95% confidence intervals. Estimates of specific indirect effects were obtained using the 'phantom model' approach described by Macho and Ledermann (2011).

## Results

Bivariate correlation coefficients, means, and standard deviations for all variables included in the path analyses are reported in Table 5. Descriptive data pertaining to additional indicators of financial circumstance are available as supplemental material in Appendix F.

Table 5

*Correlations, Means, and Standard Deviations for Variables Included in the Path Analysis in Study 3*

| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Financial concern | .41*** | -.29*** | -.09* | -.30*** | -.13** | -.24*** | .13** | -.24*** | -.28*** |
| 2. Stress | - | -.42*** | -.16*** | -.77*** | -.03 | -.45*** | .03 | -.45*** | -.61*** |
| 3. Belonging | - | - | .69*** | .40*** | .03 | .06 | -.01 | .29*** | .39*** |
| 4. Social identification | - | - | - | .16*** | .02 | .02 | -.03 | .13** | .18*** |
| 5. Mental health | - | - | - | - | -.15** | .05 | .01 | .39*** | .56*** |
| 6. Physical health | - | - | - | - | - | .04 | .01 | .04 | .03 |
| 7. Working memory | - | - | - | - | - | - | -.01 | .01 | .07 |
| 8. Hours in paid employment | - | - | - | - | - | - | - | -.03 | -.01 |
| 9. Self-control | - | - | - | - | - | - | - | - | .57*** |
| 10. Self-regulation | - | - | - | - | - | - | - | - | - |
| 11. Academic performance | - | - | - | - | - | - | - | - | - |
| 12. Age | - | - | - | - | - | - | - | - | - |
| 13. Socioeconomic status | - | - | - | - | - | - | - | - | - |
| 14. Year of study | - | - | - | - | - | - | - | - | - |
| 15. Gender | - | - | - | - | - | - | - | - | - |
| 16. UK or International | - | - | - | - | - | - | - | - | - |

*Note.* *** $p < .001$, ** $p < .01$, * $p < .05$, † $p < .10$.

Table 5 *(continued)*

| | 11 | 12 | 13 | 14 | 15 | 16 | *M* | *SD* |
|---|---|---|---|---|---|---|---|---|
| 1. Financial concern | -.16*** | .04 | -.31*** | -.05 | .14** | -.04 | 3.47 | 1.62 |
| 2. Stress | -.26*** | .05 | -.23*** | .01 | .26*** | -.03 | 3.04 | 0.72 |
| 3. Belonging | .22*** | -.06 | .15*** | .04 | -.02 | -.13** | 3.62 | 0.52 |
| 4. Social identification | -.01 | -.13** | .10* | -.03 | .08† | -.13** | 5.33 | 1.14 |
| 5. Mental health | .18*** | -.07 | .20*** | -.04 | -.16*** | .10* | 41.85 | 11.39 |
| 6. Physical health | .08† | -.06 | -.11* | -.05 | .02 | -.10* | 53.72 | 6.60 |
| 7. Working memory | .11** | .01 | .07† | .02 | -.09* | .06 | 9.53 | 2.55 |
| 8. Hours in paid employment | -.01 | .10* | -.15** | .01 | .03 | -.08† | 4.59 | 7.22 |
| 9. Self-control | .26*** | .02 | .13** | .02 | .03 | .03 | 3.19 | 0.68 |
| 10. Self-regulation | .23*** | .06 | .18*** | .06 | -.15** | .08† | 2.67 | 0.48 |
| 11. Academic performance | - | .00 | .09* | .06 | -.04 | .09* | 64.78 | 7.56 |
| 12. Age | - | - | -.04 | .48*** | -.04 | .12** | 20.51 | 1.78 |
| 13. Socioeconomic status | - | - | - | .04 | -.03 | .17*** | 5.81 | 1.62 |
| 14. Year of study | - | - | - | - | -.07 | .02 | 2.08 | 0.94 |
| 15. Gender | - | - | - | - | - | .01 | - | - |
| 16. UK or International | - | - | - | - | - | - | - | - |

*Note.* *** $p < .001$, ** $p < .01$, * $p < .05$, † $p < .10$.

**Initial Model**

In the initial model, the following variables were specified as mediating the effect of financial concern on academic performance: stress, mental health, physical health, sense of belonging, social identification, hours in paid employment, and working memory. Indirect effects of stress and working memory on academic performance were specified via self-control and self-regulation. A direct effect of financial concern on academic performance was also specified. Paths were specified from the socio-demographic control variables (socioeconomic status, gender, age, year of study, and UK or international status) to all other variables in the model. Covariances were specified between all control variables.

Figure 1 shows a path diagram for the initial model, including standardised coefficients. To preserve clarity, Figure 1 does not show the control variables.

The initial model was found to represent a poor fit to the data, as indicated by an RMSEA value of 0.24, a CFI value of 0.49, and a TLI value of -0.79. Further, there were a number of large standardised residual covariances, indicating that specific relationships between certain variables were modelled poorly.

**Model Respecification**

The first stage in model respecification was the inclusion of additional paths. The modification indices were addressed in order of magnitude, starting with the modification that would make the largest improvement to the model. If a given path was not justifiable based on previous research and theoretical concerns, or an alternative path involving the same variables was considered more substantively meaningful, then it was not included and the next largest modification index was examined. The modifications made to the model are described below in chronological order.

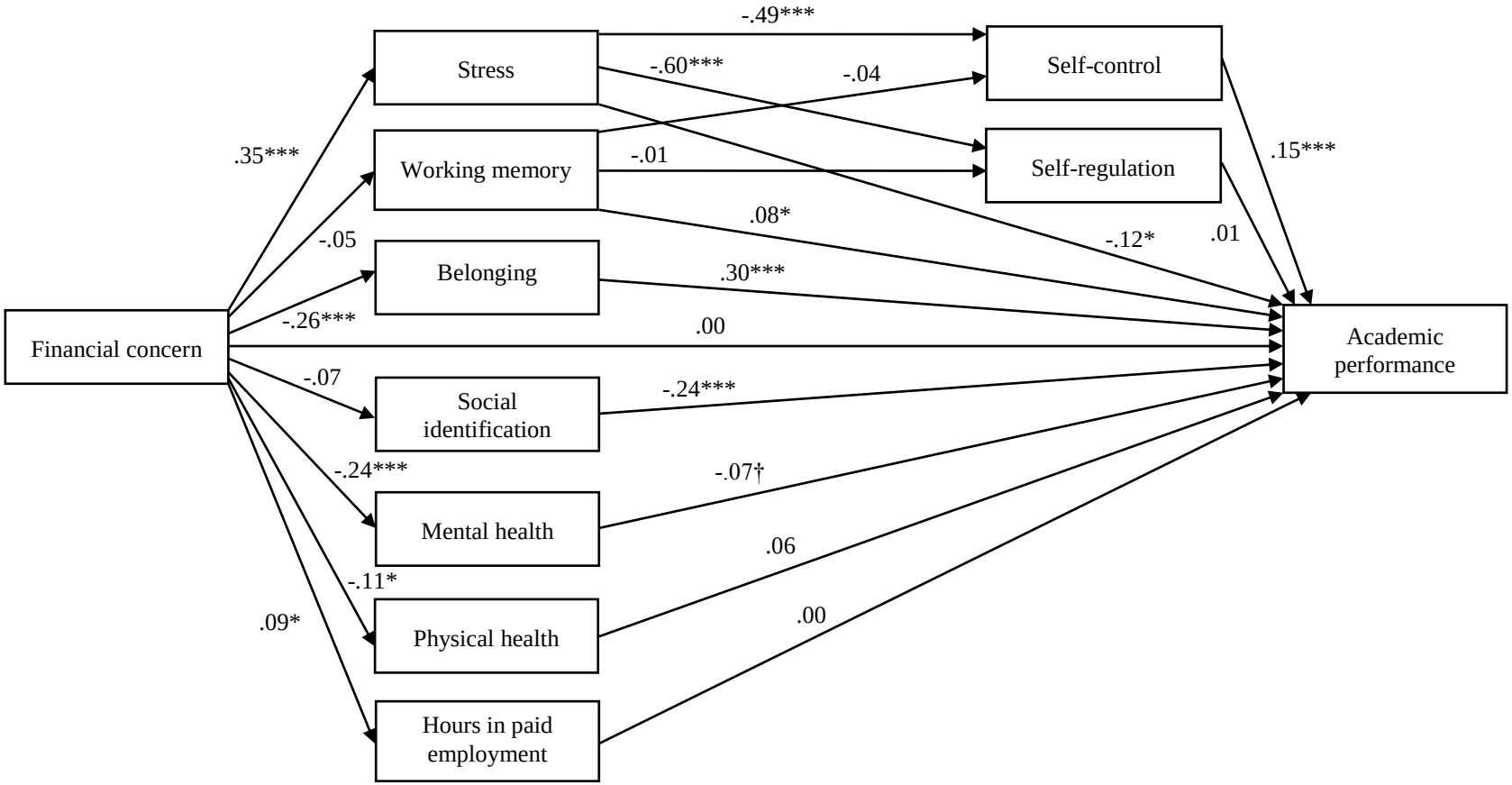


*Figure 1*. Initial model from Study 3, showing standardised estimates. CFI = 0.49, TLI = -0.79, RMSEA = 0.24. Control variables are not shown. *** $p < .001$, * $p < .05$, † $p < .10$.

The first modification allowed the residuals of sense of belonging and social identification to covary. This was justified by the conceptual similarity of these two variables, which meant that unmeasured factors affecting one variable were likely to also affect the other. Next, a path from stress to mental health was specified (for a review of evidence concerning the influence of stress on mental health, see Juster, McEwen, and Lupien [2010]). Following, the residuals of self-control and self-regulation were allowed to covary, again justified by the conceptual similarity of these two variables. Subsequently, a path was included from sense of belonging to self-regulation, as based on experimental evidence indicating that the experience of social exclusion (which may arguably result from a low sense of belonging) impairs the capacity for self-regulation (Baumeister, DeWall, Ciarocco, & Twenge, 2005). Next, a path was specified from sense of belonging to stress (for previous research concerning the link between students' sense of belonging and stress, see Grobecker [2016]). Finally, a path from sense of belonging to self-control was included. This was justified by experimental evidence highlighting a link between the fulfilment of belonging-needs and the capacity for self-control (Baumeister et al., 2005), and reflects the argument that managing concerns about a lack of belonging at university constitutes a psychological burden, which in turn reduces the capacity for effective self-regulation (Johnson, Richeson, & Finkel, 2011).

The next stage of respecification involved removing all non-significant paths, which achieved a more parsimonious model. Non-significant paths were removed in order of the magnitude of the standardised coefficients, beginning with the smallest.

After having removed all non-significant paths, modification indices highlighted that including a path from stress to working memory would significantly improve the fit of the model. This path is consistent with much previous research supporting that stress

can impair cognitive ability, including working memory specifically (e.g., Shields, Bonners, & Moons, 2015), and was therefore included in the model. Subsequently, the path from gender to working memory was no longer significant, and so was removed from the model.

At this stage, the following variables no longer mediated the effect of financial concern on academic performance within the model: mental health, physical health, self-regulation, hours in paid employment, and social identification. As such, these variables were considered redundant in terms of the present research focus, and were therefore removed from the model. Age and year of study were also removed, as neither of these control variables predicted any other variables in the model.

**Respecified Model**

The respecified model is presented in Figure 2, showing standardised path estimates. Direct, specific indirect, total indirect, and total effects for the respecified model are given in Table 6. As shown, the confidence intervals for the total indirect effect of financial concern on academic performance did not contain zero. The

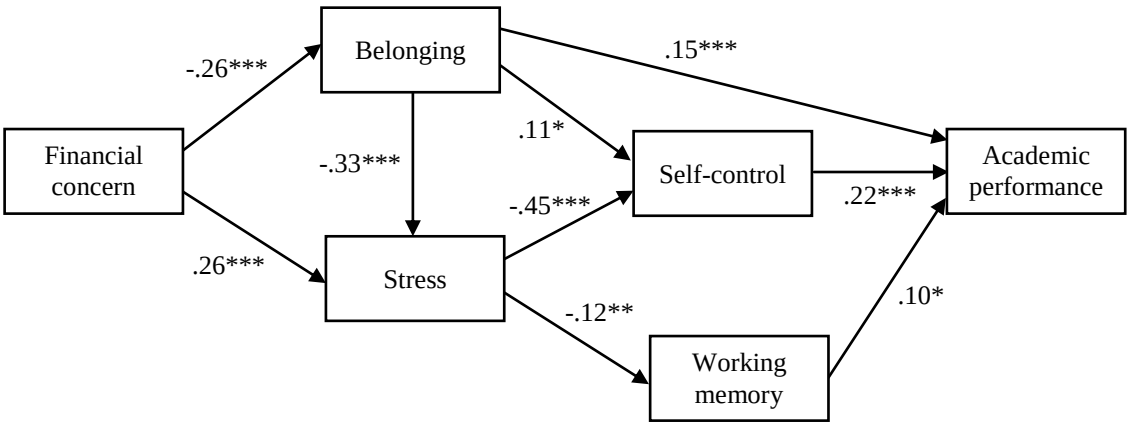


*Figure 2.* Respecified model from Study 3, showing standardised estimates. CFI = 0.99, TLI = 0.98, RMSEA = 0.021. Control variables are not shown. *** $p < .001$, ** $p < .01$, * $p < .05$.

Table 6

*Unstandardised Estimates, Standard Errors, Bias-corrected 95% CIs, and Standardised Estimates of Effects in the Respecified Model in Study 3*

| Type of effect | $b$[a] | $SE$[b] | BC 95% CIs[c] | β[d] |
|---|---|---|---|---|
| *Direct effects* | | | | |
| FC → BLG | -0.08*** | 0.01 | [-0.11, -0.06] | -0.26 |
| FC → STR | 0.12*** | 0.02 | [0.08, 0.15] | 0.26 |
| BLG → STR | -0.46*** | 0.05 | [-0.57, -0.36] | -0.33 |
| BLG → SC | 0.14* | 0.06 | [0.02, 0.25] | 0.11 |
| BLG → AP | 2.14*** | 0.64 | [0.87, 3.46] | 0.15 |
| STR → SC | -0.42*** | 0.04 | [-0.50, -0.33] | -0.45 |
| STR → WM | -0.43** | 0.15 | [-0.73, -0.15] | -0.12 |
| SC → AP | 2.44*** | 0.49 | [1.39, 3.49] | 0.22 |
| WM → AP | 0.31* | 0.12 | [0.04, 0.56] | 0.10 |
| GND → FC | 0.49** | 0.15 | [0.19, 0.80] | 0.13 |
| GND → STR | 0.35*** | 0.06 | [0.23, 0.46] | 0.21 |
| GND → SC | 0.22*** | 0.06 | [0.10, 0.34] | 0.15 |
| SES → FC | -0.30*** | 0.04 | [-0.38, -0.22] | -0.30 |
| SES → STR | -0.04* | 0.02 | [-0.08, -0.01] | -0.10 |
| SES → BLG | 0.03* | 0.01 | [0.00, 0.06] | 0.10 |
| INT → BLG | -0.22*** | 0.06 | [-0.35, -0.09] | -0.15 |
| *Specific indirect effects* | | | | |
| FC → BLG → STR | 0.04** | 0.01 | [0.03, 0.06] | 0.09 |
| FC → BLG → SC | -0.01* | 0.01 | [-0.02, 0.00] | -0.03 |
| FC → BLG → AP | -0.18** | 0.07 | [-0.33, -0.07] | -0.04 |
| FC → STR → SC | -0.05** | 0.01 | [-0.07, -0.03] | -0.09 |
| FC → STR → WM | -0.05** | 0.02 | [-0.09, -0.02] | -0.03 |
| FC → BLG → SC → AP | -0.03** | 0.02 | [-0.06, -0.01] | -0.01 |
| FC → BLG → STR → SC | -0.02*** | 0.00 | [-0.02, -0.01] | -0.03 |
| FC → BLG → STR → WM | -0.02** | 0.01 | [-0.03, -0.01] | -0.01 |
| FC → STR → SC → AP | -0.12*** | 0.04 | [-0.21, -0.06] | -0.02 |
| FC → STR → WM → AP | -0.02* | 0.01 | [-0.04, 0.00] | 0.00 |
| FC → BLG → STR → SC → AP | -0.04*** | 0.01 | [-0.07, -0.02] | -0.01 |
| FC → BLG → STR → WM → AP | -0.01* | 0.00 | [-0.02, 0.00] | 0.00 |
| BLG → STR → SC | 0.19*** | 0.03 | [0.14, 0.26] | 0.11 |
| BLG → STR → WM | 0.20** | 0.07 | [0.07, 0.36] | 0.04 |
| BLG → SC → AP | 0.34* | 0.17 | [0.07, 0.72] | 0.02 |
| BLG → STR → SC → AP | 0.47*** | 0.13 | [0.26, 0.78] | 0.03 |
| BLG → STR → WM → AP | 0.06* | 0.04 | [0.01, 0.17] | 0.00 |
| STR → SC → AP | -1.01** | 0.26 | [-1.58, -0.57] | -0.09 |
| STR → WM → AP | -0.13* | 0.08 | [-0.35, -0.02] | -0.01 |
| *Total indirect effects* | | | | |
| FC → BLG, STR → SC | -0.08** | 0.01 | [-0.12, -0.06] | -0.18 |
| FC →BLG, STR → WM | -0.07** | 0.02 | [-0.12, -0.02] | -0.04 |
| FC → BLG, STR, SC, WM → AP | -0.39** | 0.07 | [-0.53, -0.26] | -0.08 |
| BLG → STR, SC, WM → AP | 0.86** | 0.24 | [0.47, 1.42] | 0.06 |
| STR → SC, WM → AP | -1.15** | 0.26 | [-1.71, -0.68] | -0.11 |
| *Total effects* | | | | |
| FC → BLG → STR, FC → STR | 0.16** | 0.02 | [0.12, 0.19] | 0.35 |
| BLG → STR → SC, BLG → SC | 0.33** | 0.06 | [0.21, 0.44] | 0.25 |
| BLG → STR, SC, WM → AP, BLG → AP | 3.00** | 0.62 | [1.85, 4.19] | 0.21 |

*Note.* [a]Unstandardised coefficients; [b]Standard errors; [c]Lower and upper bound of bias-corrected 95% confidence intervals; [d]Standardised coefficients; FC = Financial concern; BLG = Belonging; STR = Stress; SC = Self-control; AP = Academic performance; WM = Working memory; GND = Gender; SES = Socioeconomic status; INT = UK or international status; *** $p < .001$; ** $p < .01$; * $p < .05$.

confidence intervals for the specific indirect effects of financial concern on academic performance via belonging, stress, self-control, and working memory also did not contain zero.

The respecified model was able to account for 32.6% of the variance in stress, 11.0% of the variance in sense of belonging, 1.5% of the variance in working memory, 23.5% of the variance in self-control, and 10.2% of the variance in academic performance.

The RMSEA value for the respecified model was 0.021, the upper 90% confidence interval for the RMSEA value was 0.048, the CFI value was 0.99, and the TLI value was 0.98, all indicating that the respecified model represented a good fit to the data.

## Discussion

Study 3 used cross-sectional data to identify mediators of the relation between students' financial concern and academic performance. Controlling for background variables, path analysis – alongside supplementary mediation analysis – revealed that sense of belonging at university, stress, self-control, and working memory mediated the impact of financial concern on academic performance. Further, the analysis indicated that mental and physical health, social identification with other students, hours in paid employment, and ability to self-regulate did *not* mediate the link between financial concern and academic performance.

It is important to note that the process of model respecification used in Study 3 was of a partially exploratory nature. That is, while each modification was guided by theoretical concerns and justifiable based on previous research, the respecification process was also guided by the data. It is therefore possible that paths within the respecified model may reflect idiosyncrasies of the sample, rather than more general

patterns (see Schreiber, Nora, Stage, Barlow, & King, 2006). Accordingly, in Study 4 we conduct a confirmatory test of the respecified model with a different sample of undergraduate students.

A further limitation of Study 3 concerns the use of a cross-sectional design. While path analysis using cross-sectional data is able to indicate support for certain causal paths over alternatives (Kline, 2011), it is unable to provide firm indications of causality. In contrast, within the context of assessing mediation, longitudinal designs confer many advantages over cross-sectional research. For example, apart from under certain restrictive conditions, estimates of indirect effects are likely to be more accurate when calculated using longitudinal data (Cole & Maxwell, 2003). Further, longitudinal designs allow one to control for prior levels of the dependent variables, which would otherwise confound analyses and inflate estimates of effect sizes. Accordingly, longitudinal designs can permit one to make stronger (albeit not definitive) claims regarding the potential existence of causal paths (Cole & Maxwell, 2003). Thus, in Study 4 we additionally utilise longitudinal data to examine mediators of the link between financial concern and academic outcomes among undergraduate students.

## Study 4

The first aim of Study 4 was to provide a confirmatory test of the respecified model developed in Study 3. We used data from the first wave of measurement as an independent sample to validate the respecified model.

A second aim of Study 4 was to use longitudinal data to examine whether the relationships between students' financial concern and academic outcomes (in terms of both average marks and intrinsic academic motivation) were mediated by the same potential variables as were assessed in Study 3, these being: stress, sense of belonging at university, social identification with other students, mental health, physical health,

working memory (as an indicator of cognitive function), hours in paid employment, self-control, and self-regulation.

We were primarily interested in identifying mediators of the link between financial concern and academic performance, as measured in terms of students' self-reported average marks. However, we found that financial concern was *not* able to account for any changes in academic performance over time, therefore precluding any assessment of mediators of this relationship. Consequently, we sought to additionally assess whether the potential mediating variables could account for the link between financial concern and intrinsic academic motivation. Not only is intrinsic academic motivation an important outcome in its own right, it is considered to provide a foundation for success within academic settings and predicts academic performance among university students (Kusurkar et al., 2013; Richardson et al., 2012). Further, while it has been suggested that experiencing financial difficulties could impair intrinsic academic motivation (Dupuis & Newby-Clark, 2016), and qualitative findings indicate a connection between students' finances and academic motivation (Reed & Hurd, 2016), no previous research appeared to have assessed the link between finances and intrinsic academic motivation using quantitative methods.

## Method

### Design and Procedure

The study employed a longitudinal correlational design. Three waves of data were collected via online questionnaires. The first wave of data was collected in November and December 2016, the second wave in February 2017, and the third wave in May 2017. Recruitment emails were sent to approximately 660 academic departments at 50 universities, with a request that the emails be forwarded to students. In the second and third waves of data collection participants were emailed directly.

Participants were contacted at the third wave irrespective of whether or not they completed the second wave. Recruitment emails for each wave of data collection indicated the study was concerned with student wellbeing. The first page of each questionnaire informed participants that the study would include questions about their background, personality, experience of university, and financial circumstances, along with a short 'brain training'-type task. Participants were incentivised with a £100 (approximately US$130) cash prize draw for completing each questionnaire, and a prize draw for an iPad Mini for completing all three questionnaires. In line with Kline's (2011) recommendation regarding the number of cases typically required to achieve accurate parameter estimates within structural equation modelling, we decided to recruit a minimum of 200 participants. Data collection for each wave was ended when responses to the questionnaire had become infrequent. The study was pre-registered at https://osf.io/xwv7c/.

**Participants**

Participants were undergraduate students studying in the UK. Two thousand seven hundred and ninety-four students completed the questionnaire at wave one (comprising the sample used for validation of the respecified model developed in Study 3), 834 completed the questionnaire at wave two, and 671 completed the questionnaire at wave three. Only students who completed all three waves of data collection were included in the longitudinal analyses ($N$ = 453).

Socio-demographic information for the validation and longitudinal samples is presented in Tables 7 and 8, respectively.

Table 7

*Socio-demographic Information for the Validation Sample in Study 4*

| Measure | |
|---|---|
| Age, *M* (*SD*) | 20.44 (3.32) |
| Gender, *n* (%) | |
| Female | 1811 (64.82%) |
| Male | 951 (34.04%) |
| Year of study, *n* (%) | |
| First-year | 1059 (37.90%) |
| Second-year | 768 (27.45%) |
| Third-year | 672 (24.05%) |
| Fourth-year | 265 (9.48%) |
| UK or international status, *n* (%) | |
| UK | 2202 (78.81%) |
| International | 586 (20.97%) |
| Full- or part-time status, *n* (%) | |
| Full-time | 2754 (98.57%) |
| Part-time | 40 (1.43%) |
| Ethnicity, *n* (%) | |
| White | 2199 (78.80%) |
| Asian / Asian British | 318 (11.38%) |
| Mixed / multiple ethnic groups | 131 (4.69%) |
| Black / African / Caribbean / Black British | 80 (2.86%) |
| Other ethnic group | 66 (2.36%) |
| Socioeconomic status, *M* (*SD*) | 6.14 (1.67) |

The validation sample appeared to be representative of the UK undergraduate population in terms of age, ethnicity, and whether participants were UK or international students (Higher Education Statistics Agency, 2018). However, the validation sample comprised a substantially larger proportion of female and full-time students (who in the 2016/17 academic year made up 55.71% and 89.51% of the UK undergraduate population, respectively; Higher Education Statistics Agency, 2018).

Table 8

*Socio-demographic Information for the Longitudinal Sample in Study 4*

| Measure | |
|---|---|
| Age, *M* (*SD*) | 20.52 (3.65) |
| Gender, *n* (%) | |
| Female | 308 (67.99%) |
| Male | 134 (29.58%) |
| Year of study, *n* (%) | |
| First-year | 164 (36.20%) |
| Second-year | 111 (24.50%) |
| Third-year | 118 (26.05%) |
| Fourth-year | 55 (12.14%) |
| UK or international status, *n* (%) | |
| UK | 373 (82.34%) |
| International | 80 (17.66%) |
| Full- or part-time status, *n* (%) | |
| Full-time | 446 (98.45%) |
| Part-time | 7 (1.55%) |
| Ethnicity, *n* (%) | |
| White | 404 (89.18%) |
| Asian / Asian British | 31 (6.84%) |
| Mixed / multiple ethnic groups | 10 (2.21%) |
| Other ethnic group | 6 (1.32%) |
| Black / African / Caribbean / Black British | 2 (0.44%) |
| Socioeconomic status, *M* (*SD*) | 5.95 (1.67) |

In terms of age and whether participants were UK or international students, the longitudinal sample was representative of the UK undergraduate population (Higher Education Statistics Agency, 2018). However, the longitudinal sample did appear to comprise a substantially larger proportion of female, full-time, and white students (who in the 2016/17 academic year made up 55.71%, 89.51% and 76.14% of the UK undergraduate population, respectively; Higher Education Statistics Agency, 2018).

Attrition analyses revealed a number of significant (yet relatively small) differences between participants who completed all three waves of data collection and those who completed only one or two waves. Specifically, at wave one, those participants who completed all waves of data collection had significantly higher self-reported average marks, $t$ (2044) = 2.65, $p$ = .008, $d$ = .16 (69.83% compared to 68.00%), lower socioeconomic status, $t$ (3340) = 2.45, $p$ = .014, $d$ = .12 (5.95 compared to 6.16), greater current debt, $t$ (2780) = 4.05, $p$ < .001, $d$ = .21 (£16,000 - £16,999 compared to £13,000 - £13,999), greater debt from tuition fees/maintenance loans, $t$ (2585) = 3.64, $p$ < .001, $d$ = .19 (£17,777 compared to £15,101), greater anticipated graduate debt, $t$ (2730) = 3.67, $p$ < .001, $d$ = .19 (£32,000 - £32,999 compared to £28,000 - £28,999), lower discretionary income, $t$ (2585) = 3.63, $p$ <.001, $d$ = .21 (£228 compared to £279), better working memory, $t$ (2518) = 3.65, $p$ < .001, $d$ = .20 (9.90 compared to 9.41), and worked fewer hours in paid employment, $t$ (2777) = 2.77, $p$ = .006, $d$ = .15 (3.41 compared to 4.53). Further, chi-square analyses indicated that females, $\chi^2(2) = 15.67$, $p < .001$, Cramer's $V$ = .07; third and fourth year students, $\chi^2(3) = 9.01$, $p = .029$, Cramer's $V$ = .05; UK students, $\chi^2(1) = 4.30$, $p = .038$, Cramer's $V$ = .04; and participants of white ethnicity, $\chi^2(2) = 47.70$, $p < .001$, Cramer's $V$ = .12, were more likely to complete all three waves. However, there were no significant differences between those who did and did not complete all three waves in terms of financial concern, intrinsic academic motivation, stress, sense of belonging at university, social identification with other students, self-control, self-regulation, mental or physical health, age, and whether students were enrolled full-time or part-time (all $p$s $\geq .068$).

**Materials**

Socio-demographic information was requested only in the first wave of data collection. All other measures were administered in all waves. Where appropriate, the

range of Cronbach's alpha across the three waves is given. As in Study 3, we administered a measure of personality in the first wave of data collection (Rammstedt & John, 2007), the results of which were fed back to students at the end of the questionnaire. The personality measure was intended solely as an incentive for participation, and is therefore not reported below.

The following variables were assessed using the same measures as in Study 3: financial concern (*a*s: .89 to .91), stress (*a*s: .91 to .92), sense of belonging (*a*s: .90 to .91), social identification (*a*s: .86 to .89), mental health (*a*s: .82 to .83), physical health (*a*s: .64 to .71), working memory, hours in paid employment, self-control (*a*s: .82 to .85), self-regulation (*a*s: .85 to .86), socioeconomic status, and additional indicators of financial circumstances.

Alongside the socio-demographic information that was requested in Study 3, we additionally asked students to indicate whether they studied full- or part-time (dummy coded; 0 = part-time, 1 = full-time).

**Academic performance.** Participants were asked to indicate the average percentage mark awarded for assessments over the previous three months.

**Intrinsic academic motivation.** Intrinsic academic motivation was assessed using a measure adapted from the intrinsic motivation subscale of the Motivation At Work Scale (Gagné et al., 2010). The adapted measure had three items (e.g., "One of the reasons why I am doing my degree is because I enjoy my studies very much"). Responses were made using Likert scales with options ranging from *strongly disagree* [1] to *strongly agree* [7]. A mean score was calculated for each participant, with higher scores indicating greater intrinsic academic motivation (*a*s: .89 to .92).

### Statistical Analyses

Analyses were conducted using full-information maximum likelihood estimation in AMOS 23.0 (Arbuckle, 2014). Indirect effects were estimated using bootstrapping (with 2000 samples) and bias-corrected 95% confidence intervals. All endogenous variables were regressed on the control variables, and all exogenous variables were allowed to covary with the control variables. Estimates of specific indirect effects were obtained using the 'phantom model' approach described by Macho and Ledermann (2011). Missing data were addressed using regression-based imputation within AMOS.

## Results

### Validation of the Respecified Model

Bivariate correlation coefficients, means, and standard deviations for the validation sample are reported in Table 9. Descriptive data pertaining to the financial circumstances of the validation sample are available as supplemental material in Appendix F.

The RMSEA value for the model was 0.053, the upper 90% confidence interval for the RMSEA value was 0.061, the CFI value was 0.95, and the TLI value was 0.90. Thus, the respecified model appeared to have an acceptable degree of fit in relation to the data from the validation sample.

Direct, specific indirect, total indirect, and total effects for the respecified model with the validation sample are presented in Table 10. The confidence intervals for the total indirect effect of financial concern on academic performance – along with the confidence intervals for the specific indirect effects of financial concern on academic

Table 9

*Correlations, Means, and Standard Deviations for Variables Included in the Path Analysis for the Validation Sample in Study 4*

| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | *M* | *SD* |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Financial concern | .35*** | -.20*** | -.11*** | -.16*** | -.16*** | -.32*** | .15*** | -.12*** | 3.37 | 1.57 |
| 2. Stress | - | -.48*** | -.09*** | -.42*** | -.21*** | -.16*** | .23*** | -.10*** | 3.10 | 0.76 |
| 3. Belonging | - | - | .03 | .33*** | .19*** | .15*** | -.04* | -.04† | 3.54 | 0.56 |
| 4. Working memory | - | - | - | -.04† | .13*** | .06** | -.09*** | .10*** | 9.50 | 2.56 |
| 5. Self-control | - | - | - | - | .18*** | .06** | .07*** | .09*** | 3.16 | 0.69 |
| 6. Academic performance | - | - | - | - | - | .09*** | -.10*** | .07** | 68.32 | 11.82 |
| 7. Socioeconomic status | - | - | - | - | - | - | -.01 | .22*** | 6.14 | 1.67 |
| 8. Gender | - | - | - | - | - | - | - | .04* | - | - |
| 9. UK or International | - | - | - | - | - | - | - | - | - | - |

*Note.* *** $p < .001$; ** $p < .01$; * $p < .05$; † $p < .10$.

Table 10

*Unstandardised Estimates, Standard Errors, Bias-corrected 95% CIs, and Standardised Estimates of Effects in the Respecified Model for the Validation Sample in Study 4*

| Type of effect | $b$[a] | $SE$[b] | BC 95% CIs[c] | β[d] |
|---|---|---|---|---|
| *Direct effects* | | | | |
| FC → BLG | -0.06*** | 0.01 | [-0.08, -0.05] | -0.17 |
| FC → STR | 0.11*** | 0.01 | [0.10, 0.13] | 0.23 |
| BLG → STR | -0.57*** | 0.02 | [-0.64, -0.55] | -0.43 |
| BLG → SC | 0.18*** | 0.02 | [0.13, 0.23] | 0.15 |
| BLG → AP | 2.99*** | 0.35 | [2.26, 3.76] | 0.16 |
| STR → SC | -0.35*** | 0.02 | [-0.38, -0.31] | -0.39 |
| STR → WM | -0.30*** | 0.06 | [-0.43, -0.18] | -0.10 |
| SC → AP | 2.20*** | 0.28 | [1.66, 2.75] | 0.15 |
| WM → AP | 0.65*** | 0.08 | [0.51, 0.80] | 0.16 |
| GND → FC | 0.46*** | 0.06 | [0.35, 0.57] | 0.14 |
| GND → STR | 0.28*** | 0.03 | [0.23, 0.33] | 0.18 |
| GND → SC | 0.24*** | 0.02 | [0.19, 0.28] | 0.17 |
| SES → FC | -0.30*** | 0.02 | [-0.33, -0.26] | -0.32 |
| SES → STR | -0.01 | 0.01 | [-0.03, 0.01] | -0.02 |
| SES → BLG | 0.04*** | 0.06 | [0.02, 0.05] | 0.11 |
| INT → BLG | -0.11*** | 0.03 | [-0.16, -0.06] | -0.08 |
| *Specific indirect effects* | | | | |
| FC → BLG → STR | 0.04** | 0.01 | [0.03, 0.05] | 0.06 |
| FC → BLG → SC | -0.01** | 0.02 | [-0.02, -0.01] | -0.02 |
| FC → BLG → AP | -0.18** | 0.03 | [-0.26, -0.12] | -0.03 |
| FC → STR → SC | -0.04** | 0.00 | [-0.05, -0.03] | -0.07 |
| FC → STR → WM | -0.03** | 0.01 | [-0.05, -0.02] | -0.02 |
| FC → BLG → SC → AP | -0.02*** | 0.01 | [-0.04, -0.02] | 0.00 |
| FC → BLG → STR → SC | -0.01** | 0.00 | [-0.02, -0.01] | -0.02 |
| FC → BLG → STR → WM | -0.01** | 0.00 | [-0.02, -0.01] | -0.01 |
| FC → STR → SC → AP | -0.09** | 0.01 | [-0.12, -0.06] | -0.01 |
| FC → STR → WM → AP | -0.02** | 0.01 | [-0.04, -0.01] | 0.00 |
| FC → BLG → STR → SC → AP | -0.03*** | 0.01 | [-0.04, -0.02] | 0.00 |
| FC → BLG → STR → WM → AP | -0.01** | 0.00 | [-0.01, 0.00] | 0.00 |
| BLG → STR → SC | 0.21** | 0.01 | [0.18, 0.23] | 0.13 |
| BLG → STR → WM | 0.18** | 0.04 | [0.11, 0.25] | 0.04 |
| BLG → SC → AP | 0.40*** | 0.07 | [0.27, 0.56] | 0.02 |
| BLG → STR → SC → AP | 0.41** | 0.06 | [0.31, 0.51] | 0.02 |
| BLG → STR → WM → AP | 0.12** | 0.03 | [0.07, 0.18] | 0.01 |
| STR → SC → AP | -0.77** | 0.11 | [-0.99, -0.57] | -0.06 |
| STR → WM → AP | -0.20** | 0.05 | [-0.30, -0.11] | -0.01 |
| *Total indirect effects* | | | | |
| FC → BLG, STR → SC | -0.06** | 0.01 | [-0.07, -0.05] | -0.14 |
| FC →BLG, STR → WM | -0.05** | 0.01 | [-0.07, -0.03] | -0.03 |
| FC → BLG, STR, SC, WM → AP | -0.35** | 0.04 | [-0.44, -0.28] | -0.05 |
| BLG → STR, SC, WM → AP | 0.96*** | 0.12 | [0.75, 1.22] | 0.05 |
| STR → SC, WM → AP | -0.97** | 0.12 | [-1.22, -0.76] | -0.07 |
| *Total effects* | | | | |
| FC → BLG → STR, FC → STR | 0.15** | 0.01 | [0.13, 0.17] | 0.30 |
| BLG → STR → SC, BLG → SC | 0.38** | 0.02 | [0.34, 0.43] | 0.31 |
| BLG → STR, SC, WM → AP, BLG → AP | 3.95** | 0.35 | [3.24, 4.61] | 0.22 |

*Note.* [a]Unstandardised coefficients; [b]Standard errors; [c]Lower and upper bound of bias-corrected 95% confidence intervals; [d]Standardised coefficients; FC = Financial concern; BLG = Belonging; STR = Stress; SC = Self-control; AP = Academic performance; WM = Working memory; GND = Gender; SES = Socioeconomic status; INT = UK or international status; *** $p < .001$; ** $p < .01$; * $p < .05$.

performance via stress, belonging, working memory, and self-control – did not contain zero, thus replicating the findings from Study 3.

The model accounted for 32.9% of the variance in stress, 5.5% of the variance in sense of belonging, 0.9% of the variance in working memory, 22.3% of the variance in self-control, and 9.3% of the variance in academic performance in the validation sample. These were mostly similar to the amounts of variance accounted for in Study 3, yet only half the amount of variance in sense of belonging was accounted for presently in comparison to in Study 3.

Together, the respecified model had an acceptable fit to the data of the validation sample, the confidence intervals for the total and indirect effects of financial concern on academic performance were again found to not contain zero, and the model accounted for mostly comparable proportions of variance. Therefore, the analysis represents a successful validation of the respecified model developed in Study 3.

**Longitudinal Analyses**

Bivariate correlation coefficients between variables included in the same models are reported in Table 11, along with means and standard deviations. Descriptive data pertaining to the financial circumstances of the longitudinal sample are available as supplemental material in Appendix F.

**Effects of financial concern on academic outcomes.** All of the following path models – including those assessing mediation – controlled for socioeconomic status, age, gender, year of study, whether participants studied full- or part-time, and whether participants were UK or international students.

Initially we assessed the total effect of financial concern on change in academic performance over the course of the study. Specifically, we examined the effect of financial concern at wave one on academic performance at wave three, controlling for

Table 11

*Correlations, Means, and Standard Deviations for the Longitudinal Sample in Study 4*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Socioeconomic status | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2. Age | -.14** | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 3. Gender | -.03 | -.04 | - | - | - | - | - | - | - | - | - | - | - | - |
| 4. Year of study | .07 | .28*** | -.03 | - | - | - | - | - | - | - | - | - | - | - |
| 5. Full- vs. part-time | .01 | -.22*** | -.07 | -.04 | - | - | - | - | - | - | - | - | - | - |
| 6. UK vs. international | .20*** | -.03 | .00 | -.01 | .06 | - | - | - | - | - | - | - | - | - |
| 7. Financial concern (W1) | -.31*** | .10* | .20*** | .00 | -.09† | -.06 | - | - | - | - | - | - | - | - |
| 8. Self-reported marks (W1) | .10† | .12* | -.13* | -.09† | .03 | .12* | -.22*** | - | - | - | - | - | - | - |
| 9. Self-reported marks (W3) | .10* | .00 | -.06 | .08 | -.04 | .13** | -.19*** | .55*** | - | - | - | - | - | - |
| 10. Intrinsic motivation (W1) | .03 | -.05 | .06 | -.11* | -.01 | .08 | -.05 | - | - | - | - | - | - | - |
| 11. Intrinsic motivation (W3) | .01 | -.02 | .09† | -.15** | -.02 | .08 | -.08† | - | - | .72*** | - | - | - | - |
| 12. Stress (W1) | -.12* | -.06 | .27*** | .05 | -.01 | -.08 | .34*** | - | - | -.21*** | -.21*** | - | - | - |
| 13. Stress (W2) | -.08† | -.05 | .25*** | .06 | -.03 | -.04 | .35*** | - | - | -.18*** | -.24*** | .70*** | - | - |
| 14. Belonging (W1) | .16** | -.05 | -.08† | .06 | .01 | .02 | -.19*** | - | - | .43*** | .30*** | -.51*** | -.40*** | - |
| 15. Belonging (W2) | .13** | -.01 | -.06 | .01 | .01 | -.02 | -.22*** | - | - | .42*** | .41*** | -.48*** | -.49*** | .76*** |
| 16. Social identification (W1) | .16*** | -.14** | -.01 | -.08† | .04 | .00 | -.14** | - | - | .45*** | .35*** | - | - | - |
| 17. Social identification (W2) | .16** | -.11* | -.03 | -.13** | .03 | .00 | -.17*** | - | - | .38*** | .36*** | - | - | - |
| 18. Mental health (W1) | .13** | .03 | -.20*** | -.06 | .02 | .07 | -.29*** | - | - | .21*** | .21*** | - | - | - |
| 19. Mental health (W2) | .10* | .01 | -.20*** | -.03 | .03 | .08 | -.32*** | - | - | .19*** | .22*** | - | - | - |
| 20. Physical health (W1) | .15** | -.06 | -.02 | .07 | -.01 | .05 | -.16** | - | - | -.08† | -.05 | - | - | - |
| 21. Physical health (W2) | .17*** | -.16** | -.03 | .00 | .03 | .01 | -.11* | - | - | -.10* | -.02 | - | - | - |
| 22. Working memory (W1) | .14** | -.13** | -.15** | -.03 | .04 | .14** | -.23*** | - | - | -.02 | -.02 | - | - | - |
| 23. Working memory (W2) | .04 | -.04 | -.09† | -.01 | .03 | .09† | -.11* | - | - | .00 | -.02 | - | - | - |
| 24. Working hours (W1) | -.03 | .11* | .05 | .11* | -.22*** | .02 | .13** | - | - | -.05 | -.01 | - | - | - |
| 25. Working hours (W2) | -.07 | .18*** | .03 | .07 | -.27*** | .06 | .12** | - | - | -.03 | .02 | - | - | - |
| 26. Self-control (W1) | -.04 | .03 | -.02 | .04 | -.02 | .05 | -.18*** | - | - | .23*** | .17*** | - | - | - |
| 27. Self-control (W2) | -.04 | .04 | -.04 | .05 | .01 | .04 | -.12* | - | - | .26*** | .25*** | - | - | - |
| 28. Self-regulation (W1) | .05 | .04 | -.15** | .01 | .03 | .06 | -.25*** | - | - | .24*** | .20*** | - | - | - |
| 29. Self-regulation (W2) | .09† | .06 | -.15** | .02 | .04 | .06 | -.27*** | - | - | .23*** | .23*** | - | - | - |

*Note.* *** $p < .001$, ** $p < .01$, * $p < .05$, † $p < .10$.

Table 11 *(continued)*

| | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | *M* | *SD* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Socioeconomic status | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.95 | 1.67 |
| 2. Age | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 20.52 | 3.65 |
| 3. Gender | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4. Year of study | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.14 | 1.05 |
| 5. Full- vs. part-time | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6. UK vs. international | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7. Financial concern (W1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3.30 | 1.54 |
| 8. Self-reported marks (W1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 69.83 | 11.45 |
| 9. Self-reported marks (W3) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 67.36 | 10.04 |
| 10. Intrinsic motivation (W1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.23 | 1.35 |
| 11. Intrinsic motivation (W3) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.18 | 1.43 |
| 12. Stress (W1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.32 | 1.19 |
| 13. Stress (W2) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.26 | 1.22 |
| 14. Sense of belonging (W1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3.59 | 0.56 |
| 15. Sense of belonging (W2) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3.60 | 0.53 |
| 16. Social identification (W1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5.32 | 1.19 |
| 17. Social identification (W2) | - | .81*** | - | - | - | - | - | - | - | - | - | - | - | - | 5.26 | 1.22 |
| 18. Mental health (W1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 39.63 | 12.35 |
| 19. Mental health (W2) | - | - | - | .65*** | - | - | - | - | - | - | - | - | - | - | 40.16 | 12.24 |
| 20. Physical health (W1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 52.98 | 7.73 |
| 21. Physical health (W2) | - | - | - | - | - | .57*** | - | - | - | - | - | - | - | - | 53.73 | 6.96 |
| 22. Working memory (W1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 9.90 | 2.31 |
| 23. Working memory (W2) | - | - | - | - | - | | - | .51*** | - | - | - | - | - | - | 10.41 | 2.30 |
| 24. Working hours (W1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3.41 | 7.05 |
| 25. Working hours (W2) | - | - | - | - | - | - | - | - | - | .75*** | - | - | - | - | 3.12 | 6.39 |
| 26. Self-control (W1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3.21 | 0.66 |
| 27. Self-control (W2) | - | - | - | - | - | - | - | - | - | - | - | .79*** | - | - | 3.21 | 0.62 |
| 28. Self-regulation (W1) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2.63 | 0.52 |
| 29. Self-regulation (W2) | - | - | - | - | - | - | - | - | - | - | - | - | - | .76*** | 2.67 | 0.49 |

*Note.* *** $p < .001$, ** $p < .01$, * $p < .05$, † $p < .10$.

academic performance at wave one (Figure 3). We found that initial levels of financial concern did not have a significant effect on change in academic performance over the course of the study (β = - 0.06, $p$ = .18). Thus, while we replicate the cross-sectional association between financial concern and academic performance observed in previous research and in Study 3 (see previous analyses on validation of the respecified model), we failed to observe any effect of financial concern on subsequent change in academic performance.

In the absence of any apparent effect of financial concern on subsequent change in academic performance over the course of the study, we explored whether financial concern had any effect on change in intrinsic academic motivation. Again, we specifically examined the effect of financial concern at wave one on intrinsic academic motivation at wave three, controlling for intrinsic academic motivation at wave one (Figure 4). We found that initial levels of financial concern did have a significant effect on change in intrinsic academic motivation, with greater initial levels of financial concern leading to a reduction in intrinsic academic motivation over the course of the study (β = - 0.07, $p$ = .049).

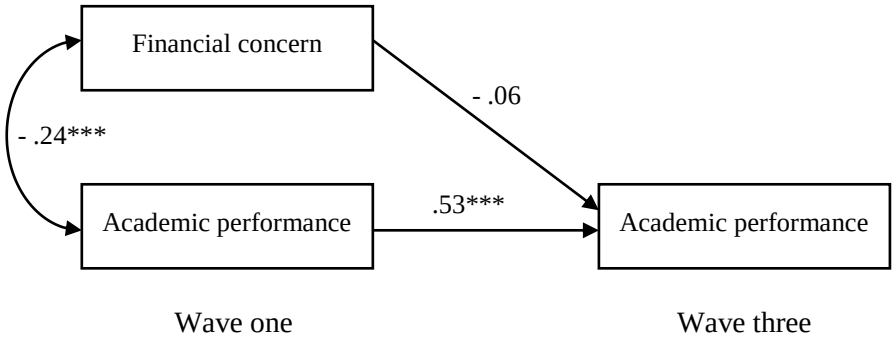


*Figure 3.* Path model of the total effect of financial concern on academic performance, showing correlation and standardised estimates. Control variables are not shown. *** $p$ < .001.

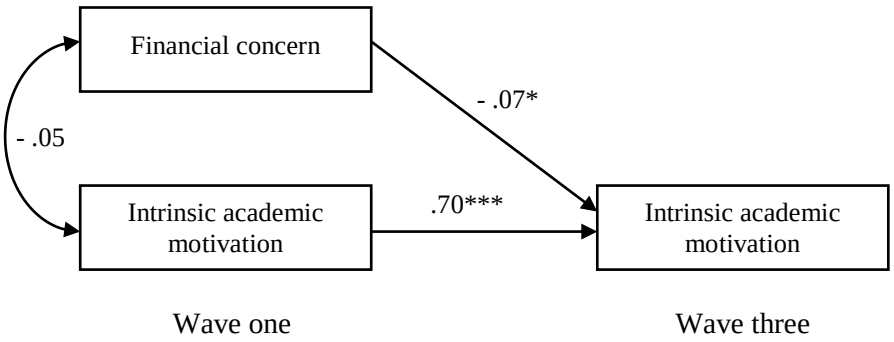


*Figure 4.* Path model of the total effect of financial concern on intrinsic academic motivation, showing correlation and standardised estimates. Control variables are not shown. *** $p < .001$, * $p < .05$.

Given there was no evidence of an effect of financial concern on change in academic performance, no further analyses concerning this outcome are reported, and the following mediation analyses concern only intrinsic academic motivation.

**Individual mediation.** A series of autoregressive models examined whether the effect of financial concern on intrinsic academic motivation was mediated by stress, sense of belonging, social identification, mental health, physical health, working memory, hours in paid employment, self-control, and self-regulation. In each model the potential mediator at wave two was regressed on financial concern at wave one, and on the potential mediator at wave one. Additionally, intrinsic academic motivation at wave three was regressed on the potential mediator at wave two, and on intrinsic academic motivation at wave one. This allowed us to examine whether financial concern led to changes in the potential mediating variables over time, and whether this led to subsequent changes in intrinsic academic motivation.

Evidence of significant mediation effects was observed for stress, sense of belonging, and mental health. Mediation analyses for these variables are reported in full

below. By contrast, there was no evidence of significant mediation for social identification, physical health, working memory, hours in paid employment, self-control, or self-regulation (all confidence intervals contained zero). Accordingly, mediation analyses for these variables are not reported below, but are available as supplemental material in Appendix F.

***Stress.*** The path model assessing mediation via stress is presented in Figure 5. Initial levels of financial concern had a significant effect on stress, such that greater financial concern predicted increased stress ($\beta = 0.13$, $p < .001$). Further, levels of stress had a significant negative effect on intrinsic academic motivation ($\beta = -0.14$, $p < .001$). Confidence intervals for the indirect effect of financial concern on intrinsic academic motivation via stress did not contain zero ($\beta = -0.02$, 95% CIs [- 0.031, - 0.007]).

***Sense of belonging.*** As may be seen in Figure 6, initial levels of financial concern significantly influenced sense of belonging, with greater financial concern

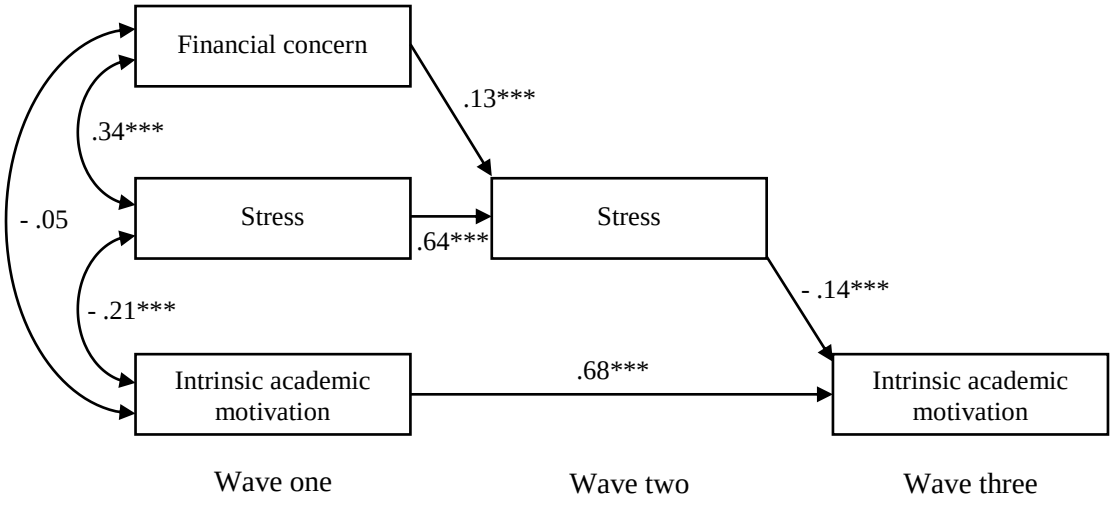


*Figure 5.* Path model assessing the effect of financial concern on intrinsic academic motivation via stress, showing correlations and standardised estimates. CFI = 1.00, TLI = 1.01, RMSEA = 0.00. Control variables are not shown. *** $p < .001$.

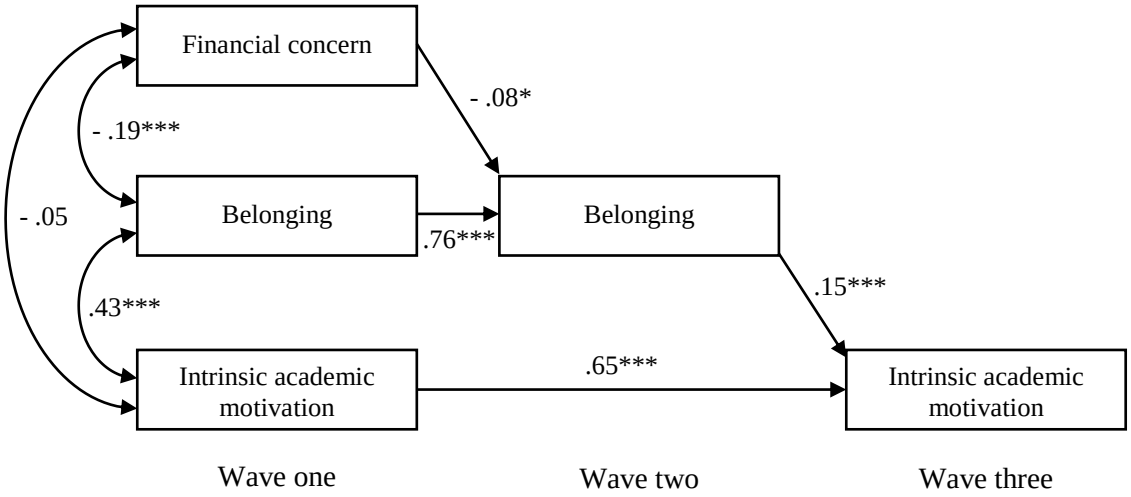


*Figure 6.* Path model assessing the effect of financial concern on intrinsic academic motivation via sense of belonging, showing correlations and standardised estimates. CFI = 0.98, TLI = 0.58, RMSEA = 0.13. Control variables are not shown. *** $p <$ .001, * $p < .05$.

leading to a reduced sense of belonging (β = - 0.08, $p = .010$). In turn, sense of belonging had a significant positive effect on intrinsic academic motivation (β = 0.15, $p < .001$). Additionally, confidence intervals for the indirect effect of financial concern on intrinsic academic motivation via sense of belonging did not contain zero (β = - 0.01, 95% CIs [- 0.032, -0.003]).

***Mental health.*** The path model in Figure 7 assessed mediation via mental health. Initial levels of financial concern had a significant negative effect on mental health (β = - 0.14, $p < .001$). Additionally, there was a significant positive effect of mental health on intrinsic academic motivation (β = 0.10, $p = .002$). Confidence intervals for the indirect effect of financial concern on intrinsic academic motivation via mental health did not contain zero (β = - 0.02, 95% CIs [- 0.031, -0.004]).

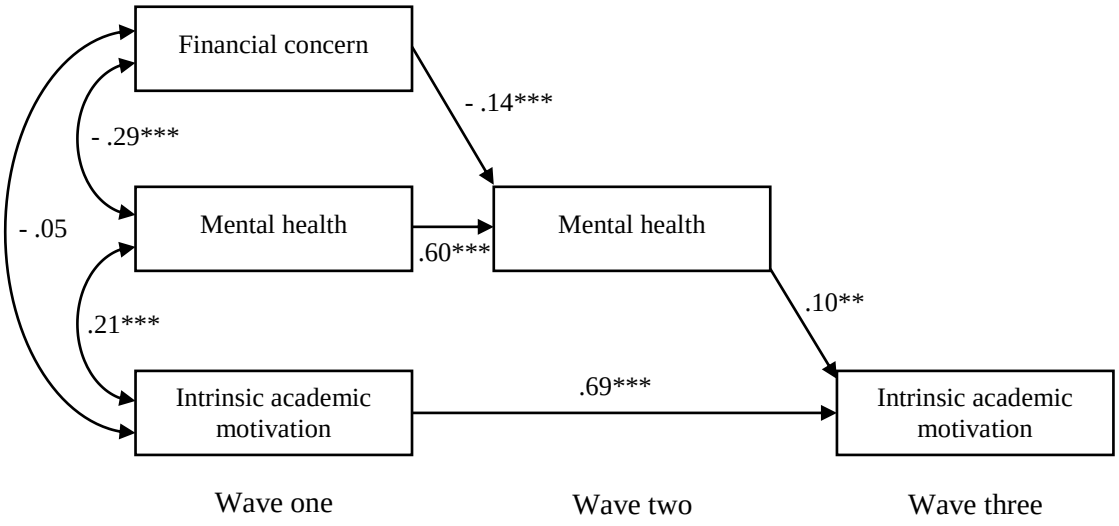


*Figure 7.* Path model assessing the effect of financial concern on intrinsic academic motivation via mental health, showing correlations and standardised estimates. CFI = 1.00, TLI = 0.96, RMSEA = 0.035. Control variables are not shown. *** $p < .001$, ** $p < .01$.

**Relative mediation.** To assess relative mediation we specified an autoregressive model including all variables for which indirect effects were found in the preceding individual mediation analyses. That is, we specified a model examining the effects of financial concern on intrinsic academic motivation via stress, sense of belonging, and mental health (Figure 8).

Within this model, stress had a significant negative effect on intrinsic academic motivation ($\beta = - 0.11$, $p = .003$). The effect of sense of belonging on intrinsic academic motivation was also found to be significant ($\beta = 0.11$, $p = .002$). However, there was no effect of mental health on intrinsic academic motivation ($\beta = - 0.03$, $p = .468$). Bootstrapping analysis indicated a total indirect effect of financial concern on intrinsic academic motivation via stress, sense of belonging, and mental health ($\beta = - 0.02$, 95% CIs [- 0.038, - 0.005]), as well as specific indirect effects of financial concern

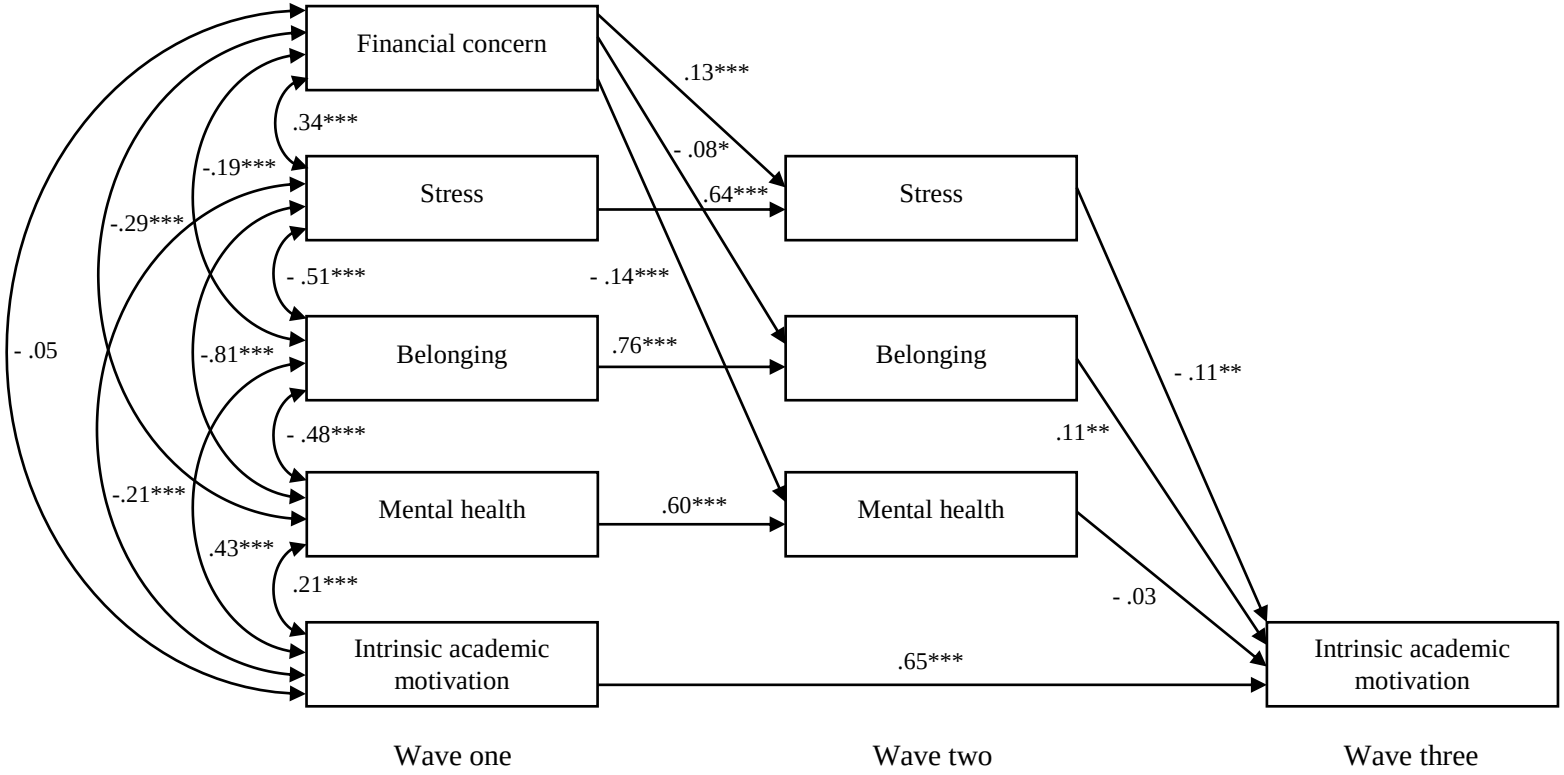


*Figure 8.* Path model assessing the effects of financial concern on intrinsic academic motivation via stress, sense of belonging, and mental health, showing correlations and standardised estimates. CFI = 0.85, TLI = 0.04, RMSEA = 0.23. Control variables are not shown. *** $p <$ .001, ** $p <$ .01, * $p <$ .05.

on intrinsic academic motivation via stress (β = - 0.01, 95% CIs [- 0.035, -0.001]) and sense of belonging (β = - 0.01, 95% CIs [- 0.025, -0.001]). However, zero *was* contained within the confidence intervals for the specific indirect effect of financial concern on intrinsic academic motivation via mental health (β = 0.00, 95% CIs [- 0.011, 0.024]).

## Discussion

The dual aims of Study 4 were to (a) provide a confirmatory test of the respecified model developed in Study 3, and (b) utilise longitudinal data to identify mediators of the relationships between financial concern and changes in academic outcomes over time, focusing on students' academic performance and intrinsic academic motivation.

We found the respecified model had an acceptable fit to the data of the validation sample. This confirmatory test suggests that the process of model respecification resulted in replicable findings about the relationships between financial concern, academic performance, and mediating variables.

In terms of the second aim we found that – controlling for students' socioeconomic status, age, gender, year of study, full- or part-time status, and whether participants were UK or international students – greater levels of financial concern predicted detrimental changes in intrinsic academic motivation over time. Further, we found that this relation was partially mediated by increased stress and a reduced sense of belonging at university. In contrast we found that levels of social identification with other students, mental and physical health, working memory, hours in paid employment, self-control, and self-regulation did not mediate the link between financial concern and intrinsic academic motivation. Further, we found that financial concern was not able to account for changes in academic performance over time.

Our findings in Study 4 serve to extend previous research within the area. For instance, while qualitative research had previously suggested a link between university students' finances and their academic motivation (Reed & Hurd, 2016), and theoretical arguments had been made proposing that financial hardship could undermine students' intrinsic motivation (Dupuis & Newby-Clark, 2016), no existing research appeared to have used quantitative methods to examine the relation between students' subjective appraisals of their financial circumstances and their academic motivation. Accordingly, that levels of financial concern were presently found to account for subsequent changes in intrinsic academic motivation affirms the findings of the aforementioned research.

The longitudinal design of Study 4 represents a valuable extension over much preceding research within the area, which has instead been of a predominantly cross-sectional nature. In controlling for prior levels of the dependent variables our analyses were able to account for many potentially confounding factors, thus providing stronger indications of potential causal pathways. Yet, our findings do not represent definitive evidence of causality. For example, it remains that an unmeasured variable could have exerted a causal influence on levels of financial concern *and* changes in the dependent variables over time, thus resulting in a non-causal (or 'spurious') association between financial concern and the dependent variables. Accordingly, future research should aim to utilise experimental designs in order to determine whether the relationships identified in Study 4 are of a causal nature.

## General Discussion

Stress and sense of belonging at university consistently emerged as mediators of the relation between financial concern and academic outcomes. These findings serve to integrate a number of formerly separate strands of research. For instance, while there were prior indications that finances affected university students' stress and sense of

belonging, and that these variables in turn influenced academic outcomes (Engle & Tinto, 2008; Freeman et al., 2007; Huang et al., 2016; Richardson et al., 2017), no existing research appeared to have directly examined whether these variables mediated the influence of finances on academic outcomes. Accordingly, the present research affords a more complete understanding of how students' finances exert their influence on academic outcomes, and through utilising both cross-sectional and longitudinal designs is able to provide convincing evidence of mediation.

While we found that financial concern predicted academic performance cross-sectionally in both studies, we found no evidence for the previously untested hypothesis that financial concern would predict subsequent changes in academic performance over time. One potential explanation for this null finding is that the time taken for financial concern to optimally affect academic performance could be substantially shorter than the six month time period between the first and final waves of measurement. If this was the case, the influence of financial concern on changes in academic performance over time would have been presently underestimated. Accordingly, a longitudinal design with shorter waves of measurement could be more successful in detecting a relation between financial concern and subsequent changes in performance. Given the consistent evidence provided for the association between financial concern and academic performance, further research in to the dynamic relationship between these variables certainly appears warranted.

Our findings have a number of important implications. The systems of higher education funding that are currently in place in many countries impose large financial burdens on university students (Kirby, 2016). For example, it is estimated that current undergraduate students in England will leave university having accrued debt in excess of £50,000 (Britton, Crawford, & Dearden, 2015). Our findings suggest that this

financial burden could be undermining students' ability to succeed within academic settings. Moreover, in controlling for socioeconomic status, our analyses indicate that the apparent influence of students' finances on academic outcomes is not simply an artefact of socioeconomic disparities that exist prior to university.

Our findings also have the potential to inform interventions aiming to mitigate any negative influence of students' financial concern on academic outcomes. For instance, that stress was presently identified as a mediating variable indicates that interventions could attempt to reduce levels of stress as a means of improving academic outcomes among students experiencing high financial concern. Indeed, stress-management training has previously been found to enhance academic success (Lumley & Provenzano, 2003), and our findings suggest this type of intervention may be particularly beneficial for students experiencing poor financial circumstances. Additionally, our findings suggest that interventions aiming to increase students' sense of belonging at university – such as those employed by Walton and colleagues (Walton & Cohen, 2007; Walton & Cohen, 2011; Walton et al., 2015) – might also attenuate the negative relations between financial concern and academic outcomes.

However, an important caveat to the aforementioned interventions is that they would not be addressing what could be considered the root cause of the problem, i.e., the financial burden often placed on university students. Accordingly, structural changes that reduce the degree of financial concern experienced by students – such as reductions in tuition fees, and increased grants to help with living costs – present themselves as more direct interventions, and would likely have more pervasive benefits to students. Indeed, experimental and quasi-experimental studies indicate that changes in the amount of financial aid received impacts outcomes such as attendance, dropout

rates, and average marks (Brock & Richburg-Hayes, 2006; Dynarski, 2000; Dynarski, 2002; Dynarski, 2003).

It is possible that different mediating variables could be implicated depending on the specific academic outcome under consideration. Indeed, this could account for why working memory ability and self-control were identified as cross-sectional mediators in regard to academic performance in Studies 3 and 4, but were *not* identified as longitudinal mediators in regard to intrinsic academic motivation in Study 4. Further, it remains that potential mediators for which no evidence was found in either of the present studies could still account for the influence of finances on other academic outcomes, such as the likelihood of dropping out (Joo et al., 2008) and the time taken to graduate from university (Letkiewicz et al., 2014). Similarly, prior research indicates financial concern may have detrimental effects on many aspects of cognitive function (Mani et al., 2013; Mullainathan & Shafir, 2013), yet present constraints on data collection meant we were able to assess only working memory. Following, it remains that presently unmeasured aspects of cognitive function – such as, for example, inhibitory control – could prove to mediate the influence of financial concern on academic outcomes. Accordingly, future research should aim to assess mediation using different operationalisations of both academic outcomes and cognitive function.

One notable limitation of the present research is the reliance on self-report measures, particularly for our assessment of academic performance. However, while subject to measurement error, meta-analysis indicates that self-reported academic performance correlates very highly with actual performance among university students (Kuncel et al., 2005). Indeed, the association between self-reported and actual marks can be as high as $r = .97$ (Crocker & Luhtanen, 2003). Nevertheless, it would be

beneficial for future research to utilise more objective measures of performance in attempts to replicate the present findings.

Another potential limitation concerns the possibility of some conceptual overlap between the measures of financial concern, stress, and belonging. More specifically, a number of the items within the financial concern scale could be argued to capture variance associated with stress (e.g., "I would list financial difficulties as one of the major stresses in my life at the moment"), and one item may have captured variance associated with belongingness (i.e., "It concerns me that my financial situation means that I may miss out on social activities"). Yet, the lack of any large correlations between financial concern and stress, and between financial concern and sense of belonging, may indicate that any conceptual overlap was not severe.

In conclusion, we present both cross-sectional and longitudinal evidence indicating that the relations between undergraduate students' financial concern and academic outcomes are mediated by increased stress and a reduced sense of belonging at university. These findings serve to integrate much previous research within the area, and in doing so help to provide a more complete account of how financial concerns may affect students' experience at university. Further, our findings have the potential to inform interventions attempting to mitigate the apparent negative influence of financial concern on academic outcomes. More broadly, our findings contribute to a growing body of literature highlighting the negative consequences of financial pressures on students (e.g., Harding, 2011; Hixenbaugh et al., 2012; Richardson et al., 2017), and additionally draw attention to the possibility that systems of higher education funding that place a large financial burden upon students – such as those systems presently found in many countries (Kirby, 2016) – could be undermining students' ability to perform well in academic settings.

# Chapter 4. Does Financial Concern Affect Students' Sense of Belonging at University?

## Abstract

Students' sense of belonging at university is important for a wide-range of academic and non-academic outcomes. Research indicates that one determinant of belonging at university may be students' financial circumstances (whereby poorer financial circumstances lead to a low sense of belonging), yet no previous experimental research appears to have examined this relationship. Accordingly, the present pre-registered experiment aimed to investigate whether a manipulation of financial concern salience would affect undergraduate students' sense of belonging at university. Participants ($N$ = 239) were randomly allocated to complete a writing task intended to induce either high or low financial concern salience. Participants then completed measures assessing their sense of belonging at university and financial circumstances. Contrary to prediction, financial concern salience did not affect belonging at university. Further, there was no evidence that any effect of financial concern salience on belonging was moderated by participants' financial circumstances. We offer a number of explanations for our null findings, including that the dependent measure may have lacked the sensitivity to detect short-term changes in the experience of belonging, and that the experimental manipulation may have failed to adequately emulate the real world experience of financial concern.

Students' sense of belonging at university – defined as the extent to which they feel accepted, respected, and supported by faculty and peers (Goodenow, 1993) – has implications for a wide range of both academic and non-academic outcomes, whereby a greater sense of belonging is linked with more positive outcomes (e.g., Hale, Hannum, & Espelage, 2005; Layous et al., 2017). Identifying determinants of belonging at university therefore appears to be an important goal, and could help to improve students' outcomes. Existing research suggests that one possible determinant is students' financial circumstances (e.g., Adams et al., 2016), yet this literature relies on correlational methods and therefore precludes interpretations of causality. Accordingly, the present study aimed to investigate whether an experimental manipulation of financial concern salience would affect students' sense of belonging at university.

**Sense of Belonging at University**

An individual's sense of belonging may be defined as the degree to which they feel accepted and supported by others in a given social context (Goodenow, 1993). Belonging has been considered a basic human need, and the extent to which a person feels that they belong in a given social environment may therefore have important implications (Baumeister & Leary, 1995). Indeed, students' sense of belonging at university has been found to predict a wide range of both academic and non-academic outcomes.

For instance, in terms of academic outcomes, Ostrove and Long (2007) found that self-reported sense of belonging at university was positively associated with average marks among undergraduate students in the United States (US), and also predicted scores on a measure of academic adjustment containing items relating to how confident students felt in their academic abilities, and how difficult they found their work. Similarly, controlling for a number of background variables (including, e.g.,

socioeconomic status and ethnicity), Pittman and Richmond (2007) found that US undergraduate students' sense of belonging at university predicted their perceived scholastic competence and self-reported average marks. Sense of belonging has additionally been found to correlate with measures of intentions to persist at university (Hausmann et al., 2007), academic engagement (Wilson et al., 2015), academic self-efficacy, intrinsic academic motivation (Freeman et al., 2007), and academic self-concept (assessed in terms of academic confidence and perceived academic competence; Curtin, Stewart, & Ostrove, 2013) among US undergraduate students (see also Studies 3 and 4 of the present thesis). Further, Zumbrunn et al. (2014) provide evidence indicating that the cross-sectional association between sense of belonging at university and academic performance is mediated by students' academic self-efficacy and engagement. Moreover, a longitudinal study conducted by Layous et al. (2017) found that a low sense of belonging at university was able to predict a significant decline in average marks over the subsequent three semesters among undergraduate students in the US.

A series of experiments by Walton and colleagues provide further evidence that belonging can play a causal role in determining academic outcomes. For instance, Walton and Cohen (2007) found that an experimental inducement of low belonging – which involved leading students to question the number of friends they had within their academic field – caused ethnic minority undergraduates in the US to feel they had less potential to succeed in their studies. Walton and Cohen (2007) also found that an intervention that served to mitigate low belonging – through portraying doubts about belonging as common to students from all types of backgrounds – improved ethnic minority students' belief in their potential to succeed at university, as well as their academic engagement (in terms of time spent studying and contact with faculty) and

average grades over the following semester. Further, Walton and Cohen (2011) administered an intervention encouraging students to perceive adversity as short-lived and common to all students, as opposed perceiving it as evidence that they did not belong at university, and found this had a positive causal impact on the average marks of ethnic minority students in the US over their subsequent three years at university. Finally, Walton et al. (2015) found that a 'social-belonging' intervention – which emphasised that while many students can have initial doubts about belonging in their academic field, most students come to feel a strong sense of belonging – served to improve the first-year average marks of women in 'male-dominated' majors in the US, and led to greater confidence that they could succeed in their academic field.

Aside from academic outcomes, sense of belonging at university has also been linked with students' mental and physical health. For instance, a cross-sectional study on US undergraduate students found that a greater sense of belonging at university predicted better perceptions of physical health among women, and fewer symptoms of poor physical health among men (Hale et al., 2005). Additionally, Suhlmann et al. (2018) found evidence of a cross-sectional association between sense of belonging at university and symptoms of depression and anxiety among German students. Further, the previously described longitudinal experiment by Walton and Cohen (2011) found the 'belonging' intervention also had a positive impact on the reported general health of ethnic minority students in the US in the three years following the intervention.

**Financial Circumstances and Sense of Belonging at University**

Given the importance of belonging for students' outcomes, identifying factors that play a role in determining students' sense of belonging at university appears to be an important research aim. Existing literature indicates that one possible determinant of sense of belonging at university is students' financial circumstances, whereby poorer

finances appear to be linked with a lower sense of belonging. For example, controlling for a number of background variables (including socioeconomic status), longitudinal research has found that higher levels of financial concern among undergraduate students in the United Kingdom (UK) predicted detrimental changes in their sense of belonging at university over a three month period (Study 4 in the present thesis). Additionally, in a sample of graduate students in the US, Ostrove et al. (2011) found a cross-sectional association between self-reported financial difficulties and students' sense of belonging at university (see also Study 3 of the present thesis). Further, in a piece of qualitative research with disadvantaged Australian students, interviews revealed that receiving financial aid enhanced students' sense of belonging at university, and this occurred primarily because the financial aid increased the availability of time for socialising with peers (Reed & Hurd, 2016).

Research also indicates that university students' financial circumstances are linked with their integration and engagement in social and academic activities, which are argued to give rise to the subjective experience of belonging (Hausmann et al., 2007; Hoffman et al., 2002; Thomas, 2012). For example, cross-sectional studies of students in the US have found that both indebtedness and the experience of financial strain are associated with reduced social integration at university (in terms of, for example, interactions with peers and engagement in extra-curricular activities; Adams et al., 2016; Quadlin & Rudel, 2015). Further, two quasi-experimental studies provide evidence that the receipt of financial aid in the form of a scholarship serves to promote the social engagement of university students in the US (Boatman & Long, 2016; Hu, 2008).

**The Present Study**

To summarise, sense of belonging at university appears to have important implications for a wide range of both academic and non-academic outcomes. Further, there is some literature indicating that students' financial circumstances could be a determinant of their sense of belonging at university (e.g., Adams et al., 2016; Study 4 in the present thesis). Yet, to the best of our knowledge, there appears to be no previous experimental research specifically investigating the impact of students' finances on their sense of belonging at university. Given the apparent importance of belonging for various outcomes, the question of whether students' financial circumstances could play a causal role in determining belonging has substantial implications. For example, it could mean that higher education funding policies that worsen students' financial circumstances might harm academic outcomes and health through reducing students' sense of belonging at university, possibly exacerbating inequalities in education and health. Further, it could point towards belonging interventions as a means to mitigate the observed negative relations between students' financial circumstances and outcomes.

Previous research has found that measures of students' subjective experiences of their financial circumstances, such as their level of financial concern, can be more important predictors of outcomes (such as academic performance and mental and physical health) than are measures of their objective financial circumstances, such as the amount of debt held (e.g., Hixenbaugh et al., 2012; Jessop et al., 2005). Further, there are a number of examples in the literature where manipulations of financial concern salience have been found to impact psychological outcomes (e.g., Mani et al., 2013; Spears, 2011), including among student populations (Chou et al., 2016). Accordingly, within the present study we elected to assess whether an experimental manipulation of

financial concern salience impacted undergraduate students' sense of belonging at university.

We assessed students' sense of belonging at university using Walton and Cohen's (2007) measure of social and academic fit. This is an established self-report measure of belonging at university, which previous research has demonstrated is sensitive to brief experimental manipulations (e.g., Walton & Cohen, 2007; Walton & Cohen, 2011).

Specifically, we predicted that:

*Hypothesis 1:* Participants in the *high financial concern salience* condition would report a lower sense of belonging at university, compared to those in the *low financial concern salience* condition.

In previous research, the impact of a manipulation of financial concern salience on psychological outcomes has been found to interact with a person's financial circumstances. For example, Mani et al. (2013) found that the inducement of high financial concern salience had a larger detrimental impact on cognitive function for those individuals with poorer financial circumstances. It appears plausible that similar moderation effects might also apply within the present context. For instance, it could be that a student who experiences poor financial circumstances in their everyday life is more susceptible to any negative effect of a short-term inducement of high financial concern salience on belonging, whereas a student with better financial circumstances could be more resistant to any negative influence of high financial concern salience on their sense of belonging. To examine this possibility, we additionally hypothesised that:

*Hypothesis 2:* Measures of students' financial circumstances would moderate the effect of a manipulation of financial concern salience, whereby the negative impact of high financial concern salience on belonging would be greater for

students with poorer financial circumstances in terms of general levels of financial concern, current debt, anticipated graduate debt, and discretionary income.

## Method

### Design and Procedure

We employed an independent-measures design. Participants were randomly allocated to either a *high financial concern salience* ($n$ = 124) or a *low financial concern salience* ($n$ = 115) condition. After completing the corresponding manipulation, all participants completed measures assessing their sense of belonging at university, demographic information, and financial circumstances.

Participants were recruited opportunistically. Administrators at approximately 226 academic departments (at 24 universities) were contacted with a request that they forward a recruitment email to undergraduate students. The recruitment email stated the study involved a short writing exercise, followed by some questions about students' experience of university and background. Participation was incentivised with entry into a £100 cash prize draw. Ethical approval was granted from the appropriate body at the host university. Data were collected in May and June 2017.

A sample size calculation indicated that a minimum sample size of 196 was required to detect a relatively small effect size ($f^2$ = 0.05) with 80% power. The small effect size was chosen to minimise the likelihood of the study being underpowered. Data collection was terminated when the required sample size had been reached and the frequency of responses had dropped to less than five responses per day.

In line with the guidelines proposed by Simmons et al. (2012) we report all data exclusions, manipulations, and measures in the study. The present study was pre-registered with the Open Science Framework (available at https://osf.io/exfp2/).

## Participants

Two hundred and forty-three students took part in the study. Four participants were excluded from analyses because they failed to complete the experimental manipulation. The final sample ($N$ = 239) comprised 170 (71.13%) females and 67 (28.03%) males (two participants did not indicate their gender). Ages ranged from 18 to 69 years ($M$ = 21.58, $SD$ = 5.23). Seventy-one (29.71%) participants were in their first year of study, 64 (26.78%) were second-year students, 75 (31.38%) were third-year students, and 26 (10.88%) were fourth-year students (three participants did not indicate their year of study). One hundred and eighty-seven (78.24%) participants were UK students, and 52 (21.76%) were international students. One hundred and seventy-one (71.55%) participants identified their ethnicity as "White".

The sample appeared to be representative of the UK undergraduate population in terms of age, ethnicity, and whether participants were UK or international students (Higher Education Statistics Agency, 2018). However, there was a comparatively larger proportion of female participants, who made up 56.69% of the UK undergraduate population in the 2016/17 academic year (Higher Education Statistics Agency, 2018).

## Materials

**Financial concern salience.** Our manipulation of financial concern salience involved presenting participants with four hypothetical scenarios outlining different financial problems. An example scenario from the *low financial concern salience* condition reads as follows: "Imagine that the money you have to live off (e.g., your maintenance loan/grant) was reduced by 3%". Participants in the *high financial concern salience* condition were presented with equivalent scenarios, but the monetary amounts involved were ten times larger (e.g., "reduced by 30%" rather than "3%"). Following each scenario were two or three questions prompting participants to think

about how the financial problems might affect them (e.g., "Given your situation, would you be able to maintain a similar lifestyle under those new circumstances? If not, what changes would you need to make?"). The scenarios and questions used were based closely on those employed by Mani et al. (2013) in their experimental studies examining the impact of inducing higher (vs. lower) levels of financial concern salience on cognitive function in community samples, but were adapted to appear more relevant to a student sample. The present manipulation was identical to that employed in Studies 1 and 2.

**Sense of belonging at university.** Sense of belonging at university was assessed using Walton and Cohen's (2007) 17-item measure of sense of social and academic fit (e.g., "People at my university accept me"). Responses were made using Likert scales ranging from *strongly disagree* [1] to *strongly agree* [5]. A mean score was calculated for each participant, with higher scores indicating greater belonging ($\alpha$ = .90).

**Socio-demographic information.** Participants were asked to indicate their gender, age, year of study, whether they were a UK or international student, and their ethnicity. Socioeconomic status was assessed using an adaptation of The MacArthur Scale of Subjective Social Status (Adler & Stewart, 2007). Scores could range from 1-10, with higher scores indicating relatively higher subjective socioeconomic status.

**General financial concern.** Participants' general level of financial concern was assessed using a measure adapted from Jessop et al. (2005). The resultant measure comprised seven items (e.g., "I would list financial difficulties as one of the major stresses in my life at the moment"). Responses were made using Likert scales ranging from *strongly disagree* [1] to *strongly agree* [7]. A mean score was calculated for each participant, with higher scores indicating greater financial concern ($\alpha$ = .89).

**Current debt.** Participants were asked to state how much total debt they currently held. Responses were made using a drop-down list with options ranging from "No debt" to "£60,000+" in increments of £1,000.

**Anticipated graduate debt.** Participants were asked to estimate how much debt they would hold upon graduating from university. Responses were made using a drop-down list with options ranging from "No debt" to "£60,000+" in increments of £1,000.

**Discretionary income.** Participants were asked to state how much money they had remaining each month after accounting for all of their essential expenses (such as, e.g., rent, utility bills). Responses were requested in Pounds Sterling.

## Results

### Preliminary Analyses

Descriptive information on participants' financial circumstances is presented in Table 12. T-test and chi-square analyses indicated there were no differences between conditions in terms of participants' general financial concern, current debt, anticipated graduated debt, amount of discretionary income, gender, age, year of study,

Table 12

*Descriptive Financial Information for Study 5 Sample*

| | Average | *SD* | Min. | Max. |
|---|---|---|---|---|
| General financial concern | 3.84[a] | 1.52 | 1.00 | 7.00 |
| Current debt | < £10,000[b] | - | £0 | ≥ £60,000 |
| Anticipated graduate debt | ≥ £60,000[b] | - | £0 | ≥ £60,000 |
| Discretionary income | £285.24[a] | £390.15 | £0 | £4,000 |

[a] Mean. [b] mode

ethnicity, socioeconomic status, or whether participants were UK or international students (all *p*s ≥ .09).

**Main Analyses**

To assess whether the experimental manipulation of financial concern salience affected participants' sense of belonging at university we conducted an independent samples t-test.

To explore whether participants' financial circumstances moderated any influence of the manipulation of financial concern salience on sense of belonging at university we performed a number of hierarchical moderated multiple regression analyses. In each regression the manipulation of financial concern salience was entered as a predictor at step one (dummy coded; *low financial concern salience* = 0, *high financial concern salience* = 1; this step additionally tested the main effect of the manipulation, yet we report the t-test as each regression analysis did not utilise the full sample). Each measure of financial circumstance (general financial concern, current debt, anticipated graduate debt, or discretionary income; all mean-centered) was entered in turn as the predictor at step two, and the corresponding interaction term between the measure of financial circumstance and the manipulation of financial concern salience was entered at step three. The third step allowed us to assess whether each indicator of participants' financial circumstances moderated any influence of the manipulation of financial concern salience on sense of belonging at university.

**The effect of financial concern salience.** Sense of belonging at university was lower for participants in the *low financial concern salience* condition ($M$ = 3.55, $SD$ = 0.56) than for those in the *high financial concern salience* condition ($M$ = 3.66, $SD$ = 0.57), yet this difference was not statistically significant, $t$ (237) = 1.48, $p$ = .14, $d$ = 0.19.

**Moderation by financial circumstances.** The regression analyses examining participants' financial circumstances as potential moderating variables are presented in Table 13. For each measure of participants' financial circumstances, the additional variance accounted for by the inclusion of the interaction term in the third step of the regressions was not statistically significant (all $\Delta F$s $\leq 1.60$, $p$s $\geq .21$, $\Delta R^2 \leq .01$). Thus, there was no evidence that financial circumstances moderated the influence of the manipulation of financial concern salience on sense of belonging at university.

## Discussion

The present study aimed to investigate the impact of financial concern salience on undergraduate students' sense of belonging at university. Contrary to our prediction we found no evidence that an experimental manipulation of financial concern salience affected students' sense of belonging at university. Further, there was no evidence that the assessed indicators of students' financial circumstances moderated any influence of the financial concern salience manipulation on their sense of belonging at university.

Previous cross-sectional and quasi-experimental research provides evidence that students' financial circumstances (including levels of financial concern) are associated with their sense of belonging at university, along with closely related variables such as social integration and engagement at university (Adams et al., 2016; Boatman & Long, 2016; Hu, 2008; Quadlin & Rudel, 2015; see also Chapter 3 of this thesis). Further, high levels of financial concern have been found to predict detrimental changes in students' sense of belonging at university over time among undergraduates in the UK (Study 4 of this thesis). However, the present study – which provides the first experimental investigation of the impact of students' financial circumstances on their

Table 13

*Hierarchical Moderated Multiple Regression Analyses (With General Financial Concern, Current Debt, Anticipated Graduate Debt, and Discretionary Income as Moderators) Predicting Sense of Belonging at University, Showing Standardised Coefficients*

| | General financial concern (*df* = 238) | | | Current debt (*df* = 235) | | | Anticipated graduate debt (*df* = 235) | | | Discretionary income (*df* = 218) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Step 1 | Step 2 | Step 3 | Step 1 | Step 2 | Step 3 | Step 1 | Step 2 | Step 3 | Step 1 | Step 2 | Step 3 |
| Condition β | 0.10 | 0.08 | 0.08 | 0.10 | 0.11 | 0.11 | 0.10 | 0.10 | 0.10 | 0.11 | 0.12$^{\dagger}$ | 0.12$^{\dagger}$ |
| Moderator β | | - 0.23$^{***}$ | - 0.20$^{*}$ | | - 0.05 | - 0.16 | | - 0.05 | - 0.08 | | - 0.07 | - 0.09 |
| Condition x moderator β | | | - 0.04 | | | 0.13$^{\dagger}$ | | | 0.04 | | | 0.02 |
| $R^2$ | .01 | .06 | .06 | .10 | .11 | .14 | .01 | .01 | .01 | .01 | .02 | .02 |
| Model *F* | 2.19 | 7.80$^{**}$ | 5.26$^{**}$ | 2.36 | 1.52 | 1.55 | 2.34 | 1.52 | 1.07 | 2.54 | 1.84 | 1.23 |
| Δ $R^2$ | | .05 | .00 | | .00 | .01 | .01 | .00 | .00 | | .01 | .00 |
| Δ *F* | | 13.29$^{***}$ | 0.23 | | 0.68 | 1.60 | | 0.69 | 0.17 | | 1.13 | 0.03 |

*Note.* *** $p < .001$, ** $p < .01$, * $p < .05$, † $p < .10$

sense of belonging at university – found no evidence that a financial concern salience manipulation influenced belonging. This finding therefore appears to conflict with, and potentially extend, much of the existing literature.

One possible explanation for the present findings is that students' sense of belonging at university might be a relatively stable variable that is immune to transient or brief manipulations of, or changes in, financial concern. This could be the case even though, over longer periods of time, students' financial circumstances may be linked with changes in belonging at university (see Chapter 3 of the present thesis). Further, the extent to which this is the case is likely to depend, in part, on the way that belonging at university is measured. For instance, if sense of belonging at university is assessed in terms of students' beliefs about whether they belong at their university in general, this may be less sensitive to a brief manipulation than if belonging were assessed in terms of how much students' feel they belong at university at a specific moment in time. Indeed, a lack of sensitivity in the dependent measure could possibly account for the null findings in the present study, where the majority of the items used to assess belonging took the form of general beliefs about students' sense of belonging (e.g., "People at my university accept me."), as opposed to how students felt in the present moment. Notably, however, the current measure of belonging at university has previously been shown to be sensitive to a brief experimental manipulation (Walton & Cohen, 2007); albeit the manipulation was of belonging itself, rather than of a hypothesised determinant of belonging such as in the present study.

An alternative explanation for the present null findings is that the experimental manipulation may have failed to adequately influence the salience of financial concern. Previous research has successfully demonstrated the effectiveness of the present manipulation by showing that the cognitive accessibility of financial concern – as

measured using a word fragment completion task – was significantly greater for participants in the *high* (vs. *low*) *financial concern salience* condition (Study 2 of the present thesis). Yet, the size of this observed effect on cognitive accessibility was small ($d$ = .29), suggesting that a stronger manipulation might have presently demonstrated a link between financial concern salience and belonging.

Relatedly, the present null findings could have occurred if the experimental manipulation failed to emulate the real life experiences associated with different levels of financial concern. That is, while the manipulation may have been able to successfully alter the accessibility of cognitions related to financial concern, it remains that the simple act of thinking about a series of hypothetical scenarios differs dramatically from the real world experiences of higher and lower levels of financial concern. For example, it is possible that the manipulation failed to influence participants' affective states in terms of the worry or anxiety often associated with the experience of financial concern. Critically, it could have been that the specific aspects of financial concern which might impact belonging were not affected by the present manipulation. Accordingly, this potential lack of ecological validity may explain why the present manipulation failed to influence students' sense of belonging at university.

One other potential explanation for the present findings is that there may be no causal relation between students' financial circumstances and their sense of belonging at university. However, given the considerable amount of correlational and quasi-experimental research linking these two variables – including longitudinal research controlling for background variables such as socioeconomic status (see Study 4 in the present thesis) – it would appear that further experimental research is necessary before this particular explanation is accepted.

Future research could aim to investigate whether a measure of belonging at university that captures the more transient experience of belonging – as opposed to general beliefs about the extent to which one belongs – is more sensitive to manipulations of financial concern salience. Additionally, future research could explore whether more ecologically valid manipulations of financial concern, or manipulations of other types of financial variables, are able to influence students' sense of belonging at university.

In summary, while previous research indicates a link between students' finances and their sense of belonging at university (e.g., Adams et al., 2016), the present study found no evidence that an experimental manipulation of financial concern salience influenced students' sense of belonging at university. There are a number of potential explanations for the present null findings, including concerns over the sensitivity of the measure of belonging – in particular the ability of the measure to detect changes in the transient experience of belonging – and the possible lack of ecological validity regarding the experimental manipulation. Accordingly, further research appears necessary before conclusions are drawn regarding the causal impact of financial circumstances on students' sense of belonging at university. Given the importance of students' sense of belonging at university for a wide range of both academic and non-academic outcomes (e.g., Suhlmann et al., 2018; Walton & Cohen, 2011), along with the large financial burden that is currently placed on many university students (Kirby, 2016), further investigation in to the role that students' financial circumstances may have in determining belonging at university remains an important avenue for future research.

# Chapter 5. Discussion

The programme of research presented in this thesis aimed to examine potential consequences of financial concern among university students, and to identify mediating variables underlying the influence of financial concern on students' academic outcomes. This final chapter provides a summary of the aims and main findings of each individual study. Following, theoretical and practical implications of the findings are explored. Finally, limitations of the programme of research are discussed, and suggestions are made regarding directions for future research.

## Summary of Aims and Findings

Existing literature indicates that financial concern can impair cognitive function (e.g., Mani et al., 2013). Given the financial burden placed on many university students (Kirby, 2016), they represent a population for whom any impact of financial concern on cognitive function could have substantial implications. Yet, no previous research had investigated this effect in university students. Accordingly, Study 1 (reported in Chapter 2) aimed to examine whether an experimental manipulation of financial concern salience affected undergraduate students' cognitive function in terms of working memory ability and inhibitory control. Study 1 additionally assessed whether any negative impact of financial concern on cognitive function was greater for students with poorer financial circumstances in terms of their current amount of debt and baseline financial concern. Contrary to prediction, Study 1 found no evidence that financial concern salience influenced students' cognitive function. Further, there was no evidence that students' financial circumstances moderated any effect of financial concern salience on cognitive function.

In light of the null findings in Study 1, a follow-up study investigated whether the experimental manipulation might have failed to influence the salience of financial

concern. Thus, Study 2 (also reported in Chapter 2) aimed to examine the impact of the experimental manipulation on the cognitive accessibility of financial concern among undergraduate students (assessed using a word fragment completion task). Study 2 found that participants in the high (vs. low) financial concern salience condition demonstrated significantly greater cognitive accessibility of financial concern. This indicated that the experimental manipulation used in Study 1 was able to effectively influence the salience of financial concern, therefore suggesting that the null findings in Study 1 might not have occurred due to manipulation failure. Yet, it remains that the null findings reported in Study 1 do not preclude that financial concern may impair students' cognitive function in real-world contexts.

Any negative influence of financial concern on cognitive function could potentially help to account for the link between students' financial circumstances and academic outcomes (e.g., Harding, 2011). Further, there exist a number of additional potential mediating variables that could explain the detrimental impact of poorer financial circumstances on academic outcomes. Accordingly, a series of correlational studies examined whether the links between undergraduate students' financial concern and academic outcomes were mediated by the following variables: stress, sense of belonging at university, social identification with other students, mental health, physical health, cognitive function (assessed in terms of working memory), working in paid employment, self-control, and self-regulation. Specifically, Study 3 (reported in Chapter 3) aimed to identify mediators of the cross-sectional association between financial concern and academic performance (assessed in terms of average marks). Path analysis and supplementary mediation analyses indicated that students' sense of belonging at university, stress, working memory, and self-control mediated the relationship between financial concern and academic performance.

Study 4 (also reported in Chapter 3) had two distinct aims. Firstly, given that the analytic method utilised in Study 3 was of a partially exploratory nature, Study 4 aimed to provide a confirmatory test of the previously developed path model. The second aim of Study 4 was to identify mediators of the longitudinal associations between undergraduate students' financial concern and academic outcomes (in terms of average marks and intrinsic academic motivation), which in comparison to the previous cross-sectional analyses would allow relatively stronger claims to be made regarding potential causal relations. Using data from the first wave of measurement as an independent sample, Study 4 successfully demonstrated the replicability of the path model developed in Study 3. Further, controlling for background variables (including socioeconomic status, gender, age, year of study, full- or part-time status, and whether participants were UK or international students), Study 4 found that greater initial levels of financial concern predicted a negative change in intrinsic academic motivation over time, and this was mediated by increased stress and a decreased sense of belonging at university. Additionally, and contrary to prediction, Study 4 found that financial concern was unable to account for changes in academic performance over time.

The correlational studies reported in Chapter 3 provided consistent evidence that students' sense of belonging at university mediated the link between financial concern and academic outcomes. While previous experimental research had demonstrated a causal effect of belonging at university on academic outcomes (Walton & Cohen, 2007; Walton & Cohen, 2011; Walton et al., 2015), no existing experimental research appeared to have tested whether students' financial circumstances impact their sense of belonging at university. Accordingly, as a complement to the correlational studies, Study 5 (reported in Chapter 4) aimed to examine whether an experimental manipulation of financial concern salience influenced undergraduate students' sense of

belonging at university. In contrast to prediction, and irrespective of students' financial circumstances, Study 5 found no evidence that financial concern salience affected students' sense of belonging at university.

## Theoretical and Practical Implications of Findings

This section considers the theoretical and practical implications of the following core findings: that the experimental manipulation of financial concern salience did not affect students' cognitive function, that stress and sense of belonging at university consistently mediated the influence of financial concern on students' academic outcomes, and that the experimental manipulation of financial concern salience did not affect students' sense of belonging at university.

### Manipulation of Financial Concern Salience Did Not Affect Cognitive Function

Existing literature indicates that a person's financial circumstances can exert influence their engagement, focus, and ability on a range of tasks (Shah, Mullainathan, & Shafir, 2012; Shah, Shafir, & Mullainathan, 2017; Shah, Zhao, Mullainathan, & Shafir, 2018). Yet, previous research assessing the impact of financial concern on cognitive function has been mixed. On the one hand, manipulations of financial concern salience have been found to have a substantial detrimental influence on aspects of cognitive function (Mani et al., 2013; Spears, 2011). However, that no effect of an experimental manipulation of financial concern salience on cognitive function was found presently adds to other studies that have produced null findings (Carvalho et al., 2016; Graves, 2015). One potential implication of this inconsistency within the literature is that, rather than having uniform effects on cognitive function, the influence of financial concern might vary based on the specific population under consideration. In the present context, for example, it could be that because university students are a relatively well-educated population they might be less susceptible to any detrimental

impact of financial concern on cognitive function. Further, the mixed findings might also be due to potential qualitative differences in the *type* of financial concern experienced by different populations. For instance, it is possible that concern arising from anticipated future debt (as might be experienced by students) may be less serious than concern over being unable to provide financially for one's family (as might be experienced more frequently by non-students), and could therefore be less harmful for cognitive function.

In more practical terms, previous research evidencing a detrimental impact of financial concern on cognitive function has recommended that the environments of those experiencing poor financial circumstances should be altered, such that cognitive loads – and thus any subsequent cognitive impairments – are minimised (Mani et al., 2013; Shah et al., 2018). For example, Gennetian and Shafir (2015) suggest that programmes aimed at helping the poor should aim to simplify the information given to individuals, and to reduce attentional demands. However, the present null finding indicates that such changes might not universally benefit those experiencing greater financial concern. Indeed, if certain populations – such as university students – experience no attendant cognitive impairments, then the provision of limited information and simplified choices could potentially result in less optimum decision-making and behaviour.

A further potential implication of this null experimental finding is that artificial manipulations of financial concern salience might not provide accurate indications of the consequences of financial concern salience in real-world contexts. Indeed, the later cross-sectional research, reported in Chapter 3, provided some evidence that natural variation in financial concern was linked with working memory ability among undergraduate students. This could be due to the likely complex and multifaceted

nature of financial concern as a construct, and the related possibility that the types of financial concern experienced by certain groups may be vastly different to those experienced by others. This implies that 'one-size-fits-all' manipulations of financial concern salience may be relatively inappropriate, and that studies utilising natural variation in financial concern could be relatively more informative.

**Stress and Sense of Belonging Mediate the Influence of Financial Concern on Academic Outcomes**

The present correlational studies provided consistent evidence that stress and sense of belonging at university mediated the relationship between undergraduate students' financial concern and academic outcomes, both in terms of academic performance (Study 3) and intrinsic academic motivation (Study 4). Following is a discussion of how these findings relate to the existing literature and contribute to theoretical development. Practical implications of these findings are additionally considered, including how the observed effects may contribute to educational inequalities, and how the findings could be used to inform interventions.

One of the main contributions of the present findings to theoretical development is in having integrated a number of formerly separate strands of research. A considerable body of research had previously investigated the consequences of university students' financial circumstances for psychological outcomes such as stress (e.g., Norvilitis et al., 2006; Richardson et al., 2017) and sense of belonging at university (e.g., Ostrove et al., 2011; Reed & Hurd, 2016). Further, the influence of both stress and sense of belonging at university on academic outcomes had also been explored (e.g., Layous et al., 2017; Lumley & Provenzano, 2003; Richardson et al., 2012; Walton & Cohen, 2007). Yet, no existing research appeared to have examined such relationships within the same analysis. Accordingly, the present findings are able

to provide a more unifying account of the consequences of financial concern among undergraduate students, and of the underlying pathways through which it may impact students' academic outcomes.

Current funding policies in higher education, both in the UK and abroad, mean that a large proportion of students experience poor financial circumstances (Belfield et al., 2017; Kirby, 2016; National Union of Students, 2015). The present findings highlight pathways through which such circumstances can harm students' ability to perform well at university, and therefore explicate the way in which burdensome funding policies might prohibit students from reaching their academic potential. Moreover, given that academic attainment is linked with a variety of other valued outcomes in later life, such as income (Department for Business, Innovation and Skills, 2013), happiness (Chen, 2011), and health (Marmot, Ryff, Bumpass, Shipley, & Marks, 1997), the apparent negative influence of financial concern on academic outcomes through the identified mediators could have further widespread and enduring consequences.

Many forms of socioeconomic inequality exist within higher education in the UK. For example, individuals from poorer socioeconomic backgrounds are less likely to attend university (Department for Business, Innovation and Skills, 2014), are more likely to drop out, and obtain poorer degree classifications (Crawford, 2014; see also Forsyth & Furlong, 2003). Much of the variance in these socioeconomic differences can be accounted for by academic performance prior to university (Crawford, 2014). Yet, when controlling for prior academic performance, students from poorer backgrounds remain less likely to succeed at university (Crawford, 2014; Hoare & Johnston, 2014; Vignoles & Powdthavee, 2009). This suggests that such inequalities are due, in part, to processes that occur *during* university, and the present findings

provide one potential explanation. On the basis that students from poorer backgrounds will tend to have worse financial circumstances, the present findings suggest that this could mean their psychological experience at university differs to that of their wealthier peers, whereby it is characterised by greater levels of stress and a reduced sense that they belong at their institution. In turn, these psychological differences could harm poorer students' ability to perform well at university, therefore contributing to socioeconomic inequalities in academic attainment. Similarly, Stephens and colleagues claim that students from low socioeconomic backgrounds can experience a 'cultural mismatch' at university – whereby *independent* norms (acting based on personal interests and preferences) are held as the cultural ideal within universities, but such students are more familiar with *interdependent* norms (being connected to, and responding to the needs of, others) – which can lead students to feel uncomfortable and not perform to their potential (Jury et al., 2017; Stephens, Markus, & Phillips, 2014; Stephens, Townsend, & Dittmann, 2018). Supporting this, messages framing culture in higher education as *independent* (vs. *interdependent*) have been found to cause first-generation students to perceive tasks as more difficult and underperform (Stephens, Fryberg, Markus, Johnson, & Covarrubias, 2012).

Importantly, the analyses in the present correlational studies controlled statistically for students' socioeconomic background, therefore indicating that current financial concern can influence stress, belonging, and academic outcomes above and beyond the effects of students' socioeconomic background. Accordingly, the present findings additionally suggest that if a student from a relatively wealthy background found themselves experiencing poor financial circumstances, they too could suffer the apparent harmful effects of financial concern on psychological and academic outcomes.

The present findings also have important practical implications for the design of interventions aiming to improve university students' academic outcomes by mitigating the negative influence of poor financial circumstances. More specifically, by highlighting stress and sense of belonging at university as mediating variables, the present findings indicate that targeting either of these variables could help to reduce the apparent detrimental impact of students' financial circumstances on their academic performance. Indeed, interventions targeting students' sense of belonging at university would also reflect the growing body of literature related to the 'social cure' approach, which argues that – because belonging to groups contributes to the fulfilment of psychological needs (such as the needs for meaning, purpose, control and efficacy) – it can lead to a wide range of improved outcomes (Cruwys, Haslam, Dingle, Haslam, & Jetten, 2014; Greenaway, Cruwys, Haslam, & Jetten, 2015; Haslam, Cruwys, Milne, Kan, & Haslam, 2016; Jetten et al., 2017).

Interventions targeting students' sense of belonging at university could take a number of different forms (Thomas, 2012; Stephens, Brannon, Markus, & Nelson, 2015). Firstly, such interventions could aim to foster the engagement of students with faculty. This might be achieved through the increased provision of situations where students are able to interact and build relationships with faculty on an individual basis. Interventions could also aim to encourage students' interaction and engagement with their peers. This might involve, for example, collaborative learning tasks, the formation of working groups, or peer mentoring programmes where students may provide social and academic support to one another. Stephens et al. (2015) additionally suggest that interventions which develop an understanding of the self that is congruent with studying and the pursuit of education could also lead to a greater sense of fit and belonging at university, particularly among students from poorer backgrounds. Further,

interventions aimed at targeting the experience of stress could potentially teach students how to best utilise adaptive coping strategies, or in perhaps more serious cases involve the provision of counselling services (Lim, Creedy, & Chan, 2010; Pereira & Barbosa, 2013).

Interventions might also benefit from addressing stress and belonging concerns linked specifically to financial issues. In a series of experiments Walton and Cohen (2007; 2011) found that academic performance was improved by interventions in which doubts about belonging were portrayed as transient and common to all students, as opposed to being experienced only by those of ethnic minority. This type of intervention could potentially be tailored so that doubts about belonging at university are portrayed as occurring regardless of students' financial circumstances. Further, Lumley and Provenzano (2003) report that a stress-management intervention involving writing about stressful experiences served to improve students' academic performance. Similarly, this intervention might be adapted so that students are encouraged to write specifically about any stress associated with their financial circumstances. It could also be useful for universities to employ professional services staff trained specifically in supporting students experiencing high levels of stress and a low sense of belonging resulting from poor financial circumstances, and to additionally ensure that such support is easily accessible.

**Manipulation of Financial Concern Salience Did Not Affect Sense of Belonging at University**

Despite consistent evidence in both the cross-sectional and longitudinal correlational studies that financial concern influenced students' sense of belonging at university, the final study within the current programme of research produced no experimental evidence for this effect. This null finding also conflicts with the many

indications in the literature that students' financial circumstances are linked with their sense of belonging at university, along with a number of other closely related variables such as social integration and engagement (e.g., Adams et al., 2016; Ostrove et al., 2011). One possible interpretation of this null finding is that the relationship between students' financial circumstances and their sense of belonging at university may not be causal, but instead could exist due to joint associations with unmeasured variables. For example, it could be that a variable such as negative affect might play a role in determining both financial concern and sense of belonging at university, therefore resulting in a spurious relationship between the two variables (c.f. Kraus, Adler, & Chen, 2013).

Yet, there are a number of alternative potential explanations that do not imply the lack of a causal relation between students' financial concern and sense of belonging at university. For instance, this null finding could have arisen if the influence of financial concern on sense of belonging does not occur immediately, but instead takes some time to manifest. Accordingly, this would suggest that any effects of financial concern might not be observable using relatively brief or transient manipulations (such as that utilised in the present research), or over short periods of time. Instead, to accurately assess the impact of financial concern on belonging it may be necessary for research to employ more enduring manipulations, and to examine potential effects over longer periods of time.

Additionally, it may be the case that any causal effects of students' financial circumstances on their sense of belonging at university are not driven specifically by levels of financial concern. Indeed, one of the primary explanations for why students' financial circumstances might influence their sense of belonging is because poorer students are less able to afford to engage in social activities with their peers, and this

effect would be expected to occur regardless of students' subjective appraisal of their financial circumstances. Accordingly, this would imply that research assessing aspects of financial circumstances other than financial concern might be more successful in identifying a detrimental influence on belonging.

## Limitations of the Programme of Research

The following section considers a number of potential limitations of the programme of research, and explores how they may have influenced the findings. These limitations include the prevalence of self-report measures, the overrepresentation of female participants, selection bias, online data collection, the strength of the experimental manipulation, and the specification of time intervals between waves of measurement in the longitudinal research.

### Self-report Measures

One potential limitation of the programme of research is that variables in all studies, with the exceptions of cognitive function and the cognitive accessibility of financial concern, were assessed using self-report measures. This means that much of the data may have been susceptible to response bias, whereby participants provide systematically inaccurate information (Furnham & Henderson, 1982). Further, this could have occurred due to unmotivated reasons, such as acquiescence, and/or due to motivated reasons, such as image management (Dodd-McCue & Tartaglia, 2010; van de Mortel, 2008).

Response bias could have been a particular issue for the self-report of potentially sensitive topics, such as participants' financial circumstances. For example, it is possible that participants may have under-reported the amount of financial concern they were experiencing, or the amount of debt they had accrued, because of concerns that poor financial circumstances would be viewed negatively (Kelly, 2015). If this was the

case, not only could it have precluded the observation of associations between participants' financial circumstances and other variables, it might also have masked any moderating influence of financial circumstances on effects of the experimental manipulations.

Another key measure that may have been particularly susceptible to response bias was self-reported academic performance within the correlational studies. Self-report measures of academic performance are widely used within educational research, and meta-analysis indicates that university students' self-reported and actual average marks are highly correlated ($r$ = .90; Kuncel et al., 2005). Indeed, the correlation between self-reported and actual marks can be as high as $r = .97$ (Crocker & Luhtanen, 2003). Yet, Kuncel et al.'s (2005) meta-analysis additionally found evidence of systematic error in self-reports of academic performance, whereby students with lower average marks tended to inflate reports of their academic performance. Accordingly, if such bias existed presently it may have obscured associations between academic performance and other variables.

Notably, however, assuming that any form of response bias was stable over time, it is arguable that the bias would not have presented any serious problems to analyses in the present longitudinal study. This was because prior levels of all dependent variables were controlled for, and so any variance attributable to systematic measurement bias would have been partialled out.

**Overrepresentation of Female Participants**

Each sample within the current programme of research comprised a higher proportion of female participants than existed in the UK undergraduate population (Higher Education Statistics Agency, 2018), and this form of overrepresentation has also been observed elsewhere within the field (e.g., Andrews & Wilding, 2004;

Harding, 2011; Richardson et al., 2018). The overrepresentation of females in Study 1 may be explained by participants having been recruited through an undergraduate psychology course for which a high proportion of those students enrolled were female. In terms of the other studies, this overrepresentation might have occurred if academic departments offering courses with higher proportions of female students were more likely to forward the recruitment emails. Yet, in the absence of demographic information on students to whom recruitment emails were sent, the possibility that female students had a higher propensity to participate is unable to be ruled out.

Irrespective of why the overrepresentation of female participants occurred, there are a number of potential reasons why it may have influenced the present findings. Firstly, previous research indicates that attitudes towards student debt can differ between male and female students. For example, in a sample of English undergraduates, Agnew and Harrison (2015) found that females were significantly less likely to believe that student debt is a good investment for the future. This could mean that female students might respond more negatively to the experience of poorer financial circumstances, which may have presently resulted in overestimates of the detrimental influence of poor financial circumstances on outcomes. On the other hand, in comparison to male undergraduates, Dwyer et al. (2013) found that female students in the US were able to take on greater amounts of educational debt before they showed an increased likelihood of dropping out of university. This suggests that female students could be more resilient to any negative influence of poorer financial circumstances, in which case the present data may have underestimated any such effects.

Existing literature further indicates that males and females tend to use different coping-strategies in response to environmental stressors (Watson, Goh, & Sawang,

2011). Specifically, females have been found to make greater use of social support (Bellman, Forster, Still, & Cooper, 2003), and of emotion-focused coping-strategies (Matud, 2004). If female students are able to cope more effectively with the strain associated with financial difficulties, this could potentially mitigate any negative impact of poor financial circumstances on outcomes. Accordingly, it is possible that the overrepresentation of female students within the present research may have masked any negative consequences of financial concern that exist within the wider student population.

**Selection Bias**

Selection bias occurs where those who decide to participate in a study differ from those who do not participate on variables that are related to the focus of the study, and can lead to biased estimates, as well as issues concerning sample representativeness (Lavrakas, 2008). Within the context of the present research, it appears plausible that the financial circumstances of participants may have differed to those of the wider student population. For instance, students experiencing poorer financial circumstances may have been less likely to participate if they had to spend a relatively larger proportion of their time managing their financial situation.

If this form of selection bias did exist, it may have had a number of possible consequences. Firstly, if participants had better financial circumstances relative to the undergraduate population, this could have meant that any negative effects of financial concern on students' outcomes were less likely to be observed. For example, the null experimental findings might have occurred simply because those students most likely to be affected by an inducement of high financial concern salience – i.e., those experiencing higher levels of financial concern in their daily lives – were not represented in the sample. Further, this form of selection bias could have meant that the

mediating variables identified in the correlational studies apply principally to those students experiencing generally lower levels of financial concern, whereas different mediators might be involved for students with higher levels of financial concern.

Importantly, the descriptive financial information provided by participants did appear to provide some indication that their financial circumstances may have been better than those of the general student population. For instance, the average amounts of current debt reported by participants in the present experimental studies were less than £10,000, which is substantially lower than the amount of debt that many undergraduates are estimated to have accrued (Belfield et al., 2017). Additionally, the average reported levels of financial concern in all of the present studies were close to the middle of the 7-point Likert scale (ranging from 3.3 to 4.0), suggesting that participants were not generally experiencing high levels of financial strain. Yet, in the absence of population data on the level of financial concern experienced by undergraduate students, it was not possible to assess whether this form of selection bias existed. This is compounded by the fact that information on the numbers of people who received the recruitment emails was unavailable, and so it was not possible to calculate the response rates for any of the present studies.

Another potential form of selection bias within the present research is the possibility that participants had greater levels of academic engagement relative to the wider undergraduate population. For example, it appears plausible that those students who are more interested their studies, and who are more motivated to perform well at university, might also be more inclined to take part in academic research. If this was the case, participants could have been likely to perform well at university irrespective of any influence of their financial circumstances. Following, any detrimental impact of

poor financial circumstances on academic outcomes that exists within the general undergraduate population may presently have been underestimated.

**Online Data Collection**

Another potential limitation of the present research is that all of the studies were conducted online, which could have meant that participants were less likely to engage adequately with the materials. This concern might apply particularly to the cognitive tasks, for which continued attention was required. Nevertheless, in a review of research, Thomas and Clifford (2017) found that the engagement of online participants with experimental manipulations equalled the engagement of those participating in-person. Additionally, Crump, McDonnell, and Gureckis (2013) provide evidence that a range of cognitive tasks (including the Stroop task) are able to be used successfully within online platforms. Moreover, the average response times and error rates observed in the cognitive tasks within the present research did not raise concerns regarding participant engagement (cf. Bleckley, Durso, Crutchfield, Engle, & Khanna, 2003; Logan & Zbrodoff, 1998). Thus, there were no specific indications that collecting data online introduced any form of systematic bias in to the current programme of research.

**Strength of the Experimental Manipulation**

It is possible that the null findings observed in the main experimental studies (Studies 1 and 5) occurred because the experimental manipulation might not have been strong enough to elicit observable effects on the outcome variables. Indeed, given that the manipulation relied on participants' engagement in hypothetical scenarios – which may or may not have been perceived as relevant – it could be argued that the manipulation was relatively artificial. This may have meant that the manipulation failed to adequately generate the affective responses that could be associated with the real-world experience of higher levels of financial concern, such as increased worry or

anxiety, which might be responsible for any subsequent negative influence on outcome variables. Accordingly, with this potential lack of ecological validity in mind, it is possible that the data produced in Studies 1 and 5 might not be interpretable as evidence either for, or against, the hypotheses that financial concern negatively impacts university students' cognitive function and sense of belonging at university. Indeed, one indication that the experimental manipulation may have lacked adequate strength comes from Study 2, where the manipulation was found to have only a relatively small effect on the cognitive accessibility of financial concern among students.

**Time Intervals Between Measurement Waves in Longitudinal Research**

The accuracy of estimates within longitudinal research is dependent on whether the intervals between waves of measurement match the time it takes for the independent variables to optimally influence the dependent variables (Cole & Maxwell, 2003). For example, if the time intervals between measurement waves are too short, this means that the proposed effects may not have time to adequately unfold. On the other hand, if the time intervals are too long, any effects that did exist could have faded such that they are no longer observable. In each scenario, the misspecification of the time intervals would result in underestimations of any true effect sizes (Selig & Preacher, 2009).

Thus, if the approximately three month time intervals between measurement waves in the present longitudinal study were not appropriately matched to the specified effects, this could have resulted in Type II errors. Further, the present longitudinal study investigated a number of different potential mediating variables, and the optimum time intervals for each of these variables – in terms of both the effects of financial concern on the proposed mediators, and of the mediators on academic outcomes – are likely to have varied considerably. For instance, it is plausible that any effect of financial concern on cognitive function might occur in a shorter amount of time than it

takes for financial concern to influence the number of hours students work in paid employment. Further, when considering each potential mediating variable alone, the time taken for the mediator to be optimally affected by financial concern could be different to the interval in which the mediator optimally influences academic outcomes.

This methodological issue might account for the finding that financial concern was unable to predict subsequent changes in students' academic performance. Indeed, in the reported analyses change in academic performance was essentially measured over a six month period, and it is plausible that the interval in which financial concern optimally affects academic performance is shorter than this. Notably, however, Andrews and Wilding (2004) found that financial difficulties *were* able to predict changes in academic performance over the course of an entire year.

## Directions for Future Research

The following section outlines a number of potential directions for future research within the field. These include investigating the consequences of different aspects of students' financial circumstances, assessing mediating variables based on different types of academic outcomes, and the identification of appropriate time intervals in which to observe effects.

### Examining the Consequences of Different Aspects of Students' Financial Circumstances

While students' financial circumstances are multifaceted, the current programme of research focused on the consequences of students' subjective experience of financial concern. This was because there were indications in the existing literature that, in comparison to more objective financial indicators, students' subjective appraisals of their financial circumstances are more closely linked with academic outcomes (e.g., Hixenbaugh et al., 2012; Ross et al., 2006). Yet, it is likely that different aspects of

students' financial circumstances will have different consequences for outcomes. Additionally, in terms of the influence of financial circumstances on academic outcomes, it is possible that different mediating variables could be involved depending on which specific aspects of students' financial circumstances are under consideration. For instance, it could be the case that while sense of belonging may be an important mediator of the link between financial concern and academic outcomes, the number of hours worked in paid employment might be a relatively more important mediator of any effect of credit card debt on academic outcomes.

Furthermore, it appears possible that poor financial circumstances in *absolute* terms (e.g., being unable to afford to buy new clothes) may influence academic outcomes via different mediating variables compared to poor financial circumstances in *relative* terms (e.g., being unable to afford clothes that are as expensive as those bought by friends). For instance, it might the case that – due to the social nature of both variables – sense of belonging at university is a relatively more important mediator of any impact of relative financial circumstances on academic outcomes, while stress could be a more important mediator when absolute financial circumstances are considered.

Accordingly, it would appear valuable for future research to investigate the influence of different aspects of students' financial circumstances on outcomes, and additionally to assess the importance of potential mediating variables as a function of different dimensions of students' financial circumstances. The findings from this avenue of research could be particularly valuable in helping to target interventions designed to mitigate any negative impact of poor financial circumstances on academic outcomes. Indeed, this would mean that interventions targeting different mediating variables could be implemented depending on the specific nature of students' financial difficulties.

**Examining Mediators Based on Different Academic Outcomes**

Students' financial circumstances have been linked with academic outcomes as operationalised in a variety of different ways. These include outcomes such as average marks (Harding, 2011), attendance (Dynarski, 2003), and the likelihood of dropping out of university (Joo et al., 2008), as well as more psychological academic outcomes such as motivation and self-efficacy (Freeman et al., 2007). Further, it appears that the importance of specific mediating variables might depend on the academic outcome that is under consideration. For instance, it is possible that while financial circumstances may influence both academic motivation and attendance at university, these effects could be transmitted via different mediators. Indeed, it might be that sense of belonging at university is a more important mediator when considering academic motivation, whereas the number of hours worked in paid employment could be a more important mediator in terms of the influence of financial circumstances on attendance.

Thus, future research should additionally aim to establish the relative importance of mediating variables for a range of different academic outcomes. Again, this avenue of research could provide valuable information for interventions. For instance, if there was a situation in which poorer financial circumstances were found to be having a particularly negative influence on the risk of students dropping out of university, interventions could be designed that targeted the mediating variables likely to have the biggest positive impact on the likelihood of dropping out.

**Identification of Appropriate Time Intervals**

As previously noted, the accuracy of estimates within longitudinal research depends, in part, on the extent to which the intervals between waves of measurement match the time it takes for the independent variables to optimally affect the dependent variables (Cole & Maxwell, 2003). Accordingly, any future longitudinal research

assessing potential mediators of the link between students' financial circumstances and academic outcomes should initially aim to identify the optimal time intervals for each proposed effect. This would include identifying the optimal time interval for the influence of (i) financial circumstances on each potential mediator, and (ii) each potential mediator on academic outcomes. Following, the information provided by this pilot research would be very beneficial in increasing the accuracy of parameter estimates, and relatedly, in reducing the possibility of null findings arising due to the misspecification of time intervals between measurement waves.

Research aimed at identifying the time it takes for financial variables to optimally affect outcomes could also be beneficial for future experimental studies. For example, if research finds that it can take a number of days for high levels of financial concern to impact students' sense of belonging at university, this indicates that measuring belonging immediately after a manipulation of financial concern would be unlikely to reveal any effect. Accordingly this would allow future studies to assess outcome variables at such times as to maximise the likelihood of observing any influence of experimental manipulations.

## Conclusion

The current programme of research identified increased stress and a reduced sense of belonging at university as mediators of the negative influence of financial concern on students' academic outcomes. This was found in relation to the cross-sectional association between financial concern and self-reported average marks (Study 3), and the longitudinal association between financial concern and subsequent changes in intrinsic academic motivation (Study 4).

These findings serve to integrate much existing literature within the field, and help to provide a more cohesive picture of how financial concern may affect students'

experiences at university, and of the pathways through which financial circumstances may influence students' outcomes. Additionally, the present findings bring to attention some of the potential negative consequences of funding policies within higher education that place a large financial burden on students and their families, and highlight specific pathways through which systems of higher education funding may contribute to and exacerbate socioeconomic inequalities in educational attainment. Further, the identification of such mediating variables provides valuable information for potential interventions aiming to mitigate the negative influence of financial circumstances on students' academic outcomes.

The present research additionally comprised a series of experimental studies aimed at examining the effects of financial concern among university students. In contrast to predictions, and irrespective of students' general financial circumstances, there was no evidence that the experimental manipulation of financial concern salience affected students' cognitive function (in terms of both working memory ability and inhibitory control; Study 1) or their sense of belonging at university (Study 5). Further, these null findings occurred despite a separate experiment (Study 2) providing evidence that the manipulation successfully influenced the cognitive accessibility of financial concern among university students (assessed using a word fragment completion task).

There are a number of possible explanations for the null experimental findings. For instance, it may have been that the manipulation lacked adequate ecological validity, or that inadequate time was allowed for any effects of the manipulation to manifest. Additionally, the null experimental findings might have been due to a selection bias, whereby those students for whom an effect would be expected (i.e., those with higher levels of financial concern generally) may have been less likely to participate.

Given the multifaceted nature of students' financial circumstances, along with the varied nature of different academic outcomes, useful avenues for future research include investigating the consequences of different aspects of students' financial circumstances, and the relative importance of potential mediating variables as a function of different academic outcomes. Further, future longitudinal and experimental research would benefit from attempts to identify the optimal time intervals for assessing the influence of financial circumstances on outcomes.

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# Appendices

# Appendix A. Study 1 Materials

## [Baseline Survey]

Before the main study you will need to complete this short pre-test survey. This will involve some questions about your background and financial circumstances, and should take no longer than 15 minutes to complete.

Within one week of completing the pre-test survey you will be emailed a link to the main study. This will involve a financial decision-making task, followed by two 'brain training' type tasks, and should take no longer than 30 minutes to complete. You may complete the main study at any time.

You will need to complete both the pre-test survey and the main study in order to receive your course credits.

In both parts of the study you will be asked for your email address. This is so we are able to send you the link to the main study, and match your data across both parts of the study. Your email address will be stored separately from the main data files and will be deleted once this programme of research has been completed.

**Please note:**

You are under no obligation to take part in this study. Participation is voluntary and you are free to withdraw at any time until the data collection stage of the study is over.

All the information that you give will be treated confidentially and there will be no way of identifying your responses in the data archive. We are not interested in any one individual's responses. We want to look at the general patterns that emerge when the data are aggregated together.

This study has been approved by the Sciences & Technology Cross-Schools Research Ethics Committee (crecscitec@sussex.ac.uk). The University of Sussex has insurance in place to cover its legal liabilities in respect of this study.

**Consent to take part:**

By clicking the 'continue' button, you are indicating that:

1) You consent to the processing of your personal information for the purposes of this research.
2) You understand that such information will be treated as strictly confidential and handled in accordance with the Data Protection Action 1988.

**Please answer the following questions about yourself**

What is your gender?

Male
Female
Other

What is your age?

_____

Which year of study are you in?

Undergraduate year 1
Undergraduate year 2
Undergraduate year 3
Undergraduate year 4

Are you an overseas or UK student?

Overseas
UK

Which of the following best describes your ethnicity?

White
Mixed/multiple ethnic groups
Asian/Asian British
Black/African/Caribbean/Black British
Other ethnic group

Do you have any form of colour blindness?

Yes
No

What is your University of Sussex email address?

_____

**Now we would like to ask you some questions about your financial situation**

Are you currently in debt?

Yes
No
Prefer not to say

If yes, what is the approximate total amount of your **current** debt?

Less than £10,000
£10,000 - £19,999
£20,000 - £29,999
£30,000 - £39,999
£40,000 - £49,999
£50,000 - £59,999
£60,000 +
Prefer not to say

Please indicate how much debt you **currently** have from each of the following sources. If you do not have any debt from a particular source, please put a '0' in the amount box.

**Tuition fee loans (e.g., from Student Finance England)**

Amount in pounds sterling:

_____

or...

Prefer not to say

**Maintenance loans (e.g., from Student Finance England)**

Amount in pounds sterling:

_____

or...

Prefer not to say

**Credit-cards**

Amount in pounds sterling:

_____

or...

Prefer not to say

**Payday loan companies (e.g., Wonga)**

Amount in pounds sterling:

_____

or...

Prefer not to say

**Bank overdrafts**

Amount in pounds sterling:

_____

or...

Prefer not to say

**Loans from partner/family/friend**

Amount in pounds sterling:

_____

or...

Prefer not to say

Approximately how much debt will you have overall when you **graduate** from university?

Less than £10,000
£10,000 - £19,999
£20,000 - £29,999
£30,000 - £39,999
£40,000 - £49,999
£50,000 - £59,999
£60,000 +
Prefer not to say

After accounting for all of your essential expenses (e.g., rent, bills), how much money do you have to spend on other things **each month**?

_____

or...

Prefer not to say

**Please read the following statements and select one answer for each statement to indicate how much you agree or disagree**

I find paying bills economically difficult

Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree

I have seriously considered abandoning my course because of financial difficulties

Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree

Thinking about the amount of debt I will have when I graduate makes me feel anxious

Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree

Financial problems cause me to lose sleep

Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree

I would list financial difficulties as one of the major stresses in my life at the moment

Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree

It concerns me that my financial situation means that I may miss out on social activities

Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree

I often worry about the debt I will have when I finish my degree at university

Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree

Please think of a ladder with 10 rungs representing where people stand in the United Kingdom. At the top of the ladder, with a score of 10, are the people who are best off – they have the most money, the most education, and the best jobs. At the bottom of the ladder, with a score of 1, are the people who are worst off – they have the least money, the least education, and the worst jobs or no jobs.

**Now think about your family. Where would your family be on this ladder?**

10 (most money, most education, best jobs)
9
8
7
6
5
4
3
2
1 (least money, least education, worst/no jobs)

Lastly, we would like your permission to access your academic record. We would like to stress that such information (and indeed all of the information you have provided) will be kept completely confidential.

If you are happy for us to access this information please click on the box below, and provide your student registration number in the space provided.

□ I am happy for you to access this information

Student registration number (this is the 8 digit number on your student card)

_____

Thank you for taking the time to complete this pre-test survey. Within one week you will receive an email with the link to the main study.

Please remember that you will need to complete the main study in order to receive your course credits.

If you have any questions or concerns regarding this study, please feel free to contact the researcher (Matthew Reid) at the following email address:

mr307@sussex.ac.uk

## [Main Study]

This study will involve a financial decision-making task, followed by two ‘brain training’ type tasks, and should take no longer than 30 minutes to complete.

You will again be asked to provide your email address. This is so we are able to match your data to the responses you gave in the pre-test survey. Your email address will be stored separately from the main data files, and will be deleted once this programme of research has been completed.

Once you have completed this part of the study you will be awarded your course credits.

**Please note:**

You are under no obligation to take part in this study. Participation is voluntary and you are free to withdraw at any time until the data collection stage of the study is over.

All the information that you give will be treated confidentially and there will be no way of identifying your responses in the data archive. We are not interested in any one individual's responses. We want to look at the general patterns that emerge when the data are aggregated together.

This study has been approved by the Sciences & Technology Cross-Schools Research Ethics Committee (crecscitec@sussex.ac.uk). The University of Sussex has insurance in place to cover its legal liabilities in respect of this study.

**Consent to take part:**

By clicking the 'continue' button, you are indicating that:

1) You consent to the processing of your personal information for the purposes of this research.
2) You understand that such information will be treated as strictly confidential and handled in accordance with the Data Protection Action 1988.

**What is your University of Sussex email address?**

_____

**[Financial concern salience manipulation – low financial concern salience condition amounts are in brackets, e.g., '30% (3%)']**

**Please read the following four scenarios carefully. Try to imagine that you are in each situation, and then write a little about how you would respond to it.**

*Scenario 1*

Imagine that the money you have to live off (e.g., your maintenance loan/grant) was reduced by 30% (3%).

(i) Given your situation, would you be able to maintain a similar lifestyle under those new circumstances? If not, what changes would you need to make?

(ii) Would it impact your leisure, housing, or travel plans?

*Scenario 2*

Imagine that your laptop/pc is having some trouble and requires a £150 (£15) service. You need to decide which of the following options to take:

(1) Pay the full amount in cash immediately
(2) Take out a loan, which you can pay back in monthly instalments of £30 (£3) a month for 6 months, which would amount to £180 (£18) in total
(3) Take a chance, forego the repair, and hope that the laptop/pc works a while longer. Of course, this leaves open the possibility of breakdown, or even greater expense in the long run

(i) Which payment option would you choose?

□ 1 □ 2 □ 3

(ii) Would it be an easy or a difficult decision for you to make?

*Scenario 3*

Imagine that an unforeseen event requires an immediate £300 (£30) expense.

(i) Are there any ways in which you could come up with that amount of money on a very short notice? How would you go about it?

(ii) Would it cause you long-lasting financial hardship?

(iii) Would it require you to make sacrifices that have long-term consequences? If so, what kind of sacrifices?

*Scenario 4*

Imagine it is essential that you buy new textbooks for your course, altogether costing £200 (£20). You can choose to:

(1) Pay the full amount in cash immediately
(2) Spread the cost over a 6 month period paying £40 (£4) each month, which would amount to £240 (£24) in total

(i) Which payment option would you choose?

□ 1 □ 2

(ii) Would you have the necessary cash on hand?

(iii) Would the additional cost of spreading payment over a 6 month period be worth it?

**The financial decision-making part of this study is now over.**

**On the following page are instructions for the first of the 'brain training' type tasks.**

**Please read the instructions very carefully before proceeding.**

In the following trials you will see words presented in different colours.

Your task is to indicate the COLOUR in which each word is printed in while ignoring what the words actually say.

Indicate the colour of the word by pressing either of the following keys:
- d for red words
- f for green words
- j for blue words
- k for black words

Example: if you see the word RED printed in the colour GREEN press 'f' for green words regardless of the meaning of the word.

Try to respond as quickly and accurately as you can, because you will be timed. If an incorrect response is made, a red X will be flashed on the screen.

Place your index and middle fingers on the 'd', 'f', 'j', and 'k' keys so that you are ready to respond.

## [Participants complete Stroop Task]

**The first 'brain training' task is now complete.**

**Please press the space bar to go on to the second 'brain training' task.**

This is the second of the 'brain training' tasks.

In this task you will try to memorize letters you see on the screen while you also solve simple math problems.

In the next few minutes, you will have some practice to get you familiar with how the task works.

We will begin by practicing the letter part of the task.

Click the left mouse button to begin.

For this practice set, letters will appear on the screen one at a time.

Try to remember each letter in the order presented.

After 2-3 letters have been shown, you will see a screen listing 12 possible letters.

Your job is to select each letter in the order presented.

To do this, use the mouse to select each letter.

The letters you select will appear at the bottom of the screen.

Click the mouse button to continue.

When you have selected all the letters, and they are in the correct order, hit the EXIT box at the bottom right of the screen.

If you make a mistake, hit the CLEAR box to start over.

If you forget one of the letters, click the BLANK box to mark the spot for the missing letter.

Remember, it is very important to get the letters in the same order as you see them.

If you forget one, use the BLANK box to mark the position.

When you're ready, click the mouse button to start the letter practice.

**[Participants complete practice letter task]**

Now you will practice doing the math part of the task.

A math problem will appear on the screen, like this:

(2 * 1) + 1 = ?

As soon as you see the math problem, you should compute the correct answer.

In the above problem, the answer 3 is correct.

When you know the correct answer, you will click the mouse button.

Click the mouse button to continue.

You will see a number displayed on the next screen, along with a box marked TRUE and a box marked FALSE.

If the number on the screen is the correct answer to the math problem, click on the TRUE box with the mouse.

If the number is not the correct answer, click on the FALSE box.

For example, if you see the problem (2 * 2) + 1 = ? and the number on the following screen is 5

click the TRUE box, because the answer is correct.

If you see the problem (2 * 2) + 1 = ? and the number on the next screen is 6 click the FALSE box, because the correct answer is 5, not 6.

After you click on one of the boxes, the computer will tell you if you made the right choice.

Click the left mouse button to continue.

It is VERY important that you get the math problems correct.

It is also important that you try to solve the problems as *quickly* as you can.

When you're ready, click the mouse to try some practice problems.

**[Participants complete practice maths task]**

Now you will practice doing both parts of the task at the same time.

In the next practice set, you will be given one of the math problems.

Once you make your decision about the math problem, a letter will appear on the screen. Try and remember the letter.

In the previous section where you only solved math problems, the computer computed your average time to solve the problems.

If you take longer than your average time, the computer will automatically move you onto the next letter part, thus skipping the True or False part and will count that problem as a math error.

Therefore, it is VERY important to solve the problems as quickly and as accurately as possible.

Click the mouse to continue.

After the letter goes away, another math problem will appear, and then another letter.

At the end of each set of letters and math problems, a recall screen will appear.

Use the mouse to select the letters you just saw.

Try your best to get the letters in the correct order.

It is important to work QUICKLY and ACCURATELY on the math.

Make sure you know the answer to the math problem before clicking to the next screen.

You will not be told if your answer to the math problem is correct.

After the recall screen, you will be given feedback about your performance regarding both the number of letters recalled and the percent correct on the math problems.

Click the mouse to continue.

During the feedback, you will see a number in red in the top right of the screen.

This indicates your percent correct for the math problems for the entire task.

It is VERY important for you to keep this at least at 85%.

For our purposes, we can only use data where the participant was at least 85% accurate on the math.

Therefore, you must perform at least at 85% on the math problems WHILE doing your best to recall as many letters as possible.

Click the mouse to try some practice problems.

**[Participants complete practice letter and maths task]**

That is the end of the practice. The real trials will look like the practice trials you just completed.

First you will get a math problem to solve, then a letter to remember.

When you see the recall screen, select the letters in the order presented.

If you forget a letter, click the BLANK box to mark where it should go.

Some of the sets will have more math problems and letters than others.

It is important that you do your best on both the math problems and the letter recall parts of this task.

Remember on the math you must work as QUICKLY and ACCURATELY as possible.

Also, remember to keep your math accuracy at 85% or above.

Click the mouse to begin the task.

**[Participants complete main OSPAN task]**

**There is a chance that we may wish to contact you sometime in the future about the opportunity to participate in follow-up studies.**

**If you are happy for us to contact you for this purpose, please tick the box below**

□ **I am happy to be contacted about follow-up studies**

**The second 'brain training' task is now complete!**

**Please could you indicate, in the box below, what you think the purpose of this study is:**

**Thank you for taking the time to participate in this study. You will now be awarded your course credits.**

**When the programme of research is complete, you will receive a short debrief email outlining what this study was about.**

**If you would like to find out more information about the study, or you have any concerns, then please feel free to contact the researcher (Matthew Reid) at the following email address:**

**mr307@sussex.ac.uk**

## Appendix B. Study 2 Materials

This study consists of:

- A short writing exercise
- A word puzzle
- Some questions about your background and circumstances

We are hoping to use the writing exercise and word puzzle in future research, and want to check they are suitable. There are no right or wrong answers to any of the questions.

The study should take around 5 minutes to complete.

If you take part, there is a prize draw to **WIN £100!**

Please note, you must be an **undergraduate student** and able to **speak English fluently** to take part in this study.

**Please note:**

You are under no obligation to take part in this study. Participation is voluntary and you are free to withdraw at any time until the data collection stage of the study is over.

All the information that you give will be treated confidentially and there will be no way of identifying your responses in the data archive. We are not interested in any one individual's responses. We want to look at the general patterns that emerge when the data are aggregated together.

This study has been approved by the University of Sussex's Sciences & Technology Cross-Schools Research Ethics Committee (crecscitec@sussex.ac.uk). The project reference number is [ref no.]. The University of Sussex has insurance in place to cover its legal liabilities in respect of this study.

If you have any concerns about this study please feel free to contact either Matthew Reid (mr307@sussex.ac.uk), Donna Jessop (who is supervising the research; d.jessop@sussex.ac.uk), or the Sciences & Technology Cross-Schools Research Ethics Committee (crecscitec@sussex.ac.uk).

**Consent to take part:**

By clicking the 'continue' button, you are indicating that:

3) You consent to the processing of your personal information for the purposes of this research.
4) You understand that such information will be treated as strictly confidential and handled in accordance with the Data Protection Action 1988.

**[Financial Concern Salience Manipulation – low financial concern salience amounts are in brackets, e.g., '30% (3%)']**

**Please read the following four scenarios carefully. Try to imagine that you are in each situation, and then write a little about how you would respond to it.**

***Scenario 1***

Imagine that the money you have to live off (e.g., your maintenance loan/grant) was reduced by 30% (3%).

(iii) Given your situation, would you be able to maintain a similar lifestyle under those new circumstances? If not, what changes would you need to make?

(iv) Would it impact your leisure, housing, or travel plans?

***Scenario 2***

Imagine that your laptop/pc is having some trouble and requires a £150 (£15) service. You need to decide which of the following options to take:

(4) Pay the full amount in cash immediately

(5) Take out a loan, which you can pay back in monthly instalments of £30 (£3) a month for 6 months, which would amount to £180 (£18) in total

(6) Take a chance, forego the repair, and hope that the laptop/pc works a while longer. Of course, this leaves open the possibility of breakdown, or even greater expense in the long run

(iii) Which payment option would you choose?

□ 1 □ 2 □ 3

(iv) Would it be an easy or a difficult decision for you to make?

***Scenario 3***

Imagine that an unforeseen event requires an immediate £300 (£30) expense.

(iv) Are there any ways in which you could come up with that amount of money on a very short notice? How would you go about it?

(v) Would it cause you long-lasting financial hardship?

(vi) Would it require you to make sacrifices that have long-term consequences? If so, what kind of sacrifices?

***Scenario 4***

Imagine it is essential that you buy new textbooks for your course, altogether costing £200 (£20). You can choose to:

(3) Pay the full amount in cash immediately

(4) Spread the cost over a 6 month period paying £40 (£4) each month, which would amount to £240 (£24) in total

(iv) Which payment option would you choose?

□ 1 □ 2

(v) Would you have the necessary cash on hand?

(vi) Would the additional cost of spreading payment over a 6 month period be worth it?

**Please now complete the following by filling letters in the blanks to create the first word that makes sense. Write one letter per blank. Some words may be plural.**

**[Order of words randomised across participants]**

B E _ _

_ O D _

P _ _ R [poor]

P A _ E R

B _ L L [bill]

F _ _ L

P _ _ K I N _

D _ _ T [debt]

H _ T C H

S H O _ _

_ O V E _ T Y [poverty]

A C _ _ _ A T E

O _ E [owe]

_ _ T T E R

B O R _ _ _ [borrow]

O V E R _ _ _ _ _ [overdraft/overdrawn]

C A L L _ _

_ R O _ E [broke]

**Now we would like to ask you some questions about your background.**

What is your gender?

Male

Female

Other

What is your age?

_____

Are you currently an undergraduate student?

Yes

No

Which of the following best describes your ethnicity?

White

Mixed/multiple ethnic groups

Asian/Asian British

Black/African/Caribbean/Black British

Other ethnic group

Are you a fluent English speaker?

Yes

No

Please think of a ladder with 10 rungs representing where people stand in society. At the top of the ladder, with a score of 10, are the people who are best off – they have the most money, the most education, and the best jobs. At the bottom of the ladder, with a score of 1, are the people who are worst off – they have the least money, the least education, and the worst jobs or no job.

**Now think about your family. Where would your family be on this ladder?**

10 (most money, most education, best jobs)
9
8
7
6
5
4
3
2
1 (least money, least education, worst/no jobs)

**Please read the following statements and indicate how much you agree or disagree with each one.**

1. I find paying bills economically difficult

| Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|

2. I have seriously considered abandoning my course because of financial difficulties
3. Thinking about the amount of debt I will have when I graduate makes me feel anxious
4. Financial problems cause me to lose sleep
5. I would list financial difficulties as one of the major stresses in my life at the moment
6. It concerns me that my financial situation means that I may miss out on social activities
7. I often worry about the debt I will have when I finish my degree at university

**Finally, what is the approximate total amount of debt that you <u>currently</u> have?**

Please note, this can include tuition fees, maintenance loans, credit card debt, bank overdrafts, informal loans from family or friends, as well as any other debt you might have.

(Please select from the drop-down list)

No debt
Less than £999
£1000 – £1999
[continuing in £1000 increments up to £60,000+]

What do you think the purpose of this study may have been?

Is there anything else you would like to mention in relation to this study?

**Thank you for taking part in this study!**

**Prize draw**

Below is a link to a separate survey where you are able to provide your contact details for entry in to the prize draw. Your contact details will not be linked to your other responses, and will be deleted once the prize draw has taken place.

**[Link to contact details survey]**

The aim of this study was to see whether different writing exercises influence how much people subsequently think about their finances. You completed one of four different writing exercises. The 'word game' was intended to assess how much people were thinking about their finances - a number of the word fragments could have created words that were related to financial concern.

If you have any concerns about this study please feel free to contact either Matthew Reid (mr307@sussex.ac.uk), Donna Jessop (who is supervising the research; d.jessop@sussex.ac.uk), or the Sciences & Technology Cross-Schools Research Ethics Committee (crecscitec@sussex.ac.uk). The project reference number is ER/MR307/9.

# Appendix C. Study 3 Materials

This survey will ask about your background, personality, experience of university, and financial circumstances. There will also be a short 'brain training' type task.

Altogether, it should take around 10 minutes to complete.

At the end of the survey you will be able to enter a prize draw to **WIN £100!**

If you are interested, **YOUR PERSONALITY TEST RESULTS** will also be generated at the end.

**Please note:**

You are under no obligation to take part in this study. Participation is voluntary and you are free to withdraw at any time until the data collection stage of the study is over. All the information that you give will be treated confidentially and there will be no way of identifying your responses in the data archive. We are not interested in any one individual's responses. We want to look at the general patterns that emerge when the data are aggregated together.

This study has been approved by the Sciences & Technology Cross-Schools Research Ethics Committee (crecscitec@sussex.ac.uk). The University of Sussex has insurance in place to cover its legal liabilities in respect of this study.

**Consent to take part:**

By clicking the 'continue' button, you are indicating that:

1) You consent to the processing of your personal information for the purposes of this research.
2) You understand that such information will be treated as strictly confidential and handled in accordance with the Data Protection Act 1988.

**Firstly we would like to ask you some questions about your background.**

What is the name of your institution?

[Drop down menu]

What is your gender?

Male

Female

Other

What is your age?

_____

Which year of study are you in?

Undergraduate year 1

Undergraduate year 2

Undergraduate year 3

Undergraduate year 4

Are you an overseas or UK student?

Overseas

UK

Which of the following best describes your ethnicity?

White

Mixed/multiple ethnic groups

Asian/Asian British

Black/African/Caribbean/Black British

Other ethnic group

Please think of a ladder with 10 rungs representing where people stand in society. At the top of the ladder, with a score of 10, are the people who are best off – they have the most money, the most education, and the best jobs. At the bottom of the ladder, with a score of 1, are the people who are worst off – they have the least money, the least education, and the worst jobs or no job.

**Now think about your family. Where would your family be on this ladder?**

10 (most money, most education, best jobs)
9
8
7
6
5
4
3
2
1 (least money, least education, worst/no jobs)

## [Self-regulation measure]

The following questions are about how you have been **during the past month.** Please indicate how true each of the following statements are for you.

1. I can concentrate on one activity for a long time, if necessary.

   Not at all true Barely true Moderately true Exactly true

2. If I am distracted from an activity, I don't have any problem coming back to the topic quickly.
3. If an activity arouses my feelings too much, I can calm myself down so that I can continue with the activity soon.
4. If an activity requires a problem-oriented attitude, I can control my feelings.
5. It is difficult for me to suppress thoughts that interfere with what I need to do.
6. I can control my thoughts from distracting me from the task at hand.
7. When I worry about something, I cannot concentrate on an activity.
8. After an interruption, I don't have any problem resuming my concentrated style of working.
9. I have a whole bunch of thoughts and feelings that interfere with my ability to work in a focused way.
10. I stay focused on my goal and don’t allow anything to distract me from my plan of action.

**[Self-control measure]**

Please indicate how much each of the following statements reflects how you typically are.

1. I am good at resisting temptation.

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all | | | | Very much |

2. I have a hard time breaking bad habits.
3. I am lazy.
4. I say inappropriate things.
5. I do certain things that are bad for me, if they are fun.
6. I wish I had more self-discipline.
7. People would say that I have iron self discipline.
8. Pleasure and fun sometimes keep me from getting work done.
9. I have trouble concentrating.
10. I am able to work effectively toward long-term goals.
11. Sometimes I can't stop myself from doing something, even if I know it is wrong.
12. I often act without thinking through all the alternatives.

**[Social identification measure]**

Please read the following statements and indicate how much you agree or disagree with each one.

1. I identify with other [name of institution] students.

| Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|

2. I see myself as a [name of institution] student.
3. I am glad to be a [name of institution] student.
4. I feel strong ties with [name of institution] students.

**[Belonging measure]**

Please answer the following questions about what your university is like for you. Indicate how much you agree or disagree with each statement.

1. People at my university accept me.

   Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

2. I feel like an outsider at my university.
3. Other people understand more than I do about what is going on at my university.
4. I think in the same way as do people who do well at my university.
5. It is a mystery to me how my university works.
6. I feel alienated from my university.
7. I fit in well at my university.
8. I am similar to the kind of people who succeed at my university.
9. I know what kind of people my university lecturers are.
10. I get along well with people at my university.
11. I belong at my university.
12. I know how to do well at my university.
13. I do not know what I would need to do to make a lecturer at my university like me.
14. I feel comfortable at my university.
15. People at my university like me.
16. If I wanted to, I could potentially do very well at my university.
17. People at my university are a lot like me.

**[Stress measure]**

The following questions ask you about your feelings and thoughts **during the last month.** In each case, you will be asked to indicate by selecting **how often** you felt or thought a certain way.

1. In the last month, how often have you been upset because of something that happened unexpectedly?

   Never Almost never Sometimes Fairly often Very often

2. In the last month, how often have you felt that you were unable to control the important things in your life?
3. In the last month, how often have you felt nervous or ‘stressed’?
4. In the last month, how often have you felt confident about your ability to handle your personal problems?
5. In the last month, how often have you felt that things were going your way?
6. In the last month, how often have you found that you could not cope with all the things that you had to do?
7. In the last month, how often have you been able to control irritations in your life?
8. In the last month, how often have you felt that you were on top of things?
9. In the last month, how often have you been angered because of things that were outside of your control?
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

## [Mental and physical health measure]

The following questions ask for your views about your health, how you feel and how well you are able to do your usual activities.

If you are unsure about how to answer any questions please give the best answer you can. Do not spend too much time in answering as your immediate response is likely to be the most accurate.

1. **In general**, would you say your health is...

   Excellent  Very good  Good  Fair  Poor

**HEALTH AND DAILY ACTIVITIES**

2. The following questions are about activities you might do during a typical day. Does your health limit you in these activities? If so, how much?
   a) **Moderate activities**, such as moving a table, pushing a vacuum, bowling, or playing golf?

      Yes, limited a lot  Yes, limited a little  No, not limited at all

   b) Climbing **several** flights of stairs

      Yes, limited a lot  Yes, limited a little  No, not limited at all

3. During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?
   a) **Accomplished less** than you would like

      Yes  No

   b) Were limited in the **kind** of work or other activities

      Yes  No

4. During the **past 4 weeks**, have you had any of the following problems with your work or other regular activities **as a result of any emotional problems** (such as feeling depressed or anxious)?
   a) **Accomplished less** than you would like

      Yes  No

   b) Didn't do work or other activities as **carefully** as usual

      Yes  No

5. During the **past 4 weeks** how much did pain interfere with your normal work (including work both outside the home and housework)?

   Not at all  A little bit  Moderately  Quite a bit  Extremely

**YOUR FEELINGS**

6. These questions are about how you feel and how things have been with you **during the past month**. For each question, please indicate the one answer that comes closest to the way you have been feeling.

   How much time during **the last month:**

   a) Have you felt calm and peaceful?

| | | | | | |
|---|---|---|---|---|---|
| All of the time | Most of the time | A good bit of the time | Some of the time | A little of the time | None of the time |

   b) Did you have a lot of energy?

| | | | | | |
|---|---|---|---|---|---|
| All of the time | Most of the time | A good bit of the time | Some of the time | A little of the time | None of the time |

   c) Have you felt downhearted and low?

| | | | | | |
|---|---|---|---|---|---|
| All of the time | Most of the time | A good bit of the time | Some of the time | A little of the time | None of the time |

   d) Has your **health limited your social activities** (like visiting friends or close relatives)?

| | | | | | |
|---|---|---|---|---|---|
| All of the time | Most of the time | A good bit of the time | Some of the time | A little of the time | None of the time |

## [Big Five Inventory]

**How well do the following statements describe your personality?**

I see myself as someone who ...

... is reserved

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|

... is generally trusting

... tends to be lazy

... is relaxed, handles stress well

... has few artistic interests

... is outgoing, sociable

... tends to find fault with others

... does a thorough job

... gets nervous easily

... has an active imagination

**Now we would like to ask you some questions about your financial situation.**

What is the approximate total amount of your **current** debt? (Please select from drop-down list)

No debt
Less than £999
£1000 – £1999
£2000 - £2999
[continuing in £1000 increments up to £60,000+]

Please indicate how much debt you **currently** have from each of the following sources. If you do not have any debt from a particular source, please put a '0' in the amount box.

**Tuition fee and maintenance loans (e.g., from Student Loans Company)**

Amount in pounds sterling:

_____

**Credit cards**

Amount in pounds sterling:

_____

**Bank overdrafts**

Amount in pounds sterling:

_____

**Loans from partner/family/friends**

Amount in pounds sterling:

_____

When you **graduate** from university, approximately how much debt will have **overall**? (Please select from drop-down list)

No debt
Less than £999
£1000 – £1999
£2000 - £2999
[continuing in £1000 increments up to £60,000+]

After accounting for all of your essential expenses (e.g., rent, bills), approximately how much money do you have to spend on other things **each month**?

Amount in pounds sterling:

_____

**Please read the following statements and indicate how much you agree or disagree with each one.**

8. I find paying bills economically difficult

| Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|

9. I have seriously considered abandoning my course because of financial difficulties
10. Thinking about the amount of debt I will have when I graduate makes me feel anxious
11. Financial problems cause me to lose sleep
12. I would list financial difficulties as one of the major stresses in my life at the moment
13. It concerns me that my financial situation means that I may miss out on social activities
14. I often worry about the debt I will have when I finish my degree at university

Do you have a paid job (or jobs) during term-time?

Yes

No

If yes, approximately how many **hours** do you work in this job (or these jobs) **each week**?

_____ Hours per week

Approximately, what is the **average grade** you have received for assessments in the **current academic year**?

_____ %

## [Displayed for University of Sussex students only]

We would like your permission to access your academic record. We emphasise that this information (and indeed all of the information you have provided) will be kept completely confidential.

If you are happy for us to access this information please tick the box below, and provide your student registration number in the space provided.

□ I am happy for you to access this information

Student registration number (this can be found on your student card):

_____

## [Working memory measure]

### Task instructions

In this task you will be presented with sequences of numbers. Try to remember the numbers, and then recall them afterwards in ascending order (i.e., from lowest to highest).

The task will become more difficult as it goes on.

Some numbers may be presented more than once. Where this happens, the numbers should be written down as many times as they were presented. An example of this will be given in the second practice trial.

Two practice trials are now provided so you may become familiar with the task

To begin the first practice trial, please click the 'continue' button.

## [Practice trials]

The practice trials are now finished, and the actual task will begin.

Remember that the task will become more difficult as it goes on.

When you are ready to begin, please click the 'continue' button.

## [Main task]

**Thank you for taking the time to complete this survey.**

If you would like to enter the **£100 PRIZE DRAW**, please enter your email address below:

Email Address:

_____

If you are happy for us to contact you about taking part in future studies, please tick the box below.

□ Yes, I am happy to be contacted about future studies.

If you have any questions or concerns regarding this survey, please feel free to contact the researcher (Matthew Reid) using the following email address:

mr307@sussex.ac.uk

If you would like to see **your personality test results**, this will be displayed on the next page.

**PERSONALITY TEST RESULTS**

Research has found five major dimensions of personality. These dimensions, along with your score for each, are listed below.

**Openness to experience**

High scorers tend to be original, creative, curious, complex; Low scorers tend to be conventional, down to earth, narrow interests, uncreative.

Your score: ___ /5

**Conscientiousness**

High scorers tend to be reliable, well-organized, self-disciplined, careful; Low scorers tend to be disorganized, undependable, negligent.

Your score: ___ /5

**Extraversion**

High scorers tend to be sociable, friendly, fun loving, talkative; Low scorers tend to be introverted, reserved, inhibited, quiet.

Your score: ___ /5

**Agreeableness**

High scorers tend to be good natured, sympathetic, forgiving, courteous; Low scorers tend to be critical, rude, harsh, callous.

Your score: ___ /5

**Neuroticism**

High scorers tend to be nervous, high-strung, insecure, worrying; Low scorers tend to be calm, relaxed, secure, hardy.

Your score: ___ /5

If you would like to learn more about these personality traits, take a look at the following page...
https://en.wikipedia.org/wiki/Big_Five_personality_traits

# Appendix D. Study 4 Materials

## [Wave 1 questionnaire only]

This is the first of three surveys on student wellbeing we would like you to complete this academic year.

For **each** survey there is a prize draw to **WIN £100!** If you complete **all three** surveys, there is an extra prize draw for an **iPad Mini!**

The second survey will be in February, and the third survey will be in May.

The surveys will ask about your background, personality, experience of university, and financial circumstances. There will also be a short 'brain training' type task.

Each survey should take around 15 minutes to complete.

If you are interested, your **PERSONALITY TEST RESULTS** will also be generated at the end.

**Please note:**

You are under no obligation to take part in this study. Participation is voluntary and you free to withdraw from the study and request that your data is removed at any time up until data analysis has begun. All the information that you give will be treated confidentially and there will be no way of identifying your responses in the data archive. We are not interested in any one individual's responses. We want to look at the general patterns that emerge when the data are aggregated together.

This study has been approved by the University of Sussex's Sciences & Technology Cross-Schools Research Ethics Committee (crecscitec@sussex.ac.uk). The project reference number is ER/MR307/6. The University of Sussex has insurance in place to cover its legal liabilities in respect of this study.

If you have any concerns about this study please feel free to contact either Matthew Reid (mr307@sussex.ac.uk), Donna Jessop (who is supervising the research; d.jessop@sussex.ac.uk), or the Sciences & Technology Cross-Schools Research Ethics Committee (crecscitec@sussex.ac.uk).

**Consent to take part:**

By clicking the 'continue' button, you are indicating that:

3) You consent to the processing of your personal information for the purposes of this research.
4) You understand that such information will be treated as strictly confidential and handled in accordance with the Data Protection Act 1988.

**Firstly we would like to ask you some questions about your background.**

What is the name of your institution?

[Drop down menu here]

What is your gender?

Male

Female

Other

What is your age?

_____

Which year of study are you in?

[Drop down menu here]

Are you a UK or International student?

UK

International

Are you a full-time or part-time student?

Full-time

Part-time

Which of the following best describes your ethnicity?

White

Mixed/multiple ethnic groups

Asian/Asian British

Black/African/Caribbean/Black British

Other ethnic group

Please think of a ladder with 10 rungs representing where people stand in society. At the top of the ladder, with a score of 10, are the people who are best off – they have the most money, the most education, and the best jobs. At the bottom of the ladder, with a score of 1, are the people who are worst off – they have the least money, the least education, and the worst jobs or no job.

**Now think about your family. Where would your family be on this ladder?**

10 (most money, most education, best jobs)
9
8
7
6
5
4
3
2
1 (least money, least education, worst/no jobs)

## [Self-regulation measure]

The following questions are about how you have been **during the past month.** Please indicate how true each of the following statements are for you.

11. I can concentrate on one activity for a long time, if necessary.

    Not at all true Barely true Moderately true Exactly true

12. If I am distracted from an activity, I don't have any problem coming back to the topic quickly.
13. If an activity arouses my feelings too much, I can calm myself down so that I can continue with the activity soon.
14. If an activity requires a problem-oriented attitude, I can control my feelings.
15. It is difficult for me to suppress thoughts that interfere with what I need to do.
16. I can control my thoughts from distracting me from the task at hand.
17. When I worry about something, I cannot concentrate on an activity.
18. After an interruption, I don't have any problem resuming my concentrated style of working.
19. I have a whole bunch of thoughts and feelings that interfere with my ability to work in a focused way.
20. I stay focused on my goal and don’t allow anything to distract me from my plan of action.

**[Self-control measure]**

Please indicate how much each of the following statements reflects how you typically are.

13. I am good at resisting temptation.

Not at all A little Moderately Quite a bit Very much

14. I have a hard time breaking bad habits.
15. I am lazy.
16. I say inappropriate things.
17. I do certain things that are bad for me, if they are fun.
18. I wish I had more self-discipline.
19. People would say that I have iron self discipline.
20. Pleasure and fun sometimes keep me from getting work done.
21. I have trouble concentrating.
22. I am able to work effectively toward long-term goals.
23. Sometimes I can't stop myself from doing something, even if I know it is wrong.
24. I often act without thinking through all the alternatives.

**[Social identification measure]**

Please read the following statements and indicate how much you agree or disagree with each one.

5. I identify with other [name of institution] students.

| Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|

6. I see myself as a [name of institution] student.
7. I am glad to be a [name of institution] student.
8. I feel strong ties with [name of institution] students.

**[Belonging measure]**

Please answer the following questions about what your university is like for you. Indicate how much you agree or disagree with each statement.

18. People at my university accept me.

Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree

19. I feel like an outsider at my university.
20. Other people understand more than I do about what is going on at my university.
21. I think in the same way as do people who do well at my university.
22. It is a mystery to me how my university works.
23. I feel alienated from my university.
24. I fit in well at my university.
25. I am similar to the kind of people who succeed at my university.
26. I know what kind of people my university lecturers are.
27. I get along well with people at my university.
28. I belong at my university.
29. I know how to do well at my university.
30. I do not know what I would need to do to make a lecturer at my university like me.
31. I feel comfortable at my university.
32. People at my university like me.
33. If I wanted to, I could potentially do very well at my university.
34. People at my university are a lot like me.

**[Intrinsic academic motivation measure]**

1. One of the reasons why I am doing my degree is because I enjoy my studies very much.

| Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|

2. One of the reasons why I am doing my degree is because I have fun doing my studies.
3. One of the reasons why I am doing my degree is because of the moments of pleasure my studies bring me.

**[Stress measure]**

The following questions ask you about your feelings and thoughts **during the last month.** In each case, you will be asked to indicate by selecting **how often** you felt or thought a certain way.

11. In the last month, how often have you been upset because of something that happened unexpectedly?

| Never | Almost never | Sometimes | Fairly often | Very often |
|---|---|---|---|---|

12. In the last month, how often have you felt that you were unable to control the important things in your life?
13. In the last month, how often have you felt nervous or ‘stressed’?
14. In the last month, how often have you felt confident about your ability to handle your personal problems?
15. In the last month, how often have you felt that things were going your way?
16. In the last month, how often have you found that you could not cope with all the things that you had to do?
17. In the last month, how often have you been able to control irritations in your life?
18. In the last month, how often have you felt that you were on top of things?
19. In the last month, how often have you been angered because of things that were outside of your control?
20. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

## [Mental and physical health measure]

The following questions ask for your views about your health, how you feel and how well you are able to do your usual activities.

If you are unsure about how to answer any questions please give the best answer you can. Do not spend too much time in answering as your immediate response is likely to be the most accurate.

7. **In general**, would you say your health is...

   Excellent  Very good  Good  Fair  Poor

**HEALTH AND DAILY ACTIVITIES**

8. The following questions are about activities you might do during a typical day. Does your health limit you in these activities? If so, how much?

   c) **Moderate activities**, such as moving a table, pushing a vacuum, bowling, or playing golf?

   Yes, limited a lot  Yes, limited a little  No, not limited at all

   d) Climbing **several** flights of stairs

   Yes, limited a lot  Yes, limited a little  No, not limited at all

9. During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?

   c) **Accomplished less** than you would like

   Yes  No

   d) Were limited in the **kind** of work or other activities

   Yes  No

10. During the **past 4 weeks**, have you had any of the following problems with your work or other regular activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

    c) **Accomplished less** than you would like

    Yes  No

    d) Didn't do work or other activities as **carefully** as usual

    Yes  No

11. During the **past 4 weeks** how much did pain interfere with your normal work (including work both outside the home and housework)?

    Not at all  A little bit  Moderately  Quite a bit  Extremely

**YOUR FEELINGS**

12. These questions are about how you feel and how things have been with you **during the past month**. For each question, please indicate the one answer that comes closest to the way you have been feeling.

    How much time during **the last month:**

    e) Have you felt calm and peaceful?

| | | | | | |
|---|---|---|---|---|---|
| All of the time | Most of the time | A good bit of the time | Some of the time | A little of the time | None of the time |

    f) Did you have a lot of energy?

| | | | | | |
|---|---|---|---|---|---|
| All of the time | Most of the time | A good bit of the time | Some of the time | A little of the time | None of the time |

    g) Have you felt downhearted and low?

| | | | | | |
|---|---|---|---|---|---|
| All of the time | Most of the time | A good bit of the time | Some of the time | A little of the time | None of the time |

    h) Has your **health limited your social activities** (like visiting friends or close relatives)?

| | | | | | |
|---|---|---|---|---|---|
| All of the time | Most of the time | A good bit of the time | Some of the time | A little of the time | None of the time |

## [Big Five Inventory]

**How well do the following statements describe your personality?**

I see myself as someone who ...

... is reserved

| Disagree strongly | Disagree a little | Neither agree nor disagree | Agree a little | Agree strongly |
|---|---|---|---|---|

... is generally trusting

... tends to be lazy

... is relaxed, handles stress well

... has few artistic interests

... is outgoing, sociable

... tends to find fault with others

... does a thorough job

... gets nervous easily

... has an active imagination

**Now we would like to ask you some questions about your financial situation.**

What is the approximate total amount of your **current** debt? (Please select from drop-down list)

No debt
Less than £999
£1000 – £1999
£2000 - £2999
[continuing in £1000 increments up to £60,000+]

**Please indicate how much debt you <u>currently</u> have from each of the following sources.**

For example, if you have £11,000 worth of debt from a particular source, please enter '11000'.

If you do not have any debt from a particular source, please enter '0' in the amount box.

**Tuition fee and maintenance loans (e.g., from the Student Loans Company)**

Amount in pounds sterling:

_____

**Credit cards**

Amount in pounds sterling:

_____

**Bank overdrafts**

Amount in pounds sterling:

_____

**Loans from partner/family/friends**

Amount in pounds sterling:

_____

When you **graduate** from university, approximately how much debt will have **overall**? (Please select from drop-down list)

No debt
Less than £999
£1000 – £1999
£2000 - £2999
[continuing in £1000 increments up to £60,000+]

After accounting for all of your essential expenses (e.g., rent, bills), approximately how much money do you have to spend on other things **each month**?

Amount in pounds sterling:

_____

**Please read the following statements and indicate how much you agree or disagree with each one.**

15. I find paying bills economically difficult

| Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|

16. I have seriously considered abandoning my course because of financial difficulties
17. Thinking about the amount of debt I will have when I graduate makes me feel anxious
18. Financial problems cause me to lose sleep
19. I would list financial difficulties as one of the major stresses in my life at the moment
20. It concerns me that my financial situation means that I may miss out on social activities
21. I often worry about the debt I will have when I finish my degree at university

Do you have a paid job (or jobs) during term-time?

Yes

No

If yes, approximately how many **hours** do you work in this job (or these jobs) **each week**?

_____ Hours per week

Approximately, what is the **average mark** you have received for assessments over the last 3 months?

_____ %

## [Working memory measure]

**Task instructions**

In this task you will be presented with sequences of numbers. Try to remember the numbers, and then recall them afterwards in **ascending** order (i.e., from **lowest** to **highest**).

The task will become more difficult as it goes on.

Some numbers may be presented more than once. Where this happens, the **numbers should be written down as many times as they were presented**. An example of this will be given in the second practice trial.

Two practice trials are now provided so you may become familiar with the task

To begin the first practice trial, please click the 'continue' button.

## [Practice trials]

The practice trials are now finished, and the actual task will begin.

Remember that the task will become more difficult as it goes on.

When you are ready to begin, please click the 'continue' button.

## [Main task]

## [Displayed for University of Sussex students only]

Finally, we would like your permission for the University of Sussex to provide us with your average mark for each term in the current academic year. We emphasise that this information (and indeed all of the information you have provided) will be kept completely confidential.

If you are happy for us to access this information please tick the box below, and provide your student registration number in the space provided.

□ I am happy for you to access this information

Student registration number (this can be found on your student card):

_____

**Thank you for taking the time to complete this survey.**

What do you think the purpose of this survey may have been?

Is there anything else you would like to mention in relation to this survey?

So we can contact you if you are the winner of the **£100 PRIZE DRAW**, and send you the next surveys, please enter your contact information below:

Forename:

Surname:

Email address:

If you have any concerns about this study please feel free to contact either Matthew Reid (mr307@sussex.ac.uk), Donna Jessop (who is supervising the research; d.jessop@sussex.ac.uk), or the Sciences & Technology Cross-Schools Research Ethics Committee (crecscitec@sussex.ac.uk). The project reference number is ER/MR307/6.

If you would like to see your **personality test results**, these will be displayed on the next page.

**PERSONALITY TEST RESULTS**

Research has found five major dimensions of personality. These dimensions, along with your score for each, are listed below.

**Openness to experience**

High scorers tend to be original, creative, curious, complex; Low scorers tend to be conventional, down to earth, narrow interests, uncreative.

Your score: ___ /5

**Conscientiousness**

High scorers tend to be reliable, well-organized, self-disciplined, careful; Low scorers tend to be disorganized, undependable, negligent.

Your score: ___ /5

**Extraversion**

High scorers tend to be sociable, friendly, fun loving, talkative; Low scorers tend to be introverted, reserved, inhibited, quiet.

Your score: ___ /5

**Agreeableness**

High scorers tend to be good natured, sympathetic, forgiving, courteous; Low scorers tend to be critical, rude, harsh, callous.

Your score: ___ /5

**Neuroticism**

High scorers tend to be nervous, high-strung, insecure, worrying; Low scorers tend to be calm, relaxed, secure, hardy.

Your score: ___ /5

If you would like to learn more about these personality traits, take a look at the following page:

ttps://en.wikipedia.org/wiki/Big_Five_personality_traits

## Appendix E. Study 5 Materials

This study consists of:

- A short writing exercise
- Some questions about your experience of university and your background

The study should take around 5 minutes to complete.

If you take part, there is a prize draw to **WIN £100!**

You must be an **undergraduate student** to take part in this study.

**Please note:**

You are under no obligation to take part in this study. Participation is voluntary and you are free to withdraw at any time until the data collection stage of the study is over.

All the information that you give will be treated confidentially and there will be no way of identifying your responses in the data archive.

We plan to write reports on our findings and make data from the study available in a public data repository. This means that your research data may be made publicly available in order to share knowledge gained as a result of this study, but any personal information that could identify you will be removed before your data are made public.

This study has been approved by the University of Sussex's Sciences & Technology Cross-Schools Research Ethics Committee (crecscitec@sussex.ac.uk). The project reference number is ER/MR307/11. The University of Sussex has insurance in place to cover its legal liabilities in respect of this study.

If you have any concerns about this study please feel free to contact either Matthew Reid (mr307@sussex.ac.uk), Donna Jessop (who is supervising the research; d.jessop@sussex.ac.uk), or the Sciences & Technology Cross-Schools Research Ethics Committee (crecscitec@sussex.ac.uk).

**Consent to take part:**

By clicking the 'continue' button, you are indicating that:

5) You consent to the processing of your personal information for the purposes of this research.
6) You understand that such information will be treated as strictly confidential and handled in accordance with the Data Protection Action 1988.
7) I understand that data from this study may be made publicly available in order to share knowledge gained from the study, but that any personal information that could identify me will be removed before data are made public.

**[Financial concern salience manipulation – low financial concern salience condition is in brackets, e.g., '30% (3%)']**

**Please read the following four scenarios carefully. Try to imagine that you are in each situation, and then write a little about how you would respond to it.**

***Scenario 1***

Imagine that the money you have to live off (e.g., your maintenance loan/grant) was reduced by 30% (3%).

(v) Given your situation, would you be able to maintain a similar lifestyle under those new circumstances? If not, what changes would you need to make?

(vi) Would it impact your leisure, housing, or travel plans?

***Scenario 2***

Imagine that your laptop/pc is having some trouble and requires a £150 (£15) service. You need to decide which of the following options to take:

(7) Pay the full amount in cash immediately

(8) Take out a loan, which you can pay back in monthly instalments of £30 (£3) a month for 6 months, which would amount to £180 (£18) in total

(9) Take a chance, forego the repair, and hope that the laptop/pc works a while longer. Of course, this leaves open the possibility of breakdown, or even greater expense in the long run

(v) Which payment option would you choose?

□ 1 □ 2 □ 3

(vi) Would it be an easy or a difficult decision for you to make?

***Scenario 3***

Imagine that an unforeseen event requires an immediate £300 (£30) expense.

(vii) Are there any ways in which you could come up with that amount of money on a very short notice? How would you go about it?

(viii) Would it cause you long-lasting financial hardship?

(ix) Would it require you to make sacrifices that have long-term consequences? If so, what kind of sacrifices?

***Scenario 4***

Imagine it is essential that you buy new textbooks for your course, altogether costing £200 (£20). You can choose to:

(5) Pay the full amount in cash immediately

(6) Spread the cost over a 6 month period paying £40 (£4) each month, which would amount to £240 (£24) in total

(vii) Which payment option would you choose?

□ 1 □ 2

(viii) Would you have the necessary cash on hand?

(ix) Would the additional cost of spreading payment over a 6 month period be worth it?

**Please answer the following questions about what your university is like for you. Indicate how much you agree or disagree with each statement.**

1. People at my university accept me.

| Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree |
|---|---|---|---|---|

2. I feel like an outsider at my university.
3. Other people understand more than I do about what is going on at my university.
4. I think in the same way as do people who do well at my university.
5. It is a mystery to me how my university works.
6. I feel alienated from my university.
7. I fit in well at my university.
8. I am similar to the kind of people who succeed at my university.
9. I know what kind of people my university lecturers are.
10. I get along well with people at my university.
11. I belong at my university.
12. I know how to do well at my university.
13. I do not know what I would need to do to make a lecturer at my university like me.
14. I feel comfortable at my university.
15. People at my university like me.
16. If I wanted to, I could potentially do very well at my university.
17. People at my university are a lot like me.

**Now we would like to ask you some questions about your background.**

What is your gender?

Male

Female

Other

What is your age?

_____

What year of study are you in?

Undergraduate year 1

Undergraduate year 2

Undergraduate year 3

Undergraduate year 4

Other

Are you an International or UK student?

International

UK

Which of the following best describes your ethnicity?

White

Mixed/multiple ethnic groups

Asian/Asian British

Black/African/Caribbean/Black British

Other ethnic group

Please think of a ladder with 10 rungs representing where people stand in society. At the top of the ladder, with a score of 10, are the people who are best off – they have the most money, the most education, and the best jobs. At the bottom of the ladder, with a score of 1, are the people who are worst off – they have the least money, the least education, and the worst jobs or no job.

**Now think about your family. Where would your family be on this ladder?**

| | |
|---|---|
| 10 | (most money, most education, best jobs) |
| 9 | |
| 8 | |
| 7 | |
| 6 | |
| 5 | |
| 4 | |
| 3 | |
| 2 | |
| 1 | (least money, least education, worst/no jobs) |

**Please read the following statements and indicate how much you agree or disagree with each one.**

22. I find paying bills economically difficult.

| Strongly disagree | Disagree | Slightly disagree | Neither agree nor disagree | Slightly agree | Agree | Strongly agree |
|---|---|---|---|---|---|---|

23. I have seriously considered abandoning my course because of financial difficulties.
24. Thinking about the amount of debt I will have when I graduate makes me feel anxious.
25. Financial problems cause me to lose sleep.
26. I would list financial difficulties as one of the major stresses in my life at the moment.
27. It concerns me that my financial situation means that I may miss out on social activities.
28. I often worry about the debt I will have when I finish my degree at university.

**What is the approximate total amount of debt that you <u>currently</u> have?**

Please note, this can include tuition fees, maintenance loans, credit card debt, bank overdrafts, informal loans from family or friends, as well as any other debt you might have.

(Please select from the drop-down list)

No debt
Less than £999
£1000 – £1999
[continuing in £1000 increments up to £60,000+]

**Approximately how much debt will you have overall when you <u>graduate</u> from university?**

(Please select from the drop-down list)

No debt
Less than £999
£1000 – £1999
[continuing in £1000 increments up to £60,000+]

**After accounting for all of your essential expenses (e.g., rent, bills), approximately how much money do you have to spend on other things <u>each month</u>?**

Amount in pounds sterling:

_____

What do you think the purpose of this study may have been?

Is there anything else you would like to mention in relation to this study?

**Thank you for taking part in this study!**

At the beginning of the study we asked you to think about some financial problems. Some of you were asked to consider financial problems involving relatively large amounts of money, and some of you were asked to consider financial problems involving smaller amounts of money. Our aim is to see whether this influences how much people feel they 'belong' at their university.

If you are experiencing financial concern you may find it helpful to contact student welfare and support services provided by your university. Nightline Association (https://www.nightline.ac.uk/) provides student support when university services are unavailable.

Depending on your circumstances, your university may be able to provide funding to help you with financial hardship. More information is available at https://www.gov.uk/extra-money-pay-university/university-and-college-hardship-funds

**Prize draw**

Below is a link to a separate survey where you are able to provide your contact details for entry in to the prize draw. Your contact details will not be linked to your other responses, and will be deleted once the prize draw has taken place.

**[Link to contact details survey]**

If you have any concerns about this study please feel free to contact either Matthew Reid (mr307@sussex.ac.uk), Donna Jessop (who is supervising the research; d.jessop@sussex.ac.uk), or the Sciences & Technology Cross-Schools Research Ethics Committee (crecscitec@sussex.ac.uk). The project reference number is ER/MR307/11.

# Appendix F. Supplemental Material

## Descriptive Financial Information

***Descriptive financial information for the Study 3 sample.***

| Measure | |
|---|---|
| Participants in debt, *n* (%) | 414 (80.23%) |
| Current debt (for participants in debt) | £12,000 – £12,999 / £18,000 - £18,999 [a] |
| Tuition and maintenance loans, *M* (*SD*) | £17,579 (£14,007) |
| Credit card debt, *M* (*SD*) | £43 (£596) |
| Bank overdrafts, *M* (*SD*) | £258 (£537) |
| Informal loans, *M* (*SD*) | £546 (£4355) |
| Anticipated graduate debt | £40,000 – £40,999 [a] |
| Discretionary income, *M* (*SD*) | £257 (£256) |

[a] Mode / joint modal amounts

***Descriptive financial information for the validation sample in Study 4.***

| Measure | |
|---|---|
| Participants in debt, *n* (%) | 2109 (75.48%) |
| Current debt (for participants in debt) | £9,000 - £9,999 [a] |
| Tuition and maintenance loans, *M* (*SD*) | £15,548 (£14,028) |
| Credit card debt, *M* (*SD*) | £75 (£506) |
| Bank overdrafts, *M* (*SD*) | £199 (£621) |
| Informal loans, *M* (*SD*) | £548 (£4479) |
| Anticipated graduate debt | £27,000 – £27,999 [a] |
| Discretionary income, *M* (*SD*) | £271 (£271) |

[a] Mode

***Descriptive financial information for the longitudinal sample in Study 4.***

| Measure | Wave one | Wave two | Wave three |
|---|---|---|---|
| Participants in debt, *n* (%) | 386 (81.24%) | 382 (84.33%) | 390 (86.09%) |
| Current debt (for participants in debt) | £9,000 – £9,999 [a] | £9,000 – £9,999 [a] | £9,000 – £9,999 [a] |
| Tuition and maintenance loans, *M* (*SD*) | £17,777 (£14,426) | £18,306 (£14,806) | £21,014 (£15,655) |
| Credit card debt, *M* (*SD*) | £112 (£661) | £87 (£544) | £151 (£881) |
| Bank overdrafts, *M* (*SD*) | £163 (£605) | £134 (£404) | £202 (£508) |
| Informal loans, *M* (*SD*) | £145 (£940) | £236 (£1210) | £326 (£1,578) |
| Anticipated graduate debt | £40,000 – £40,999 [a] | £50,000 – £50,999 [a] | £50,000 – £50,999 [a] |
| Discretionary income, *M* (*SD*) | £228 (£205) | £223 (£228) | £235 (£247) |

[a] Mode

**Additional Individual Mediation Analyses in Study 4**

***Social identification.*** Initial levels of financial concern had a marginal negative effect on social identification (β = - 0.05, *p* = .066). Social identification had a positive effect on intrinsic academic motivation (β = 0.11, *p* = .002). There was no indirect effect of financial concern on intrinsic academic motivation via social identification (β = - 0.01, *p* = .056, 95% CIs [- 0.02, 0.00]).

***Physical health.*** Initial levels of financial concern had a non-significant effect on physical health (β = 0.01, *p* = .75). Physical health had a non-significant effect on intrinsic academic motivation (β = 0.06, *p* = .097). There was no indirect effect of financial concern on intrinsic academic motivation via physical health (β = 0.00, *p* = .52, 95% CIs [0.00, 0.01]).

***Working memory.*** Initial levels of financial concern had a non-significant effect on working memory (β = 0.01, *p* = .88). Working memory had a non-significant effect on intrinsic academic motivation (β = - 0.01, *p* = .77). There was no indirect effect of financial concern on intrinsic academic motivation via working memory (β = 0.00, *p* = .86, 95% CIs [0.00, 0.00]).

***Hours in paid employment.*** Initial levels of financial concern had a non-significant effect on the number of hours in paid employment (β = 0.00, *p* = .93). The number of hours in paid employment had a non-significant effect on intrinsic academic motivation (β = 0.03, *p* = .34). There was no indirect effect of financial concern on intrinsic academic motivation via hours in paid employment (β = 0.00, *p* = .80, 95% CIs [0.00, 0.00]).

***Self-control.*** Initial levels of financial concern had a non-significant effect on self-control (β = 0.03, *p* = .43). Self-control had a significant positive effect on intrinsic academic motivation (β = 0.08, *p* = .016). There was no indirect effect of financial concern on intrinsic academic motivation via self-control (β = 0.00, *p* = .35, 95% CIs [0.00, 0.01]).

***Self-regulation.*** Initial levels of financial concern had a significant negative effect on self-regulation (β = - 0.08, *p* = .024). Self-regulation had a significant positive effect on intrinsic academic motivation (β = 0.08, *p* = .027). There was no indirect effect of financial concern on intrinsic academic motivation via self-regulation (β = - 0.01, *p* = .052, 95% CIs [- 0.02, 0.00]).