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RESEARCH PAPER

Stress and Subjective Well-Being Among First Year UK Undergraduate Students

Andrew Denovan[1] · Ann Macaskill[2]

Abstract Transition to university is stressful and successful adjustment is imperative for well-being. Historically research on transitional stress focussed on negative outcomes and ill health. This is the first UK study applying a positive psychology approach to investigate the characteristics that facilitate adjustment among new university students. A range of psychological strengths conceptualised as covitality factors, shown individually to influence the stress and subjective well-being (SWB) relationship were assessed among 192 first year UK undergraduates in week three of their first semester and again 6 months later. Path analyses revealed that optimism mediated the relationship between stress and negative affect (a component of SWB) over time, and academic self-efficacy demonstrated significant relationships with life satisfaction and positive affect. Contrary to predictions, stress levels remained stable over time although academic alienation increased and self-efficacy decreased. Optimism emerged as a key factor for new students to adjust to university, helping to buffer the impact of stress on well-being throughout the academic year. Incorporating stress management and psycho-educational interventions to develop strengths is discussed as a way of promoting confidence and agency in new students to help them cope better with the stress at university.

Keywords Positive psychology · Stress · Undergraduate students · Well-being

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1 Background

Historically British university students were an elite in terms of academic achievement, financial position, and high levels of family support, with most coming from relatively affluent backgrounds, all of which are protective factors in terms of their ability to cope with the stress of university (Royal College of Psychiatrists 2011). As a result, there is little research on student stress until the 1990s (Humphrey et al. 1998). However, recent changes in university education in the UK have arguably increased student stress.

A government widening participation agenda has encouraged students from sectors of society that historically had low levels of participation in university education (DfES 2003). While widening participation in university education, the UK government has steadily decreased funding for students, thus increasing the financial pressures on students (Robotham and Julian 2006). Historically students did not pay fees at UK Universities and the government provided means-tested family living allowances. Student fees of £1000 annually were introduced in 1998 and have gradually increased to the current figure of £9000 annually. Concurrently, student living allowances have been replaced by loans. Due to these financial pressures, more students combine study with paid employment, to the detriment of their education (Andrews and Wilding 2004; National Union of Students 2008; Unite 2004).

While student numbers have grown, successive governments have reduced funding to universities, resulting in significant changes to the student experience (UUK 2013). Students are taught in larger groups, making it more difficult to make friends and develop a sense of belonging (Macaskill 2012). Staff/student ratios have increased and there are more demands on staff time making personal support less obtainable (Robotham and Julian 2006). Funding of support services such as counselling has not kept pace with the growth in student numbers (Association of University and College Counselling 2011).

Such factors have increased the potential stressors in students' lives beyond the traditional well-documented stressors associated with examinations, course-work and academic study (e.g. Ansari et al. 2011; Ansari and Oskrochi 2014; Reisberg 2000; Robotham and Julian 2006). The university transition has always been another stressor, requiring adaptation to a new social and academic environment (Fisher 1994). The positive aspects include new opportunities and meeting new people, but the challenges are significant. It is argued that the changing context of UK education and the increases in financial burdens have increased this stress.

A longitudinal study found UK undergraduates, assessed 2 months before university and 6 weeks into semester one, showed evidence of raised psychological disturbance and absent-mindedness following the transition (Fisher and Hood 1987). The transition has also been reported to be significant for determining later university achievement in another longitudinal study (Tinto 1993), as 75 % of non-progressing students attributed the reasons for leaving university to first year problems.

There is relatively little research on stress and achievement in undergraduates, but what there is suggests that high stress levels are associated with lower levels of achievement (Baker 2003; Hojat et al. 2003; McKenzie and Schweitzer 2001; Robotham and Julian 2006). Stress impairs learning ability through impeding concentration and memory; functions crucial for attainment (Fisher 1994; Khalsa 1997).

These increases in student stress are not confined to the UK. Research has reported undergraduate mean stress levels to exceed those of the general population in Canada (Adlaf et al. 2001; Stewart-Brown et al. 2000), the UK (Humphrey et al. 1998), the United

States (Sax 1997), Sweden (Vaez et al. 2004), and to be higher than in their peer group who are working (Cotton et al. 2002; Vaez et al. 2004). These studies suggest that increases in stress associated with increased financial and social pressures are an international issue. American research associates the increases in student stress with decreases in student mental health (Blanco et al. 2008). In the UK, the incidence of mental health problems amongst students is at general population levels (Macaskill 2012) suggesting students are no longer an elite, able to cope with stressors due to protective background and social factors (Royal College of Psychiatrists 2011). One aim of this study is to assess stress levels in first year students over their first 6 months of study.

1.1 Everyday Stress and Psychological Well-Being

The transactional model (Folkman 2008; Lazarus and Folkman 1984) suggests that stress occurs when environmental or internal demands are appraised by an individual as exceeding or taxing their ability to cope (Holroyd and Lazarus 1982). The individual evaluates all events in terms of their significance for well-being. If a situation is appraised as involving harm/loss, threat, or otherwise challenging well-being, it is conceptualised as stressful (Lazarus 2006). A substantial literature suggests that everyday irritants or hassles are more detrimental to well-being than stressful life events (Weinberger et al. 1987). Among undergraduates, daily hassles have been shown to be a greater risk factor than life events in inducing stress (Burks et al. 1985) and represents an important focus for this research. However, a limitation of the traditional research approach is that stress and the associated impact on well-being are largely understood via an emphasis on the regulation of negative outcomes (Folkman and Moskowitz 2000). This neither provides a satisfactory understanding of effective coping nor explains how characteristics of students might facilitate this. What can be deduced from this research are the types of students more likely to be at risk.

Folkman and Moskowitz (2000) claim research on stress has almost exclusively focussed on negative outcomes, and that more attention needs to be devoted to positive outcomes, such as positive affect and subjective well-being. Arguably, without focussing on positive outcomes, research cannot address effectively the factors that help minimize or avoid the adverse health effects of stress. This study addresses this by focussing on the relationship of psychological characteristics with happiness in response to stressful experience.

1.2 Positive Psychology

Current research has not systematically explored the range of individual difference variables that may contribute to successful adjustment to the transition to university. The recent development of positive psychology has introduced new variables relevant to coping with stress that may be relevant in explaining successful adjustment. Positive psychology is a theoretical approach that focusses on positive individual traits, valued subjective experiences, and positive institutions (Seligman and Csikszentmihalyi 2000); it emphasises an understanding of the processes and factors that contribute to the health, success, and flourishing of individuals. Within positive psychology, happiness has been shown to equate with measures of subjective well-being (SWB) (Pavot and Diener 2008). SWB consists of three components; emotional reactions to events (positive affect and negative affect), and cognitive appraisal of fulfilment and satisfaction. Research has reported an inverse relationship between happiness as measured by SWB and stress (Schiffrin and Nelson 2010;

Suh et al. 1996; Zika and Chamberlain 1992). Thus, SWB offers a means of assessing the effects of stress on a student's functioning beyond illness outcomes and gives a measure equivalent to happiness (Diener and Lucas 2000).

However, research on psychopathology has found that combinations of co-occurring disorders, so-called co-morbidity, affects how individuals cope making the condition more severe and difficult to treat (Seligman and Csikszentmihalyi 2000; Drake and Wallach 2000). In a similar vein to co-morbidity in psychopathology, it is increasingly being argued that positive characteristics within individuals may help to counter the effects of adversity. Weiss et al. (2002) have labelled these characteristics that provide positive benefits as covitality factors. Psychological capital is another term that has been used to describe positive attributes that individuals bring to deal with adversity although it applies to a specific subset of strengths (Luthans et al. 2004). Here, the aim is to examine the role of psychological strengths as covitality factors that may influence the relationships between stress and happiness. Schiffrin and Nelson (2010) have argued that this more comprehensive understanding of the role of other positive variables is required to deepen our understanding of stress and SWB, and this will be examined here.

A literature review of individual difference variables associated with stress, well-being and academic performance, identified the psychological strengths of optimism, hope, self-control, self-efficacy, and resilience. These individual difference variables are included in the present study as covitality factors, the hypothesis being that these variables will mediate the relationship between stress and SWB and act specifically to buffer the impact of stress on SWB. Interventions empirically demonstrated to be effective exist for all these variables so it was felt ethical to include them as they could in future be implemented to provide support for students who are struggling.

1.3 Psychological Strengths

Optimism is defined in relation to Carver and Scheier's (2001) dispositional optimism as a generalised positive outcome expectancy. Individuals who possess positive expectations about future conduct are viewed to believe good outcomes will happen, perceive these outcomes as attainable, and persevere in goal-oriented efforts (Carver and Scheier 2001). Aspinwall and Taylor (1992) found greater optimism was associated with lower stress, higher well-being, and the use of problem-focussed coping and social support, which in turn predicted better adjustment to university. Optimism was predictive of higher academic achievement (Yates 2002), and was associated with greater SWB (Chang and Sanna 2001; Lucas et al. 1996). Students higher in optimism tend to use more effective coping (Scheier et al. 1986) and respond to stressful demands with confidence that favourable outcomes will result from their endeavours and thus exercise lower stress levels (Lopes and Cunha 2008). Macaskill and Denovan (2014) in a study of first year UK undergraduates found optimism to be positively correlated with the life satisfaction element of SWB, but it was not a predictor of life satisfaction and had no statistically significant relationship with positive affect.

Hope is similar to dispositional optimism in assuming future outcomes are influenced by goal-oriented cognitions (agency thinking) (Snyder 1994). However, hope theory is equally concerned with an individual's perceived capability to develop a pathway to achieve a goal (Snyder and Lopez 2005). Students high in hope are determined, focussed, motivated and persistent in reaching goals (Snyder 1994; Snyder et al. 1998). Snyder et al. (2002) found higher hope scores predicted higher cumulative GPA and a greater likelihood of graduating. Research on hope and adjustment to stress amongst students is scarce; however,

Chang (1998) found high hope students displayed greater problem-solving abilities for coping with stress. Hope has been shown to be positively associated with SWB; in particular life satisfaction (Park et al. 2004). In a study assessing psychological health and SWB in UK students, hope agency was a predictor of positive affect, life satisfaction, mental health, and self-esteem (Macaskill and Denovan 2014).

Self-control is the ability to exercise restraint over behaviour to meet long-term interests. Tangney et al. (2004) found students higher in self-control had better academic performance and displayed better psychological adjustment. There is little research on stress and self-control amongst undergraduates (see Muraven et al. 1999). Self-control has been linked with greater problem-solving ability (Fraser and Tucker 1997) and problem-focussed coping (Fabes et al. 1994).

Academic self-efficacy refers to a belief in one's ability to achieve desired results from one's behaviour in academic settings (Solberg et al. 1993). Students high in academic self-efficacy perceive tasks, difficulties, and setbacks as challenges to be overcome rather than threats (Schwarzer 1992). They are more likely to use problem-focussed coping, resulting in lower stress and better well-being (Solberg et al. 1998; Karademas and Kalantzi-Azizi 2004). Chemers et al. (2001) found in a yearlong study that students higher in optimism and self-efficacy were more likely to perceive the transition as a challenge rather than a threat, and reported greater satisfaction with adjustment, university life, and experienced less stress and illness. Efficacious students are likely to be academically successful due to working harder, setting higher yet achievable goals, and are more efficient at independently challenging themselves (Bandura 1997; Macaskill and Denovan 2013). Experience of success reinforces students' confidence and perceived ability, and enhances their future performance (Chemers et al. 2001). Roddenberry and Renk (2010) reported that higher levels of self-efficacy are associated with lower perceived stress levels in a sample of American undergraduate students although they used a general measure of self-efficacy. Examining Australian students and their transition to university, Morton et al. (2014) found that higher levels of self-efficacy were associated with lower stress levels.

Resilience represents the personal qualities that facilitate recovery from adversity (Garmezy 1993). Higher trait resilience is associated with greater use of coping strategies, which elicit positive affect in response to stress, such as positive reappraisal and problem-focussed coping (Affleck and Tennen 1996; Billings et al. 2000). Greater access to and the ability to use positive emotional resources buffer the impact of stress and offer respite from stressful experiences (Zautra et al. 2005). Kjeldstadli et al. (2006) found in a 6-year study that resilient medical students displayed stable levels of high life satisfaction (LS), lower perceived stress, and less use of emotion-focussed coping. In contrast, non-resilient medical students gradually declined in LS over the 6 years. Higher levels of resilience were positively associated with LS in a large sample of Chinese undergraduates in Hong Kong (Mak et al. 2011). However, research focussing on undergraduate samples is sparse.

1.4 The Current Study

The current study applied a positive psychology approach to investigate the relative contribution of psychological strengths as covitality factors to stressor exposure, academic performance, and subjective well-being over the course of one academic year. Two time points were investigated; the beginning of the academic year (time 1), and 6 months later (time 2). This facilitated comparison between the initial transition to university and a later time when the students should be more settled. Measuring at different time points provides evidence on the temporal order of variables; whereas in single time point designs it is

difficult to establish the direction of relationships amongst variables (Bartlett 1998). To investigate the role of covitality factors on the stress-SWB relationship, a model was proposed which conceptualised of covitality as a mediator that would lessen the cumulative impact of hassles throughout the academic year. Most empirical tests of mediation use cross-sectional data that can lead to biased conclusions (Maxwell and Cole 2007). Accordingly, the proposed mediational effect was examined over time in the current study.

The hypotheses are:

1. Stressor exposure will be negatively associated with SWB and academic performance, and covitality factors will be positively associated with SWB, academic performance and negatively associated with stress.
2. Covitality factors will mediate the relationship between stress and SWB over time.
3. Stress levels will be lower at time 2 than time 1 as the students gradually adjust to university. Levels of SWB will be higher at time 2 indicating adjustment to the transition. Students will report different sources of stress at each time point reflecting different demands being made of them.

2 Methods

2.1 Participants

Three hundred and six first year BSc Psychology undergraduates from a post-92 UK University committed to widening participation took part at time 1. Two hundred and fifty-nine took part at time 2, with 192 identified to have taken part at both time points (33 males, 159 females, mean age = 19.68, age range = 18–42, SD = 2.91). Of the sample, 75 % lived away from home; 47 % worked part-time.

2.2 Measures

2.2.1 Covitality Factors

The Life Orientation Test–Revised (Scheier et al. 1994) measured optimism, and consists of 12 items rated on a five-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). It has good internal reliability with alpha coefficients between .7 and .8 (Scheier et al. 1994) and test–retest reliability of .58 to .79 over 28 months (Atienza et al. 2004).

The Trait Hope Scale (Snyder et al. 1991) assessed trait hope using 12 items with an 8-point Likert rating scale from 1 (*definitely false*) to 8 (*definitely true*). The scale is internally reliable with alphas between .74 to .82 (Gibb 1990) and temporally stable with test–retest reliabilities of .76 to .82 over 10 weeks.

The Brief Self-Control Scale (BSCS) (Tangney et al. 2004) consists of 13 items assessing an individual's degree of trait self-control including controlling thoughts, controlling emotions, controlling impulses, regulating behaviour and habit-breaking. Ratings are on a 5 point Likert scale from 1 (*not at all like me*) to 5 (*very much like me*). It is internally reliable with alphas between .83 and .85 and test–retest reliability of .87 at 3 weeks (Tangney et al. 2004).

The 15-item Resilience Scale (Neill and Dias 2001) measured trait resilience using a 7 point Likert scale of 1 (*strongly disagree*) to 7 (*strongly agree*), assessing stable aspects of

resilience; self-reliance, determination, and finding meaning in life. The scale has good internal consistency with alphas between .85 and .91 (Neill and Dias 2001).

The College Self-Efficacy Inventory (CSEI) (Solberg et al. 1993) assessed academic self-efficacy beliefs of undergraduates in relation to tasks associated with higher education including course efficacy, roommate efficacy, and social efficacy. The inventory has 19 items, rated on a nine point Likert scale from 0 (*not at all confident*) to 8 (*extremely confident*), and is a valid and reliable measure with an alpha coefficient of .92 (Solberg et al. 1993) and good convergent and discriminant validity (Gore et al. 2006).

In this study, the reliability of the measures for covitality factors was generally high: LOT-R α = .77, Hope Scale α = .82, BSCS α = .83, Resilience Scale α = .91 and CSEI α = .91 at time 1, α = .85 at time 2.

2.2.2 Stressor Exposure

The Inventory of College Students' Recent Life Experiences (ICSRLE) (Kohn et al. 1990) measured undergraduate stress (hassle exposure). The ICSRLE includes 49 items, rating the extent of students' experience with each during the past month from 1 (*not at all part of my life*) to 4 (*very much part of my life*). The ICSRLE consists of seven subscales (developmental challenge, time pressure, academic alienation, romantic problems, assorted annoyances, general social mistreatment, and friendship problems). It has good internal reliability with alphas of .88 and .89 and correlates strongly with perceived stress suggesting that it is a valid measure of stress appraisal (Kohn et al. 1990). In this study, the ICSRLE was highly reliable at time 1, α = .88, and time 2, α = .91.

2.2.3 Subjective Well-Being (SWB)

The Satisfaction with Life Scale (SWLS) (Diener et al. 1985) assessed the cognitive dimension of SWB, with a global cognitive judgement of life satisfaction. It consists of five items rated on a 7 point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). The internal consistency of the scale is high with alphas over .80 and 2-month test–retest reliability of .82 (Diener et al. 1985). In this study the SWLS was reliable at time 1, α = .76, and time 2, α = .91.

The Positive and Negative Affectivity Schedule (Watson et al. 1988) measured the affective dimension of SWB, phrased to focus on state experience, asking how respondents felt emotionally over the past month. The 20-item Positive and Negative Affect Schedule (PANAS) (Watson et al. 1988) comprises two mood scales, 10 items measuring positive affects and 10 measuring negative affects. Participants rate items on a scale of 1 (*very slightly*) to 5 (*extremely*) to indicate the extent to which they have felt the emotion in the past month. The reported internal reliabilities are good with alpha coefficients between .86 and .90 for positive affect and .84–.87 for negative affect and test–retest reliability of .68 for positive affect and .71 for negative affect (Watson et al. 1988). The reliability of both the PA and NA scales was generally high in this study: PA time 1 α = .61, PA time 2 α = .85, NA time 1 α = .76, NA time 2 α = .86.

2.2.4 Academic Performance

Academic performance was assessed using students' grade point average (GPA) for the two semesters, which is often utilised in the literature (e.g. McKenzie and Schweitzer

2001; Shields 2001; Tchen et al. 2001). One academic year consisted of two semesters and GPA represented the mean score for each student over all the modules studied.

2.3 Procedure

Prospective participants were invited to take part via lab classes. Participants were provided with a questionnaire booklet to complete. Questionnaires were distributed in week three of university for time 1 and 6 months later for time 2. The University Research Ethics Committee approved the study. The procedure was the same at both time points.

3 Results

3.1 Hypothesis 1: Examining Associations Between Stress, Covitality, SWB, and Academic Performance Over Time

To investigate the relationships between stressor exposure, covitality variables, affective and cognitive aspects of SWB, and academic performance at time 1 and time 2, Pearson correlations were computed (Table 1). Within these data, there were no issues with multicollinearity, and all correlations were below .9. Table 1 shows that hassle exposure is negatively associated with life satisfaction (LS) and positive affect (PA) at time 2 and with LS at time 1. Optimism and academic self-efficacy were positively related to LS and PA and negatively related to NA at both time points. Hope and resilience show a positive relationship with LS and PA at both times and a negative relationship with NA at time 1. Self-control is positively associated with PA at time 1 and negatively correlated with NA at time 1 and 2. Academic performance showed no significant associations with the predictor variables at either time point, and consequently was not investigated as an outcome variable.

Table 2 shows the intercorrelations between stress and the covitality factors. Self-efficacy, optimism and hope are significantly negatively associated with stress at time 1, but only optimism (assessed at time 1) and self-efficacy (assessed at time 2) share a statistically significant negative association with stress at time 2. These results indicate that the covitality factors are negatively associated with stressor exposure among the undergraduates.

3.2 Hypothesis 2: Path Analysis of Covitality as Mediator of Stress and SWB

To examine the influence of stress and covitality factors on subjective well-being over time, a series of path models were constructed. There were three path models in total, and each one examined a separate component of SWB over time. Direct effects (stress on SWB) and indirect effects (stress on SWB, through self-efficacy and optimism) were examined in each model. To ensure good model fit, only significant covitality factors (across all well-being variables and at both time points) were focussed on; namely optimism and academic self-efficacy. Model fit was determined via consideration of absolute and relative fit indices. Absolute fit indices assess the degree, to which a hypothetical model fits observed data (e.g., Chi square, standardized root mean-square residual and root mean-square error of approximation). Relative fit compares the proposed model and the

Table 1 Correlations of stress and covitality factors with three components of subjective well-being ($N = 192$) and academic performance ($N = 186$) at time 1 and time 2

Variable	Time 1				Time 2			
	Life satisfaction	Positive affect	Negative affect	Academic performance	Life satisfaction	Positive affect	Negative affect	Academic performance
Hassle exposure (stress)	−.36**	−.09	.47**	−.09	−.53**	−.42**	.53**	−.07
Academic self-efficacy	.40**	.39**	−.26**	.10	.52**	.32**	−.25**	.08
Optimism	.42**	.41**	−.32**	.05	.43**	.24**	−.31**	.01
Hope	.44**	.52**	−.22**	.04	.25**	.12	−.13	.03
Resilience	.48**	.54**	−.23**	−.03	.28**	.14**	−.12	−.09
Self-control	.12	.21**	−.16*	.09	.07	−.0	−.16*	.09

* $p < .05$; ** $p < .001$

Table 2 Intercorrelations of stress and covitality factors ($N = 192$)

Variable	1	2	3	4	5	6	7	8
1. Stress T1		−.38**	−.23**	−.13	−.19**	−.06	.02	.08
2. Self-efficacy T1			.28**	.38**	.45**	.18*	−.08	−.09
3. Optimism T1				.58**	.54**	.22**	−.22**	.28**
4. Hope T1					.68**	.30**	−.12	.38**
5. Resilience T1						.45**	−.19	.45**
6. Self-control T1							−.05	.18*
7. Stress T2								−.37**
8. Self-efficacy T2								

* $p < .05$; ** $p < .001$

Chi square value of the null model (e.g., Comparative Fit Index). A range of goodness-of-fit statistics assessed model fit.

Chi square (χ^2) evaluated the difference between the observed and expected covariance matrices; good fitting models produce non-significant results. Chi square is influenced by sample size, small samples are associated with type I errors and large samples type II errors (Tanaka 1987). Thus, additional indices also determined model fit. The Comparative Fit Index (CFI: Cronbach 1990) compares data to a baseline model, where all variables are uncorrelated. Values above .90 indicate reasonable fit and values above .95 specify good model fit (Hu and Bentler 1999). The standardized root mean-square residual (SRMR: Jöreskog and Sörbom 1981) and root mean-square error of approximation (RMSEA: Steiger 1990) were also considered. Ideally, these indices should be <.05; however, values <.08 suggest adequate fit (Hu and Bentler 1999) and <.10 indicates marginal fit (Browne and Cudeck 1993). For reporting RMSEA values, the 90 % confidence interval (CI) was included.

To assess whether indirect effects were statistically significant, a mediation analysis using the bias-corrected bootstrap 95 % confidence intervals (CI) procedure (Hayes 2013) was applied with 5000 bootstrap samples. The reasoning for this further analysis was to examine the specific influence of each proposed mediator; AMOS cannot examine the unique influence of two or more mediators when simultaneously included in a path diagram. To discern the influence of each proposed mediator (self-efficacy and optimism) on the relationship between stress and well-being outcomes (specifically life satisfaction, positive affect, and negative affect), Preacher and Hayes' (2008) INDIRECT bootstrapping macro was run.

3.2.1 Model 1: Life Satisfaction as Outcome

For model one with life satisfaction (LS) as the outcome, fit indices show acceptable model fit on all indices but RMSEA which exceeded the minimum threshold of .10: χ^2 (7, $N = 192$) = 24.06, $p < .05$, CFI = .92, SRMR = .05, RMSEA = .11 (90 % CI .07–.16). The majority of path coefficients were significant at the $p < .05$ level. At time 1, stress had a significant negative effect on self-efficacy (SE) ($\beta = −.38$, $p < .001$), optimism ($\beta = −.18$, $p < .05$), and on LS ($\beta = −.21$, $p < .05$). Optimism and SE reported

significant positive effects on LS ($\beta = .25, p < .001$; and $\beta = .28, p < .001$ respectively). At time 2, optimism (assessed at time 1) did not have a significant effect on stress ($\beta = -.01, p > .05$) or LS ($\beta = .09, p > .05$). Also, time 1 SE did not significantly affect LS at time 2 ($\beta = -.06, p > .05$), so mediation over time was not assessed. Stress at time 2 had a significant negative effect on SE ($\beta = -.36, p < .001$) and on LS ($\beta = -.41, p < .001$), and SE had a significant positive effect on LS ($\beta = .34, p < .001$).

3.2.2 Model 2: Positive Affect as Outcome

For model two with positive affect (PA) as the outcome, fit indices indicated good model fit: $\chi^2 (7, N = 192) = 13.73, p > .05$, CFI $= .96$, SRMR $= .04$, RMSEA $= .07$ (90 % CI .01–.13). The majority of path coefficients were significant at the $p < .05$ level. At time 1, stress had a significant negative effect on SE ($\beta = -.38, p < .001$) and optimism ($\beta = -.18, p < .05$), but a non-significant effect on PA ($\beta = .10, p > .05$). Optimism and SE reported significant positive effects on PA ($\beta = .26, p < .001$; and $\beta = .38, p < .001$ respectively). Time 2 stress had a significant negative effect on SE ($\beta = -.36, p < .001$) and on PA at time 2 ($\beta = -.35, p < .001$), and SE had a significant positive effect on PA ($\beta = .18, p < .05$). At time 2, optimism (assessed at time 1) did not have a significant effect on stress ($\beta = -.01, p > .05$) or PA ($\beta = .01, p > .05$) at time 2. SE (assessed at time 1) also did not have a significant effect on PA at time 2 ($\beta = .04, p > .05$). Therefore, mediation was not examined given the absence of significant pathways between the covitality factors on PA over time.

3.2.3 Model 3: Negative Affect as Outcome

Standardized coefficients appear in Fig. 1. Fit indices indicated good overall model fit: $\chi^2 (5, N = 192) = 13.93, p < .05$, CFI $= .96$, SRMR $= .04$, RMSEA $= .09$ (90 % CI .04–.16). The majority of path coefficients were significant at the $p < .05$ level. At time 1,
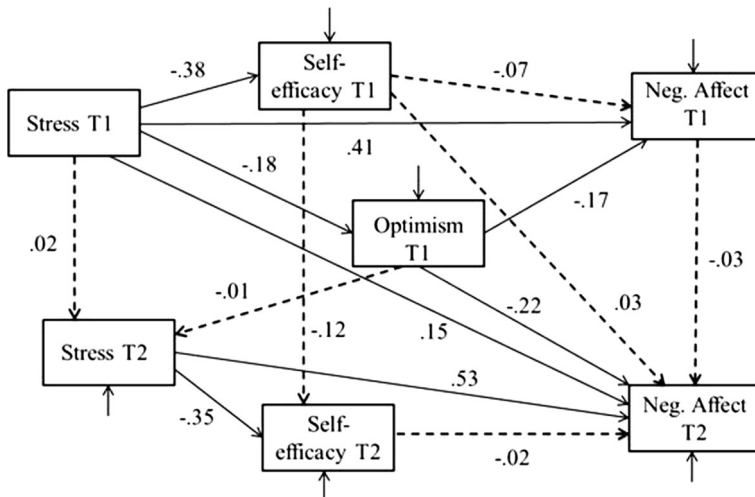

Fig. 1 Putative relations between stress, optimism, self-efficacy, and negative affect at time 1 and time 2. *Solid lines* indicate standardized coefficients (all are significant at $p < .05$). *Discontinuous lines* are non-significant paths
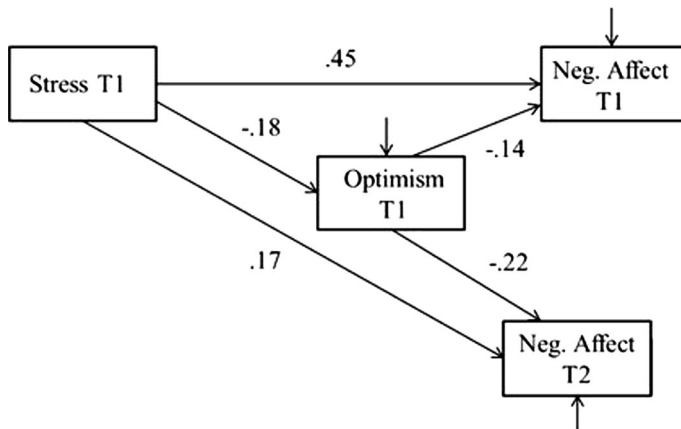
Fig. 2 Refined model demonstrating the mediating relationship between stress and NA over time. *Solid lines* indicate standardized coefficients (all are significant at $p < .05$)

stress had a significant negative effect on SE ($\beta = -.38$, $p < .001$), optimism ($\beta = -.18$, $p < .05$), and a positive effect on negative affect (NA) ($\beta = .41$, $p < .001$). Optimism (assessed at time 1) had a significant negative effect on NA both at time 1 and at time 2 ($\beta = -.17$, $p < .05$; and $\beta = -.22$, $p < .001$ respectively), but not on stress at time 2 ($\beta = -.01$, $p > .05$). Stress measured at time 2 had a significant negative effect on self-efficacy ($\beta = -.36$, $p < .001$) and a positive effect on NA at time 2 ($\beta = .53$, $p < .001$), though similarly to time 1 self-efficacy (SE) did not have a significant effect on NA ($\beta = -.02$, $p > .05$).

Given that a significant path was evident from stress and optimism at time 1 to NA at time 2, this suggests possible mediation over time. Mediation was examined using the INDIRECT macro while controlling for self-efficacy. Results indicated that optimism (but not self-efficacy) mediated the relationship between stress and NA and the indirect effect of stress through optimism was significant at the 95 % confidence level across bias corrected point estimates ($p < .05$, 95 % CI .02–.05). Accordingly, the path model for NA was refined by eliminating non-significant paths. The final model explicating the mediating relationship between stress and NA over time is presented in Fig. 2. Fit statistics for the model showed very good model fit: χ^2 (1, $N = 192$) $= .94$, $p > .05$, CFI $= 1.0$, SRMR $= .01$, RMSEA $= .01$ (90 % CI .01–.19). In comparison with Model 3, the AIC fit statistic was lower (26.94 compared with 73.93). All paths were significant. Specifically, at time 1, stress had a significant negative effect on optimism ($\beta = -.18$, $p < .05$), and a positive effect on NA ($\beta = .45$, $p < .001$). Stress at time 1 also had a significant positive effect on NA at time 2 ($\beta = .17$, $p < .05$). Optimism at time 1 had a significant negative effect on NA at time 2 ($\beta = -22$, $p < .001$), and using the bootstrapping method via AMOS 21indicated that optimism significantly mediated the relationship between stress and NA over time ($p < .05$, 95 % CI $-.04$ to $-.29$).

3.3 Hypothesis 3: Changes in Stress, Academic Self-Efficacy, SWB, and Academic Performance Over Time

To investigate hypothesis three that students would have lower stress levels and higher SWB at time 2 than time 1, mean level changes in hassle exposure, self-efficacy, SWB, and

academic performance (GPA) were examined using paired t tests with a Bonferroni adjusted alpha level of .007 (Table 3). Although GPA was not significantly associated with the study variables for the path analyses, it was anticipated that this variable would be important in aiding understanding change over time amongst undergraduates. Self-efficacy was examined because this was investigated as a state variable at each time point.

Hassle exposure, life satisfaction, and negative affect remained relatively stable over time, with no significant mean increases or decreases from time 1 to time 2. In contrast, there was a significant mean decrease in self-efficacy amongst the undergraduates from time 1 to time 2 ($t(191) = 3.41, p < .007, d = .23$). Cohen's d indicated a small effect size. There was a significant decrease over time in PA from time 1 to time 2 ($t(191) = 4.24, p < .007, d = .36$), and a significant decrease over time in academic performance from time 1 to time 2 ($t(185) = 7.78, p < .007, d = .49$). Cohen's d indicated a small effect size for PA, and a medium effect size for academic performance.

It was predicted that students would have lower stress levels at time 2; however, no significant difference was identified between the mean level of hassle exposure at time1 ($M = 86.7, SD = 15.99$) and time 2 ($M = 87.32, SD = 17.51$), $t(192) = -67, p > .007$. It was hypothesised that students would report different sources of stress at each time point as a reflection of different demands in their life. To test this, paired samples t tests were conducted comparing the means of the subscales of the measure utilised for student stress (the ICSRLE). The established subscales include developmental challenge, time pressures, academic alienation, romantic problems, assorted annoyances, general social mistreatment, and friendship problems (Kohn et al. 1990).

From Table 4 it is apparent that there were no significant mean differences from time 1 to time 2 for time pressure, romantic problems, assorted annoyances, general social mistreatment, and friendship problems subscales, indicating stability over time for these sources of stress amongst the undergraduates. Developmental challenge was lower than the .05 alpha level ($t(191) = -1.98, p = .049$) but was no longer significant when the Bonferroni correction of .007 was applied. There was a significant increase in academic alienation from time 1 to time 2 ($t(191) = -3.22, p < .007, d = -32$). Cohen's d indicated a small effect size. The means for the subscales of time pressures, romantic problems, assorted annoyances general social mistreatment, and friendship problems decreased over time; however, these decreases were not statistically significant.

Table 3 Comparison between means of hassle exposure, self-efficacy, SWB, and academic performance at time 1 and time 2

Variable	Time 1		Time 2		Paired t test	
	Mean	SD	Mean	SD	t	p
Hassle exposure	86.67	15.99	87.32	17.51	−.67	.51
Self-efficacy	98.60	18.18	94.28	18.81	3.41	.001**
Life satisfaction	25.15	5.72	24.77	6.41	.97	.34
Positive affect	34.96	6.62	32.59	6.46	4.23	.001**
Negative affect	23.91	8.04	24.29	7.46	−.67	.50
Academic performance	63.88	8.65	59.67	8.87	7.78	.001**

** $p < .007$ (Bonferroni adjustment)

Table 4 Comparison between means of ICSRLE subscales at time 1 and time 2

Variable	Time 1		Time 2		Paired t test	
	Mean	SD	Mean	SD	t	p
Developmental challenge	18.67	4.50	19.67	5.36	−1.98	.049
Time pressures	14.35	3.57	13.95	3.90	1.07	.285
Academic alienation	4.42	1.70	5.02	1.98	−3.22	.001**
Romantic problems	5.81	2.35	5.69	2.20	.53	.600
Assorted annoyances	7.94	2.30	7.80	2.12	.65	.517
General social mistreatment	10.11	3.18	9.74	3.14	1.17	.242
Friendship problems	5.13	1.97	5.05	1.72	.43	.671

** $p < .007$ (Bonferroni adjustment)

4 Discussion

The results partly support the first hypothesis. Specifically, stress exposure is negatively associated with the life satisfaction (LS) element of SWB at both times 1 and 2. As predicted, stress exposure is negatively associated with the positive affect (PA) element of SWB but only at time 2 while negative affect (NA) is positively associated with stress at both times 1 and 2. These associations are in line with previous research suggesting that as stress levels increase happiness levels in students decrease (Schiffrin and Nelson 2010; Suh et al. 1996; Zika and Chamberlain 1992). With only a few exceptions, the covitality factors are positively associated with SWB as predicted. At time 1 all of the factors (academic self-efficacy, optimism, hope, resilience and self-control) are positively associated with PA and negatively associated with NA; however, self-control is not significantly associated with life satisfaction at time 1 or 2. In addition, at time 2, hope and self-control have no significant association with PA, and hope and resilience are not significantly associated with NA. In terms of the hypothesised negative associations between the covitality factors and stress at both time points, only academic self-efficacy and optimism support the prediction while hope, self-control, and resilience are not significantly associated with stress over time.

The prediction that covitality factors will mediate the relationship between stress and SWB over time is partially supported. Optimism and self-efficacy are the only two co-vitality factors positively associated with SWB outcomes at both time 1 and 2. For life satisfaction, at time 1, path analyses indicated that stress is a negative predictor and optimism and self-efficacy are positive predictors. This is in line with other research where higher levels of optimism and self-efficacy in students were found to be associated with greater LS over time (Aspinwall and Taylor 1992; Chemers et al. 2001). It seems that optimistic and self-efficacious students cope better with the immediate stress of transition to university with these covitality factors helping to ameliorate the effects of stress. Previous research supports these findings reporting that optimistic students use effective coping strategies to deal with stressors (Brissette et al. 2002; Fontaine et al. 1993), and students high in self-efficacy perceive difficulties as temporary setbacks to be overcome (Bandura 1997). However, Macaskill and Denovan (2014) reported that optimism was not a predictor of life satisfaction in their cross-sectional study with an undergraduate sample.

Other researchers report that academic self-efficacy is negatively associated with stress and positively associated with well-being in students (Chemers et al. 2001; Morton et al. 2014; Roddenberry and Renk 2010; Solberg et al. 1993). However, when the effects of optimism and self-efficacy on the relationship between stress and life satisfaction is examined over the academic year, only self-efficacy shares positive associations with both stress and life satisfaction. Therefore, the hypothesis that the covitality factors of optimism and self-efficacy mediate the relationship between stress and life satisfaction is not supported.

Path analysis confirmed that the covitality factors of optimism and self-efficacy do not mediate the relationship between stress and PA. At time 1, while the covitality factors are negatively associated with stress, there is no significant relationship between stress and PA. Stress is a significant predictor of PA at time 2, with self-efficacy as a negative predictor of stress and a positive predictor of PA but not optimism. While some previous cross-sectional studies on undergraduates have reported that optimism is a predictor of PA (Chang and Sanna 2001; Lucas et al. 1996), Macaskill and Denovan (2014) found no statistically significant relationship between optimism and PA as in this study. Optimism is a complex variable, which can become unrealistic optimism in some circumstances and thus its effect on well-being may be difficult to predict and may be influenced by contextual factors (Chapin and Coleman 2009). The relationship between academic self-efficacy and PA has not been examined previously although general self-efficacy has been measured. Previous studies report that higher levels of general self-efficacy are associated with lower stress scores (Chemers et al. 2001; Morton et al. 2014) and this association is replicated here.

For the NA component of SWB the covitality factor of optimism mediated the relationship between stress and NA among the new undergraduates throughout the academic year. The data suggests that over time students with higher levels of optimism will have lower levels of stress and lower levels of the negative affect that are associated with experiencing higher levels of stress. While the association between optimism and stress has already been discussed, the role of optimism as a mediator between stress and NA is new. It is likely that this relationship exists because optimism acts as a buffer for life stressors. Generally, individuals with higher levels of optimism have a more positive view of life, analyse the majority of life situations with a positive outlook and expect positive consequences. This positive expectancy framework that exists among individuals higher in optimism, in which success is expected when one is presented with a challenge, influences their experiences when confronted with stressful situations such as the university transition, and such individuals tend to positively reinterpret the stressful circumstances they encounter (Avey et al. 2008). The confidence, agency, and positive outlook that come with optimism protect against the experience of negative emotion. In addition to optimism acting as a protective cognitive resource against the negative emotion associated with stress, it also facilitates the use of adaptive approaches to cope with stress as previously discussed (Aspinwall and Taylor 1992; Brissette et al. 2002).

This finding provides strong evidence for the value of introducing positive psychology interventions to promote optimistic thinking in students and decrease negative affect (Peters et al. 2010; Shapira and Mongrain 2010). This is a somewhat intriguing result given that while optimism is consistently associated with SWB it does not mediate the relationship between stress and PA or stress and LS. These results require further investigation.

In terms of the other covitality factors, the relationships with SWB were inconsistent across time as discussed previously. This may have been influenced by methodological factors in that with the exception of self-efficacy, the covitality variables were only measured at time 1. The positive psychology literature conceptualises covitality character

strengths such as hope, optimism, and resilience as being broadly equivalent to trait measures of personality (Peterson and Seligman 2004), the inference being that they will be relatively stable across time, certainly within the period used here. To reduce the assessment burden on the research participants, the authors thus decided not to repeat these measures. Future studies should not follow this strategy, as it could be that experiences such as the university transition, which occur at a time when young people are becoming independent adults, are significant enough to stimulate changes in levels of character strengths such as those that constituted the covitality variables in this study.

Self-control reported significant associations with PA and NA at time 1 and no association with LS. This finding was unexpected, as the transition has been shown previously to be a risk factor for self-control problems due to the number of changes occurring in the student's life, particularly for students initially low in self-control (Muraven et al. 1999). High self-control students are thought to adapt more quickly and then adopt a more disciplined approach to work so lower stress would be expected but there was no significant association between self-control and stress at either time point.

The inconsistent association between hope and SWB across time was unexpected. Hope has been found previously to contribute to higher SWB, particularly life satisfaction, amongst undergraduates (Chang 1998; Snyder et al. 1998). As well as the measurement issues discussed earlier, the lack of significance may be due to including optimism in addition to hope. While the two are different, they share similarities in both emphasising agency and expectations as motivators for positive outcomes (Snyder and Lopez 2005). Including optimism may have masked the effect of hope on SWB due to similarities in the constructs. Research has shown that optimism and hope correlate significantly with one another ($r = .65$, Magaletta and Oliver 1999).

Contrary to hypothesis three, stress scores remained relatively stable over the first year, levels of LS and NA did not significantly change and in the main sources of stress did not change very much, although increases in academic alienation were reported later in the year. Positive affect, academic self-efficacy, and academic performance were all lower later on in the academic year. It is not clear why such unexpected findings emerged. These results require further research as they suggest that students are becoming unhappier and less confident about their performance and are performing less well across the year. Students may find it difficult to cope with the university requirement for autonomous learning as reported by Denovan and Macaskill (2013). In particular, learner autonomy is a key component of UK Higher Education (HE) (Brown et al. 1999; Macaskill and Denovan 2013), and paradoxically, UK Further Education (FE) does not prepare students for the university environment due to emphasis on high class contact hours, supportive staff, and small teaching groups (Greenbank 2007). The contrasts between FE and HE make it inevitably difficult for new UK undergraduates to adjust to university. For some students their self-efficacy may have reduced if their performance in semester one did not meet their personal expectations and as mentioned earlier may be experiencing a crisis of confidence. Self-efficacy is furthermore a key component of learner autonomy (Macaskill and Denovan 2013), and has been reported to decrease because of not meeting expectations and not succeeding in academic tasks (Bandura 1997; Chemers et al. 2001).

4.1 Suggestions for Future Research

The finding that stress levels did not decrease as the undergraduates adjusted needs to be replicated and explored in more detail in other universities. The increases in academic alienation and decreases in self-efficacy across the year need further research to establish

why this occurs so that remedial actions may be incorporated, as both contribute to university success. The issue of only measuring some of the character strength elements of the covitality measures at baseline and assuming they will be stable over relatively short time periods also needs further examination.

Consideration of later time points may provide additional comparative evidence regarding the transition and adaptation of the student, the role of covitality factors, and the hassles that may become important throughout university. For example, Vollrath (2000) found the hassle of developmental challenge to be significant and increase over the 3 years at university in response to increasing assessment demands. In addition, inclusion of students' past academic performance (e.g. college GPA) may have added greater explanatory weight to the findings, particularly for the decrease in academic performance and self-efficacy.

5 Conclusion

The increases in academic alienation in tandem with lower levels of self-efficacy, positive affect and academic performances are worrying. Clearly, such findings warrant further investigation over a longer duration to examine whether such variables change throughout university as a function of the ongoing adaptation and adjustment of the students to university life. Providing support may help to encourage self-belief amongst new students. For example, Macaskill and Denovan (2013) demonstrated how promoting self-efficacy in new undergraduates can boost levels of autonomous learning. Covitality factors of self-efficacy and optimism were important protective factors among new undergraduates adjusting to the transition in this study. In particular, optimism helped to buffer the impacts of stress over time. These results suggest that offering interventions to develop optimism may significantly improve new students' ability to cope with stress at university and lead to reductions in negative affect.

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