

Coping styles of new undergraduate mathematicians

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ABSTRACT

The academic transition between school and university mathematics is challenging for many students, due to the nature of mathematics. This paper reports on the results of a study in which the Coping Styles Questionnaire (CSQ) was distributed to 186 first-year mathematicians. Barely-remarkable gender differences were found in students' responses, which might suggest that gender stereotypes in mathematics may not be as extreme as many believe. Furthermore, findings suggest that questionnaires such as the CSQ could be used to identify students' coping styles and consequently help them adopt effective coping strategies for the secondary-tertiary mathematics transition.

KEYWORDS

Transition, mathematics, coping styles, higher education, assessment

RÉSUMÉ

La transition académique entre les mathématiques du lycée et celles de l'université est un défi pour de nombreux étudiants, en raison de la nature même des mathématiques. Cet article fait un rapport sur les résultats d'une étude dans laquelle le Questionnaire des Modes d'Adaptations ('Coping Styles Questionnaire') fut distribué à 186 mathématiciens de première année. Aucune différences majeures entre les deux sexes n'ont été trouvées dans les réponses des étudiants ce qui suggère que les stéréotypes sexistes en mathématiques pourraient ne pas être aussi extrême que ce que beaucoup pense. De plus, les résultats suggèrent que les questionnaires comme le Questionnaire des Modes d'Adaptations pourraient être utilisés pour identifier les modes d'adaptations des étudiants et donc pourraient

les aider à adopter des stratégies d'adaptations plus efficaces pour la transition du secondaire au supérieur.

MOTS-CLÉS

Transition, mathématiques, éducation supérieure, modes d'adaptation, évaluation

INTRODUCTION

Gender differences in mathematics

Participation

More men than women study post-compulsory secondary mathematics in the United Kingdom, with boys comprising 61% of those who gained the secondary school-leaving, post-compulsory qualification A-level Mathematics and 73% of those who took A-level Further Mathematics in 2016 (Joint Council for Qualifications, 2016). However, the gender gap here has narrowed since the 1950s (Department for Education and Skills - DfES, 2007).

Despite women out-performing men in A-level Mathematics most years since the 1950s (DfES, 2007), women have comprised less than 40% of the UK's undergraduate mathematicians in the last 10 years (Higher Education Statistics Agency, 2015). At postgraduate levels and beyond, this difference becomes increasingly pronounced through masters and doctorate students, to researchers, lecturers and professors (McWhinnie & Fox, 2013).

The loss of women at each level has been characterised as a 'leaky pipeline' and attributed to a number of factors. Mathematics is generally perceived as a male subject (Mendick, Moureau & Hollingworth, 2008), with undergraduate women experiencing 'fragile' identities as mathematicians (Solomon, Lawson & Croft, 2011) and feeling that they do not belong (Solomon, 2007). Walls (2008, p. 4) even goes as far as to say that women in mathematics "are required to don a cloak of invisibility that affords them temporary status as honorary males in a male domain".

Self-efficacy and mathematics anxiety

The stereotypes most common in mathematics education are that girls are not as good at mathematics as boys, and less 'suited' to it. The former has been regularly discounted at post-compulsory levels, with girls often achieving a greater proportion of the top grades than boys at A-level. The latter is perpetuated by the media, society and supported by figures which show male dominance in terms of participation in mathematics learning and work. However, gender alone cannot be used to explain differences in participation and attainment in mathematics (Halpern et al., 2007).

Gifted girls are particularly likely to underestimate their mathematical competence (Reis & Park, 2001) and women judge their abilities more harshly than men (Chatard,

Guimond & Selimbegovic, 2007). Undergraduate women in the sciences have been found to have less self-confidence in their ability, even if gender differences did not exist in terms of achievement (Peters, 2013). This is also a problem at postgraduate levels (Becker, 1990).

A meta-analysis by Hyde, Fennema, Ryan, Frost and Hopp (1990) and more recent research (Goetz, Bieg, Lüdtke, Pekrun & Hall, 2013) has found that women are also more susceptible to mathematics anxiety – “feelings of tension and anxiety that interfere with the [...] solving of mathematical problems” (Richardson & Suinn, 1972, p. 551). Mathematics anxiety has been associated with poor performance (Hembree, 1990).

Beilock, Rydell and McConnell (2007) suggest that gender differences in mathematics anxiety could be because of the stereotype threat that women are not as good at mathematics as men. Furthermore, Dweck (2006) claims that women do not cope with mathematical challenges as well as men, even if they are equally capable. For example, in environments where females experience stereotype threat, their performance has been found to be compromised (Spencer, Steele & Quinn, 1999; Inzlicht & Ben-Zeev, 2000), even in subtle situations such as being asked to state their gender before doing a mathematics test (Danaher & Crandall, 2008).

However, a meta-analysis by Ma (1999) concluded that mathematics anxiety is *not* statistically significantly related to gender. Furthermore, Alcock, Attridge, Kenny and Inglis (2014) found that, whilst gender was a predictor of achievement and behaviour in second year mathematics undergraduates, once that was controlled for, personality accounted for more variances than gender. Therefore, stereotypes and the changing nature of participation in post-compulsory mathematics mean that it should not be accepted that females are necessarily totally different to males with respect to their experiences of mathematics.

The secondary-tertiary mathematics transition

School-university transition

The transition from school to university study is a stressful life change (Wilcox, Winn & Fyvie-Gauld, 2005) and it is important for students to be able to manage stress effectively if they are to successfully transition into tertiary study (Parker, Summerfeldt, Hogan & Majeski, 2004). It presents students with *organisational* discontinuities through a move to a much larger population which has higher academic standards, with a different pedagogy which requires the adoption of independent study habits. It also involves *social* discontinuities, which include the development of peer groups, new living circumstances and evolving relationships with family and friends (Anderson, Jacobs, Schramm & Splittgerber, 2000).

Social integration is a major part of the transition to undergraduate study (Kantanis, 2000), which sometimes results in loneliness (Parker et al., 2004) and isolation (Peel,

2000). Homesickness can be a problem for some new undergraduates (Thurber & Walton, 2012), something which has been found to result in more pronounced increases in depression and obsessiveness in women than in men (Fisher & Hood, 1987).

The literature is divided in terms of whether men or women cope better in this academic transition. Some studies suggest that men find social, academic and personal changes more difficult than women (Calaguas, 2011), with Parker, Hogan, Eastabrook, Oke and Wood (2006) claiming that women have more emotional intelligence than men, which makes them more likely to succeed at university. Conversely, some findings indicate that men cope better than women with the secondary-tertiary transition (Sander & Sanders, 2009), with women exhibiting signs of greater stress (Abouserie, 1994) and anxiety (Cooke, Bewick, Barkham, Bradley & Audin, 2006) at this time.

However, much research in the area of the secondary-tertiary academic transition is conducted in the United States, and so has limited applicability to the UK context. Differences in the nature of end-of-secondary schooling and qualifications in the two countries exist, and differences in the transition are further exacerbated by the significant cultural differences regarding entry to and the nature of universities in the UK and USA (Weko, 2004). For example, applicants to British universities apply to subject-specific courses from the offset, whereas American students make more general applications, often studying wide varieties of subjects in their first year at university. Indeed, whilst McLafferty, Mallett and McCauley (2009, p. 14) found no gender differences in their research regarding the resilience and emotional intelligence of new undergraduates at an Irish university, they recognised that gender differences might exist between students of other subjects, “particularly those engaging in courses which have traditionally been gender-typed”. Mathematics is one such course.

Mathematics transition

There are a lot of aspects of the secondary-tertiary mathematics transition that new undergraduates must cope with. For many students, they were top of their school mathematics classes, which would have contributed to a strong confidence in their mathematical ability. However, at university, they are joined by others with much the same experience. Such a change of fortunes shares commonalities with the big-fish-little-pond effect, a phenomenon described by Marsh (1987, p. 280) as when “equally able students have lower academic self-concepts in high ability schools than in low-ability schools” because of their perceived relative position in the ‘ranking’ of success and ability. Sax (1994) claims that even the most initially-confident mathematics students become less so at undergraduate level.

The transition from school to university mathematics, in particular, is special and is a popular topic of research. The formalisation of mathematics at university involves a change “from describing to defining, from convincing to proving in a logical manner

based on these definitions” (Tall, 1991, p. 20). Indeed, studies of mathematics assessment at upper-secondary and university level in the UK have found significant differences in the nature of the skills required to answer mathematics questions at each stage (Darlington, 2014).

Students find the transition to tertiary mathematics difficult, and universities complain that new undergraduates are ill-prepared for it (London Mathematical Society, 1995). Undergraduate mathematicians have been found to hold inaccurate conceptions of the subject (Crawford, Gordon, Nicholas & Prosser, 1998), contributing to some students losing interest as they fail to engage with mathematics (Daskalogianni & Simpson, 2002).

Consequently, new undergraduate mathematicians not only have to grapple with the general transition between secondary and tertiary study, and the associated new independence thrust upon them in new environments with new peers, but they must also adjust to the ‘new’ nature of mathematics.

Coping styles

Roger, Jarvis and Najarian (1993) describe coping as “a process of adaptation to a perceived threat” (p. 619), such as the study of an unexpectedly different mathematics to someone’s previous experience. Specifically, it is “the thoughts and behaviours used to manage the internal and external demands of situations that are appraised as stressful” (Folkman & Moskowitz, 2004, p. 745).

Folkman and Lazarus (1986) did seminal work on stress and coping, and first made distinctions between problem-focused and emotion-focused coping. A problem-focused individual copes with a situation through “information seeking, planning, direct action, and seeking instrumental help” whereas someone with an emotion focus blames themselves or others and uses “controlling or venting emotions, [...] emotional support, and avoidance” (Felsten, 1998, p. 290) to cope with stressful situations. Women students have reported more emotion-focused coping styles than men (Brougham, Zail, Mendoza & Miller, 2009), a ‘maladaptive’ coping style which has been linked to stress (Sulkowski, Dempsey & Dempsey, 2011).

Other distinctions include active and avoidant coping styles, with the latter considered maladaptive (Holahan & Moos, 1987). Heppner, Cook, Wright and Johnson (1995) distinguish between reactive, suppressive and reflective coping. The COPE questionnaire (Carver, Scheier & Weintraub, 1989) distinguishes between 14 different coping styles such as acceptance, behavioural disengagement, denial, and positive reinterpretation and growth. However, COPE has been widely criticised for its poor reliability and having too many factors (Endler & Parker, 1990; Parker & Endler, 1992; Roger et al., 1993). Scales which consider fewer factors include the Multidimensional Coping Inventory (Endler & Parker, 1990) which distinguishes between avoidance, emotional and task coping.

The Coping Styles Questionnaire (Roger et al., 1993) distinguishes between avoidance, detachment, emotional and rational coping.

A literature review by Miller and Kirsch (1987) found that differences tend to be found in men and women's coping strategies. For example, Leong, Bonz and Zachar (1997) studied first-year undergraduates at an American university and found that women were significantly more likely than men to use emotion-focussed coping strategies. Similar was found in a study by Lawrence, Ashford and Dent (2006) on first-year sport science undergraduates at a British university.

Objectives

As the literature would suggest that there are gender differences in the study of mathematics in a number of ways, and that the transition to its study at university level is unique, this study sought to examine first-year undergraduate mathematicians' coping styles. Specifically, data were collected and analysed in order to compare the coping styles of males and females in order to see whether gender differences exist.

METHOD

In order to establish the coping styles of first-year undergraduate mathematicians, Roger et al.'s (1993) Coping Styles Questionnaire (CSQ) was administered to a sample of students and analysed. The CSQ was selected because it has good test-retest reliability (Roger et al., 1993) and various studies using it have found 'acceptable' (Briggs & Cheek, 1986) internal consistency for all of RATCOP (range: 0.78-0.87), DETCOP (range: 0.76-0.90), EMCOP (range: 0.73-0.83) and AVCOP (range: 0.63-0.70) scales (Roger et al., 1993; Elklit, 1996; Johnson, 2004; Matud, 2004; Lawrence et al., 2006; Sulkowski et al., 2011). Other studies of undergraduate students have used the CSQ, so it was hoped that the results from this research concerning undergraduate mathematicians could be compared to students of other subjects from other studies. Participation was voluntary and anonymous in order to encourage students to be truthful.

Participants

186 first year undergraduate mathematicians at a leading British university completed the CSQ. It was administered during the middle of their second term at university at the end of a lecture for a compulsory course. All were students of either a single honours mathematics degree, or of a joint honours degree with mathematics (e.g. mathematics and physics). Approximately 74% of participants were male, somewhat higher than the current 62% of full-time undergraduates in the mathematical sciences (Higher Education Statistics Agency, 2016a).

Instrument

The Coping Styles Questionnaire (Roger et al., 1993) is a 60-item Likert scale questionnaire which asks participants to describe how they react to stressful situations as ‘always, often, sometimes or never’.

Analysis of the CSQ gives respondents a score on four different coping styles scales:

1. **Rational** coping (RATCOP)

This coping style is consistent with task-oriented responses, wherein the individual adopts a problem solving approach.

Example CSQ item: ‘Try to find a logical way of explaining the problem.’

2. **Detached** coping (DETCOP)

This coping style involves a detachment from stressful events.

Example CSQ item: ‘Get things into proportion – nothing is really that important.’

3. **Emotional** coping (EMCOP)

An emotional coping style is associated with “emotional responses, self-preoccupation, and fantasising responses” (Endler & Parker, 1990, p. 846).

Example CSQ item: ‘Feel helpless – there’s nothing you can do about it.’

4. **Avoidance** coping (AVCOP)

This can be either person- or task-oriented in the sense that someone may cope with stress by seeking out support or by engaging in another activity to distract themselves or avoid an issue (Endler & Parker, 1990).

Example CSQ item: ‘Pretend there’s nothing the matter, even if people ask what’s bothering me.’

TABLE 1

CSQ data for existing studies by gender

Paper	Participants	RATCOP		DETCOP		EMCOP		AVCOP	
		M	F	M	F	M	F	M	F
Roger et al. (1993)	521 undergraduates at British universities	27.26	24.28	18.71	16.01	16.80	18.22	15.38	15.69
Matud (2004)	2816 people from the Canary Islands	25.06	23.15	11.61	10.61	11.55	13.19	9.02	10.09
Palmer and Rodger (2009)	135 first year undergraduates at a Canadian university	27.36	25.12	21.9	15.9	15.04	16.48	15.73	16.51

Whilst a number of other studies using the CSQ have found some gender differences in participants' responses on each of the four coping style scales (see Table 1), other studies and instruments have found no gender differences (Felsten, 1998; Lengua & Stormshak, 2000; Pritchard & Wilson, 2006). However, such studies involved a mixture of participants at American universities, where students experience a different subject study structure to the UK (see earlier). Consequently, the experiences of undergraduate mathematicians, and the gender make-up of this group, mean that the sample used in this study had the potential to produce different results to other studies.

RESULTS

Values were assigned to all possible responses: Never=0, Sometimes=1, Often=2, Always=3. These values for the items associated with each subscale were then summed to give a score for each of the four coping styles.

In order to identify and exclude any univariate outliers, z-scores for each of the coping styles were calculated. This standardisation revealed no outliers. Mahalanobis distances indicated no multivariate outliers; hence there was no need to discount any of the data from analysis.

Of all four coping style scales, most participants scored highest on RATCOP, with 14% scoring highest on DETCOP, 13% on EMCOP and 6% on AVCOP. A MANOVA (see Table 2) found gender differences in the students' responses: $F(4, 140)=3.196, p=.015$.

TABLE 2

<i>MANOVA of gender vs coping styles</i>	
Pillai's trace	$V = .081$
Wilks's statistic	$\Lambda = .0919$
Hotelling's trace	$T = .088$
Roy's largest root	$\theta = .088$

According to a series of one-way ANOVAs and independent samples *t*-tests, to improve accuracy, these differences lay in EMCOP ($p=.038$) and DETCOP ($p=.007$) where women scored higher and lower than men, respectively (see Table 3).

TABLE 3

Descriptive statistics for the CSQ by gender

	Male				Female			
	Min	Max	M	SD	Min	Max	M	SD
RATCOP	9	41	24.28	6.22	9	42	23.48	6.48
EMCOP	1	33	14.09	6.53	7	34	16.57	6.67
DETCOP	7	34	20.49	6.08	8	36	17.55	5.42
AVCOP	3	31	18.90	5.46	7	30	16.81	6.11

Note: The range of possible values for RATCOP and EMCOP is 0-48, 0-45 for DETCOP and 0-39 for AVCOP

However, the gender differences in EMCOP ($r=.17$) and DETCOP ($r=.21$) – where the differences lay – had very small effect sizes. Furthermore, the overlap in the scores of men and women on each scale were large, with extreme minimum and maximum scores occurring for both sexes.

DISCUSSION AND CONCLUSION

Much has been made of the fact that undergraduate mathematics differs greatly to the mathematics that students learn at school. Consequently, first-year mathematicians often struggle to adapt to the ‘new’ mathematics that they study – a subject of great interest in mathematics education research. Furthermore, there are numerous gender differences evident in the study of mathematics ranging from participation in the subject, to perceptions and experiences of it. Gender differences have been found to exist in this study in terms of individuals’ coping styles although, crucially, these were very small. Hence, despite findings in the literature which may point towards women having different coping styles to men, and women in mathematics being in a minority, the differences here are not noteworthy. This is an important finding because it does not make bold claims about women in mathematics being different to men: “*Emphasis on gender differences in the popular literature reinforces stereotypes that girls lack mathematical and scientific aptitude... To neutralize traditional stereotypes about girls’ lack of ability and interest in mathe-*

atics and science, we need to increase awareness of gender similarities” (Hyde & Linn, 2006, p. 600).

What this study does do is it highlights that ascertaining a students’ coping style in a situation such as the secondary-tertiary transition, regardless of gender, has the potential for appropriate support to be provided in order to facilitate the development of productive coping strategies. The transition to university study is challenging for many and, according to the Higher Education Statistics Agency (2016b), drop-out rates in the mathematical sciences in the UK is the highest of all subject areas (32% compared to an average of 14%). Consequently, this is an important issue to address given the low numbers of students studying mathematics degrees in the UK has long been a concern (e.g. Advisory Committee on Mathematics Education, 2009).

REFERENCES

- Abouserie, R. (1994). Sources and levels of stress in relation to locus of control and self-esteem in university students. *Educational Psychology, 14*(3), 323-330.
- Advisory Committee on Mathematics Education. (2009). The mathematics education landscape in 2009. Retrieved from [http://www.acme-uk.org/media/1963/acme%20paper%20on%20the%20mathematics%20landscape%20for%20dcsf-dius%20hls%20meeting%20\(june%202009\)%20final.pdf](http://www.acme-uk.org/media/1963/acme%20paper%20on%20the%20mathematics%20landscape%20for%20dcsf-dius%20hls%20meeting%20(june%202009)%20final.pdf).
- Alcock, L., Attridge, N., Kenny, S., & Inglis, M. (2014). Achievement and behaviour in undergraduate mathematics: personality is a better predictor than gender. *Research in Mathematics Education, 16*(1), 1-17.
- Anderson, L.W., Jacobs, J., Schramm, S., & Splittgerber, F. (2000). School transitions: beginning of the end or a new beginning? *International Journal of Educational Research, 33*(4), 325-339.
- Becker, J. R. (1990). Graduate education in the mathematical sciences: factors influencing women and men. In L. Burton (Ed.), *Gender and Mathematics: An International Perspective* (pp. 119-130). London: Cassell.
- Beilock, S. L., Rydell, R. J., & McConnell, A. R. (2007). Stereotype threat and working memory: mechanisms, alleviation, and spillover. *Journal of Experimental Psychology: General, 136*(2), 256-276.
- Briggs, R. S., & Cheek, J. M. (1986). The role of factor analysis in the development and evaluation of personality scales. *Journal of Personality, 54*(1), 106-148.
- Brougham, R. R., Zail, C. M., Mendoza, C. M., & Miller, J. R. (2009). Stress, sex differences, and coping strategies among college students. *Current Psychology, 28*(2), 85-97.
- Calaguas, G. M. (2011). Sex differences and the relation of age in adjustment difficulties among college freshmen. *Journal of Advances in Developmental Research, 2*(2), 221-226.
- Carver, C., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: a theoretically based approach. *Journal of Personality and Social Psychology, 56*(2), 267-283.
- Chatard, A., Guimond, S., & Selimbegovic, L. (2007). “How good are you in math?” The effect of gender stereotypes on students’ recollection of their school marks. *Journal of Experimental and Social Psychology, 43*(6), 1017-1024.
- Cooke, R., Bewick, B. M., Barkham, M., Bradley, M., & Audin, K. (2006). Measuring and managing the psychological well-being of first year university students. *British Journal of Guidance and Counselling, 34*(4), 505-517.

- Crawford, K., Gordon, S., Nicholas, J., & Prosser, M. (1998). University mathematics students' conceptions of mathematics. *Studies in Higher Education*, 23(1), 87-94.
- Danaher, K., & Crandall, C. (2008). Stereotype threat in applied settings re-examined. *Journal of Applied Social Psychology*, 38(6), 1639-1655.
- Darlington, E. (2014). Contrasts in mathematical challenges in A-level Mathematics and Further Mathematics, and undergraduate mathematics examinations. *Teaching Mathematics and its Applications*, 33(4), 213-229.
- Daskalogianni, K., & Simpson, A. (2002). "Cooling off": the phenomenon of a problematic transition from school to university. Paper presented at the Proceedings of the Second International Conference on Teaching Mathematics at the Undergraduate Level, Hersonissos, Crete.
- Department for Education and Skills. (2007). *Gender and education: the evidence on pupils in England*. Nottingham: DfES Publications.
- Dweck, C. (2006). Is math a gift? Beliefs that put females at risk. In S. J. Ceci & W. Williams (Eds.) *Why aren't more women in science? Top researchers debate the evidence*. Washington, DC: American Psychological Association.
- Elklit, A. (1996). Coping Styles Questionnaire: a contribution to the validation of a scale for measuring coping strategies. *Personality and Individual Differences*, 21(5), 809-812.
- Endler, N. S., & Parker, J. D. (1990). Multidimensional assessment of coping: a critical evaluation. *Journal of Personality and Social Psychology*, 58(5), 844-854.
- Felsten, G. (1998). Gender and coping: use of distinct strategies and associations with stress and depression. *Anxiety, Stress, and Coping: An International Journal*, 11(4), 289-309.
- Fisher, S., & Hood, B. (1987). The stress of transition to university: a longitudinal study of psychological disturbance, absent-mindedness and vulnerability to homesickness. *British Journal of Psychology*, 78(3), 425-441.
- Folkman, S., & Lazarus, R. S. (1986). Stress processes and depressive symptomology. *Journal of Abnormal Psychology*, 95(2), 107-113.
- Folkman, S., & Moskowitz, J. T. (2004). Coping: pitfalls and promise. *Annual Review of Psychology*, 55(1), 745-774.
- Goetz, T., Bieg, M., Lüdtke, O., Pekrun, R. H., & Hall, N. C. (2013). Do girls really experience more anxiety in mathematics? *Psychological Science*, 24(10), 2079-2087.
- Halpern, D. F., Benbow, C. P., Geary, D. C., Gur, R. C., Hyde, J. S., & Gernsbacher, M. A. (2007). The science of sex differences in science and mathematics. *Psychological Science in the Public Interest*, 8(1), 1-51.
- Hembree, R. (1990). The nature, effects and relief of mathematics anxiety. *Journal for Research in Mathematics Education*, 21(1), 33-46.
- Hepner, P. P., Cook, S. W., Wright, D. M., & Johnson, C. W. (1995). Progress in resolving problems: a problem-focused style of coping. *Journal of Counseling Psychology*, 42(3), 279-293.
- Higher Education Statistics Agency. (2015). Table 13 - HE qualifications obtained by sex, subject area, level of qualification obtained and class of first degree 2009/10 to 2013/14. Retrieved from https://www.hesa.ac.uk/dox/pressOffice/sfr210/071277_student_sfr210_1314_all_tables.xlsx.
- Higher Education Statistics Agency. (2016a). Table 4 - HE student enrolments by level of study, subject area, mode of study and sex 2010/11 to 2014/15. Retrieved from https://www.hesa.ac.uk/dox/pressOffice/sfr224/061046_student_sfr224_1415_table_4.xlsx.

- Higher Education Statistics Agency. (2016b). Table SN3 - percentage of all UK domiciled entrants to full-time other undergraduate courses in 2013/14 who are no longer in HE in 2014/15. Retrieved from https://www.hesa.ac.uk/dox/performanceIndicators/1415_j62/sn3_1415.xlsx.
- Holahan, C. J., & Moos, R. H. (1987). Risk, resistance, and psychological distress: a longitudinal analysis with adults and children. *Journal of Abnormal Psychology, 96*(1), 3-13.
- Hyde, J. S., Fennema, E., Ryan, M., Frost, L., & Hopp, C. (1990). Gender comparisons of mathematics attitudes and affect. *Psychology of Women Quarterly, 14*(3), 299-324.
- Hyde, J. S., & Linn, M. C. (2006). Gender similarities in mathematics and science. *Science, 314*(5799), 599-600.
- Inzlicht, M., & Ben-Zeev, T. (2000). A threatening intellectual environment: why females are susceptible to experiencing problem-solving deficits in the presence of males. *Psychological Science, 11*(5), 365-373.
- Johnson, M. (2004). Approaching the salutogenesis of sense of coherence: the role of 'active' self-esteem and coping. *British Journal of Health Psychology, 9*(3), 419-432.
- Joint Council for Qualifications. (2016). A-Level results. Retrieved from <http://www.jcq.org.uk/Download/examination-results/a-levels/2016/a-as-and-aea-results>.
- Kantanis, T. (2000). The role of social transition in students' adjustment to the first year of university. *Journal of Institutional Research, 9*(1), 1001-1110.
- Lawrence, J., Ashford, K., & Dent, P. (2006). Gender differences in coping strategies of undergraduate students and their impact on self-esteem and attainment. *Active Learning in Higher Education, 7*(3), 273-281.
- Lengua, L. J., & Stormshak, E. A. (2000). Gender, gender roles, and personality: gender differences in the prediction of coping and psychological symptoms. *Sex Roles, 43*(11-12), 787-820.
- Leong, F. T. L., Bonz, M. H., & Zachar, P. (1997). Coping styles as predictors of college adjustment among freshmen. *Counselling Psychology Quarterly, 10*(2), 211-220.
- London Mathematical Society. (1995). *Tackling the mathematics problem*. London: London Mathematical Society.
- Ma, X. (1999). A meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics. *Journal for Research in Mathematics Education, 30*(5), 520-540.
- Marsh, H. W. (1987). The big-fish-little-pond effect on academic self-concept. *Journal of Educational Psychology, 79*(3), 280-295.
- Matud, M. P. (2004). Gender differences in stress and coping styles. *Personality and Individual Differences, 37*(7), 1401-1415.
- McLafferty, M., Mallett, J., & McCauley, V. (2009). Coping at university: the role of resilience, emotional intelligence, age and gender. *Journal of Quantitative Psychological Research, 1*(1), 1-6.
- McWhinnie, S., & Fox, C. (2013). *Advancing women in mathematics: good practice in UK university departments*. Oxford: Oxford Research and Policy.
- Mendick, H., Moureau, M. P., & Hollingworth, S. (2008). *Mathematical images and gender identities*. London: UK Resource Centre for Women in Science, Engineering and Technology.
- Miller, S. M., & Kirsch, N. (1987). Sex differences in cognitive coping with stress. In R. C. Barnett, L. Biener & G. K. Baruch (Eds), *Gender and Stress* (pp. 278-307). New York: The Free Press.
- Parker, J. D., & Endler, N. S. (1992). Coping with coping assessment: a critical review. *European Journal of Personality, 6*(5), 321-344.
- Parker, J. D., Summerfeldt, L. J., Hogan, M. J., & Majeski, S. A. (2004). Emotional intelligence and aca-

- ademic success: examining the transition from high school to university. *Personality and Individual Differences*, 36(1), 163-172.
- Parker, J. D., Hogan, M. J., Eastabrook, J. M., Oke, A., & Wood, L. M. (2006). Emotional intelligence and student retention: predicting the successful transition from high school to university. *Personality and Individual Differences*, 41(7), 1329-1336.
- Peel, M. (2000). 'Nobody Cares': The challenge of isolation in school to university transition. *Journal of Institutional Research*, 9(1), 22-34.
- Peters, M. L. (2013). Examining the relationships among classroom climate, self-efficacy, and achievement in undergraduate mathematics: a multi-level analysis. *International Journal of Science and Mathematics Education*, 11(2), 459-480.
- Pritchard, M. E., & Wilson, G. S. (2006). Do coping styles change during the first semester of college? *The Journal of Social Psychology*, 146(1), 125-127.
- Reis, S. M., & Park, S. (2001). Gender differences in high-achieving students in math and science. *Journal for the Education of the Gifted*, 25(1), 52-73.
- Richardson, F. C., & Suinn, R. M. (1972). The mathematics anxiety rating scale: psychometric data. *Journal of Counseling Psychology*, 19(6), 551-554.
- Roger, D., Jarvis, G., & Najarian, B. (1993). Detachment and coping: the construction and validation of a new scale for measuring coping strategies. *Personality and Individual Differences*, 15(6), 619-626.
- Sander, P., & Sanders, L. (2009). Measuring academic behavioural confidence: the ABC scale revisited. *Studies in Higher Education*, 34(1), 19-35.
- Sax, L. J. (1994). Mathematical self-concept: how college reinforces the gender gap. *Research in Higher Education*, 35(2), 141-166.
- Solomon, Y. (2007). Not belonging? What makes a functional learner identity in the undergraduate mathematics community of practice? *Studies in Higher Education*, 32(1), 79-96.
- Solomon, Y., Lawson, D., & Croft, A. (2011). Dealing with "fragile identities": resistance and refiguring in women mathematics students. *Gender and Education*, 23(5), 565-583.
- Spencer, S. J., Steele, C. M., & Quinn, D. M. (1999). Stereotype threat and women's math performance. *Journal of Experimental and Social Psychology*, 35(1), 4-28.
- Sulkowski, M. L., Dempsey, J., & Dempsey, A. G. (2011). Effects of stress and coping on binge eating in female college students. *Eating Behaviors*, 12(2), 188-191.
- Tall, D. (1991). *Advanced mathematical thinking*. Dordrecht, the Netherlands: Kluwer Academic Publishers.
- Thurber, C. A., & Walton, E. A. (2012). Homesickness and adjustment in university students. *Journal of American College Health*, 60(5), 415-419.
- Walls, F. (2008). *Girls, mathematics and the gendered construction of mathematical (dis)ability*. Paper presented at the conference of the International Group for the Psychology of Mathematics Education, Morelia, Mexico.
- Weko, T. (2004). *Old dogs and new tricks: what can the UK teach the US about higher education?* London: Higher Education Policy Institute.
- Wilcox, P., Winn, S., & Fyvie-Gauld, M. (2005). 'It was nothing to do with the university, it was just the people': The role of social support in the first-year experience of higher education. *Studies in Higher Education*, 30(6), 707-722.

