Trait Emotional Intelligence: Protecting Health from the Negative Impact of Stress

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A thesis submitted in fulfilment for the requirements for the degree of Doctor of Philosophy

Sponsoring establishment

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Submission date: July 2010

DECLARATION

I declare that while registered for the research degree, I was with the University's specific permission, an enrolled student for the following awards: The Teaching Toolkit at the University of Central Lancashire; The PgC LTHE at the University of Cumbria. I declare that no material contained in the thesis has been used in any other submission for an academic award and is solely my own work.

We can easily manage if we will only take, each day, the burden appointed to it. But the load will be too heavy for us if we carry yesterday's burden over again today, and then add the burden of the morrow before we are required to bear it.

John Newton

~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~

Anyone can become angry, that is easy. But to be angry with the right person, to the right degree, at the right time, for the right purpose, and in the right way- this is not easy.

Aristotle

~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~

Nerves and butterflies are fine - they're a physical sign that you're mentally ready and eager. You have to get the butterflies to fly in formation, that's the trick.

Steve Bull

This thesis explored the ability of two trait EI subscales [Emotional recognition and expression (ERE), and Emotional control (EC)] to explain significant amounts of unique variance in health variables. It asked first, whether the relationship between trait EI and health was mediated by coping, social support or unhealthy behaviours; and second, whether the harmful effect of stressor exposure on health was moderated by trait EI subscales. The thesis focussed on two specific components of EI to aid understanding of how specific elements of trait EI influence health, cross sectional and longitudinal designs were used; both objective (salivary cortisol) and subjective (life event inventory) measures of stress were used; personality, gender and age were considered as control variables wherever the predictive power of EI was explored, and health was explored as a multidimensional construct. Additionally, the selected trait EI measure [the Swinburne University Emotional Intelligence Test (SUEIT; Palmer & Stough, 2001)],was well matched to the ability EI model proposed by Mayer & Salovey (1997) and did not include correlates of trait EI such as facets personality. Original contribution to knowledge are; first, the longitudinal investigation of trait EI subscales and health; and second, the exploration in a naturalistic setting of the capacity of trait EI subscales to explain significant variance in cortisol reactivity, when personality, gender and age were controlled.

Results revealed neither ERE nor EC could explain significant amounts of variance in health variables (cross-sectionally or longitudinally), or in cortisol reactivity. However both ERE and EC were found to moderate the relationship between life event stressor exposure and health status. Moderational analyses revealed that, under a high frequency of stressful events, health was worse when EI subscales were low. In combination the results of these studies suggest that trait EI subscales ERE and EC are predictive of health only under high stress conditions. This finding is contradictory to the findings of recent meta analysis (Martins, Ramalho & Morin, in press), and discussion suggests that the discrepancy may be because past studies have used trait EI measures with content wider than the ability EI model (such as personality and happiness), which increased predictive power but reduced theoretical understanding.

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ACKNOWLEDGEMENTS

I would like to thank everyone who has helped and supported me during the completion of my PhD. Particular thanks go to my supervisors Dr. Pamela Qualter and Dr Mark Roy for their help and advice over the past few years. Thanks also to my friends for their laughter and understanding, my family for keeping me motivated and to my partner Richard for his love, encouragement and wisdom.

Chapter One

Emotional Intelligence (EI) comprises inter and intra-personal skills which relate to perceiving, regulating, understanding and using emotions (Mayer & Salovey, 1997). Since its formal proposal (Salovey & Mayer, 1990), the construct has been the subject of controversy as protagonists disagree over both definition and measurement. However, this has not prevented EI from being the subject of much investigation, or reduced claims of its importance as a factor which impacts positively on important life outcomes. For example, research findings have revealed that high EI can protect individuals from the physiological impact of stressors (Mikolajczak, Roy, Luminet, Fillee, & De Timary, 2007), reduce avoidant coping (Parker, Taylor & Bagby, 1998), promote social support quality (Austin, Saklofske & Egan, 2005), and aid positive health (Mikolajczak, Luminet & Menil, 2006).

This thesis investigated the relationship between trait EI, stressor exposure and health, with the aim of refining and expanding past research. The current research expands understanding of the association between EI and health in the following ways: first, it investigates whether the relationship between stressor exposure and health was moderated by trait EI; second, it explores whether the relationship between EI and health was mediated by coping, unhealthy behaviours, or social support; and third, it focuses on two specific components of EI [Emotional recognition and expression (ERE) and Emotional control (EC)] rather than using global scores, this aids understanding of how specific elements of trait EI influence health. Both objective (salivary cortisol) and subjective (life event inventory) measures of stress were used; personality, gender and age were considered as control variables wherever the predictive power of EI was explored, and health was explored as a multidimensional construct.

Study 1 aimed to explore whether ERE or EC subscales of trait Emotional Intelligence, as measured with the Swinburne University Emotional Intelligence Test (SUEIT: Palmer & Stough, 2001), could explain unique variance in health outcomes. Further, it investigated the mechanisms behind the positive association between EI and health. Previous literature proposed three possibilities: (1) that ERE and EC influence coping styles, which in turn impact on health; (2) that ERE and EC are predictive of social support, which in turn influences health; or (3) that ERE and EC moderate the effect of stress on health. Analyses sought evidence of an association between the EI subscales

and health and tested whether ERE and/or EC moderated the impact of stressor exposure on health. Results revealed that neither ERE nor EC could explain significant amounts of variance in health; therefore no further mediational analyses were conducted. Moderational analyses revealed that ERE and EC moderated the relationship between stress and health; interaction plots showed that under high stress, health was better when trait EI subscales were high (perceived health was better when EC was high, and health as measured by GP visit frequency was better when ERE was high). The discussion considers whether the lack of cross sectional findings are the result of the health measure used and this leads to a more comprehensive measure being used in studies two and three. Additionally, it is noted that longitudinal investigation is required to strengthen and further explore findings.

The aims of study 2 were to extend study 1 by improving the health measure used, and by investigating whether the relationship between EI and health was mediated by unhealthy behaviours such as drinking, smoking, and drug taking. This is an extension of study 1 as unhealthy behaviours can be considered aspects of disengaged coping if the purpose of them is to reduce feelings of anxiety. Additionally, if ERE or EC were predictive of unhealthy behaviours, this could provide evidence of a mechanism between EI and health, so even if EI subscales could not explain variance in health cross sectionally it would provide information about longitudinal processes. The investigation explored whether the relationship between trait EI and health could be explained either by the mediating presence of unhealthy behaviours and social support, or by EI moderating the relationship between stressor exposure and health. The health measure from study 1 was replaced by a more comprehensive health measure, the health related quality of life questionnaire (HRQOL; Hennessy, Moriarty, Zack, Scherr, & Brackbill, 1994). In addition to unhealthy behaviours (smoking, alcohol consumption and drug taking), social support subscales were investigated as mediators of the relationship between EI and health. Results revealed that trait EI could not explain a significant amount of unique variance in health variables. Furthermore, correlational analyses revealed only one significant relationship between EI and unhealthy behaviours, something which suggests that unhealthy behaviours do not explain the relationship between EI and health. This finding is contrary to recent review findings that Low EI is associated with more intensive smoking, alcohol use and illicit drug use, moreover reporting that subscales relating to ‘emotion regulation’ and ‘decoding and differentiating emotions’ were the most important factors (Kun & Demetrovics, 2010).

Potentially this discrepancy is an artefact of the current study using a focussed trait EI measure which does not include correlates of EI such as happiness, optimism and social skills. Moderation analyses did not reveal any significant interactions between EI and stress when predicting health, and therefore study 2 finds that EI does not moderate the relationship between stress and health.

The aim of study 3 (chapter five) was to extend studies 1 and 2 by investigating the longitudinal relationship between Emotional intelligence and health. The study asked if ERE and/or EC moderated the relationship between stressful life events and health, and whether the relationship between ERE or EC and health was mediated by coping or social support. Results revealed that ERE explained a significant amount of variance in health at time two (T2) as measured by illness reducing daily activity but was not predictive of health time three (T3). As ERE was not significantly related to social support or coping, no further mediational analyses were undertaken. Moderational analyses revealed that EI subscales significantly moderated the relationship between stressor exposure and health. Interaction plots reveal that under high stress conditions, health was best for those with high trait EI, such that participants under high stress at T1 but with higher ERE had the higher number of healthy days and illness impacted on their daily activities least at; further, participants under high stress at T1 undertook most exercise at T3 when they had high ERE and EC. Discussion suggests that EI subscales may only be beneficial to health under high stress conditions. Therefore, study four explores whether EI can moderate the relationship between EI and cortisol reactivity under the influence of a stressful task.

The aims of study 4 were to extend studies 1 to 3 by investigating whether EI moderated the relationship between the acute stress of a public speaking task and related cortisol and mood reactions. Two experimental groups (1-high stress, 2- control group) completed mood questionnaires and gave saliva samples. The first group (high stress) were students giving assessed presentations for course assessment in front of their peers; the second group (controls) were non-presenting members of the class. Participants gave saliva samples and completed mood questionnaires once before and twice after the stressor. Saliva samples were later assayed to establish their cortisol concentrations. Analyses revealed that neither ERE nor EC could explain significant amounts of unique variance in cortisol levels, and that neither subscale moderated the relationship between stress condition and cortisol. However, EC was found to moderate

the relationship between stress condition and mood: under high stress those with high EC report less energetic mood at stressor onset (baseline), suggesting that EC is helpful in maintaining composure. Discussion suggests that incongruence with previous research investigating trait EI and cortisol (Mikolajczak et al., 2007; Salovey et al., 2002), can be explained by the current studies use of a naturalistic setting, considering age gender and personality as controls, and using a narrower measure of trait EI.

This thesis provides an original contribution to knowledge by exploring the relationship between trait EI and health in several unique ways: **First,** this thesis examines the longitudinal relationship between EI and health, investigating coping and social support and mediators, and asking if EI can moderate the relationship between stressor exposure and health. No previous research has examined the relationship between EI and health longitudinally. **Second**, the experimental cortisol study presented in chapter 5 explores whether EI can explain unique variance in cortisol reactivity. This study is conducted using a measure of EI which is a good match to the ability EI model, and instead of using global scores focuses on two theoretically interesting subscales ERE and EC. Furthermore it considers personality as control variables and uses a naturalistic rather than a lab based setting for the experiment. Of the two previous studies to have investigated the relationship between trait EI and cortisol, both used inferior measures, one failed to control for personality, and both used experimental lab based protocols.

Overall, this thesis has found that trait EI subscales of Emotional Recognition and Expression (ERE) and Emotional Control (EC) are unable to explain significant amounts of unique variance in health variables or cortisol reactivity. This thesis concludes that research using trait EI measures with focussed content (that is content limited to the ability model as proposed by Mayer & Salovey, 1997), controlling for personality, gender, and age where appropriate, and exploring cortisol in naturalistic settings are unable to predict health variables. Whether tests of EI should contain elements wider than the EI model is an issue distinct from predictive power. Future research should aim to provide evidence that focussed measures of trait EI have predictive power and incremental validity, and further, aim to consider individual subscales or branches of EI to provide greater theoretical understanding of how EI influences other constructs. Further, it should be noted that measurement of cortisol change is only one physiological measure of health and others, (i.e., heart rate, blood pressure, and measures of immunity such as SiGA) should be investigated to provide

support for the findings here. Moreover, although EI may show effects in cortisol response to stress in the laboratory, results of study 4 suggest that trait EI does not have the same significant relationship when people are exposed to real life stressors; future research should aim to further understand the impact of trait EI on stress reactions in naturalistic settings. It is important to understand these nuances to understand how EI may impact on physical health. Stress is ubiquitous in work and educational settings, so it is worthwhile investigating how EI might protect from its negative effect on health.

Chapter Two.

2.1 Background of Emotional Intelligence

Although a relatively new construct, emotional intelligence (EI) has its roots in a century of research on intelligence. Early precursors of EI can be credited to Thorndike (1920, cited Burns, Bastian & Nettlebeck, 2007) for his work on social intelligence; Gardner (1983, 1993) for considering both interpersonal and intrapersonal intelligence; and to both Leuner (1966, cited Bar-On, 2004) and Payne (1986, cited Mayer, 2001) for first using the term Emotional Intelligence. EI was formally proposed in the seminal paper by Salovey and Mayer (1990), as the ability to accurately appraise, express, utilise and manage emotions in oneself and others. This definition was later refined (Mayer & Salovey, 1997) as " the ability to perceive emotions, to access and generate emotions so as to assist thought, to understand emotions and emotional knowledge and to reflectively regulate emotions so as to promote emotional and intellectual growth" (p.10). In this way, EI is defined as a skill, and is referred to as 'ability EI' (Petrides, Pita & Kokkinaki, 2007). This 1997 model was proposed as having four key interrelated abilities: perceiving, using, understanding and managing emotions.

EI attracted most interest after the 1995 publication of a book by Daniel Goleman, where it was treated as a range of characteristics including personality and motivation. This publication made unsubstantiated claims that EI mattered more than intelligence in predicting a range of life outcomes, including career success, happiness and social standing (Matthews, Zeidner and Roberts, 2002). As academics sought greater scientific rigour and evidence to support Goleman's claims, EI soon became the focus of academic research seeking to refine and shape the construct. During this wave of enquiry, a second proposed definition of EI was put forward; this interpretation considered EI to be a constellation of emotion related self perceived abilities and dispositions, located at the lower levels of personality hierarchies (Petrides & Furnham, 2001). In this way, EI was defined as a facet of personality. This second 'type' of EI is now referred to as 'trait EI'.

This divergence in definition of EI continues, with proponents of EI as a traditional intelligence ('ability EI') advising that the construct should be assessed with an objective test similar in style to an intelligence test. Meanwhile, supporters of EI as a

personality trait ('trait EI') suggest that a self report methodology is more suitable. At present, neither the 'ability' nor 'trait' conceptualisation of EI have prevailed as most dominant in research publications; indeed, both propositions of EI require confirmation that they have predictive power. Therefore, both 'types' of EI are acceptable in current use provided that researchers understand the technical differences between ability and trait EI. These are discussed in more detail below.

2.1.1 Ability EI

The 'Ability' model

In developing a model of EI (now considered to be 'Ability EI' model), Mayer and Salovey (1997) sought to identify the abilities which link cognitive processes with emotion, and emotion with thinking. This review lead to the proposition of the four component model of EI described above, containing four branches: *branch one*, perception appraisal and expression of emotion; *branch two*, understanding and analysing emotion and employing emotional knowledge; *branch three*, reflective regulation of emotions to promote emotional and intellectual growth; and *branch four*, emotional facilitation of thinking.

The overlap of Ability EI with Intelligence

As the original conceptualisation of EI emerged from the literature on intelligence, ability EI is considered by it's protagonists as a cognitive ability and a correlate of intelligence (Mayer & Salovey, 1997). For this reason, in seeking convergent validity, ability EI measures have been correlated with intelligence tests and assessments of other aspects of cognitive ability. Such research has found that ability EI significantly overlaps with cognitive ability (O'Connor & Little, 2003); and while some authors consider this to be evidence of construct validity (Roberts, Zeidner & Matthews, 2001), others have concluded that ability EI has little unique predictive power (Schulte, Ree & Caretta, 2004). In replying to an article which summarized evidence for the validity of the MSCEIT, Brody (2004) argued that there was no single reported study, which had controlled for personality and intelligence, that found nontrivial incremental validity for a socially important outcome. This statement is supported by meta-analysis (Van Rooy & Viswesvaran, 2004) finding that ability EI did not evidence incremental validity (explain unique variance) over general mental ability (GMA). More recent evidence has subsequently reported that the MSCEIT can explain a significant and moderate to

large amount of unique variance in alcohol use with personality and intelligence controlled (Rossen & Kranzler, 2009).

Measurement of Ability EI

Proponents of ability EI consider EI to be a skill based on cognitive processes; objective measurement is thus appropriate. In assessment akin to an IQ test, each test item has 'correct' answers; these answers are deemed correct either by a panel of expert judges, or by seeking population consensus. Proponents for ability measures of EI posit that these tests measure actual emotional ability while trait measures assess an individual's own perceived ability, so ability EI measures have better construct validity (O'Connor & Little, 2003). That said, as construct validity is about divergence between the latent construct and the measured construct, and as definition of the construct is not agreed upon, this argument is a duplication of dispute over conceptualisation. A further criticism of ability EI is that tests assess knowledge of emotion, but do not test the ability to perform tasks based upon that knowledge, (Brody, 2004).

Giving 'correct' answers to ability EI tests creates problems which stem from the consensus and expert scoring. Consensus scoring is problematic, as a test cannot be both normally distributed and reliable (MacCann, Roberts, Matthews & Zeidner, 2004) because it is not feasible for consensus tests to discriminate above average ability. It should be possible for someone of high EI ability to have a correct but non consensual answer, yet this is not possible. Moreover, it is problematic in the interpretation of scores. For example, if a population shows evidence of gender or ethic differences in their typical answers, it is equivocal as to which group should be considered 'correct' and therefore have the highest score (Roberts, Zeidner & Matthews, 2001). Also, as results reflect the social appropriateness of responses, some authors consider that consensus scoring is merely measuring a form of conformity (Roberts, Zeidner & Matthews, 2001).

Expert scoring of ability EI tests is also problematic: first, because it makes supposition of the most adaptive emotional response to any given situation (Petrides & Furnham, 2000); and second, because it is not possible to operationalise a test of ability EI which comprehensively assesses the EI domain. For example, the aspects of EI such as intrapersonal understanding of emotion cannot be tested (Petrides, Furnham & Mavroveli, 2007).

It should be noted that some proponents of ability EI assert that ability EI can be measured through self-report testing (Mayer, Salovey & Caruso, 2000c). For example Schutte's Self-Report Emotional Intelligence Test (SREIT; 1998) is based on the ability model proposed by Mayer and Salovey (1997), and attempts to measure four EI subscales (emotion perception; managing self relevant emotions; managing others emotions; and utilizing emotions). Although this measure is based on an ability model, other authors refer to this measure as an operationalised example of EI as a personality trait (Matthews, Zeidner & Roberts, 2002). Such critique is based on the SREIT having large overlap with personality traits (r= .31 to r= .62; Bastian, Burns & Nettlebeck, 2005), significant correlation with other self report measures (r=.43, Bracket & Mayer, 2003), significant correlation with self efficacy (Kirk, Schutte & Hine, 2008), and low correlations with ability measure the MSCEIT (Goldenberg, Mathesson, Mantler, 2006; Bracket & Mayer, 2003).

Difficulty with categorising the SREIT is an example of the confusion between theoretical and methodological aspects of the field of EI. Petrides and Furnham (2000) make the distinction between 'ability' and 'trait' EI based upon method of measurement; they consider a self report questionnaire 'trait EI' and a maximal performance test an 'ability EI' test. This categorisation is unrelated to the distinction of 'ability' and 'mixed' models, made by Mayer et al (2000) who state that a 'mixed model' is one which mixes cognitive ability with other characteristics. In agreement with the distinction made by Petrides and Furnham, the position of the current research programme is that self report assessments measure trait EI, while objective assessments attempt to measure ability EI. However, contrary to Petrides and Furnham (2000), the position of this thesis is that trait EI measures should still seek to include content which matches the Mayer & Salovey 1997 ability model.

The reliability of the MSCEIT, a measure of Ability EI has found the test to have acceptable internal reliability of above .75 (Mayer, Salovey, Caruso & Sitarenios, 2003), although this is lower than the reliability of cognitive tests, which range from .85, (Kaplin & Saccuzzo, 2004) to .95 (Murphy & Davidshofer, 2005).

Given the extensive issues listed above, it is debateable whether the predictive power of an ability EI test could outweigh theoretical and methodological problems. In addition

to the issues raised above, ability EI overlaps with measures of intelligence, and the issues relating to this are considered below.

Measurement of Ability EI using the MSCEIT

There are a number of issues with the only comprehensive measurement of ability EI, the Mayor Salovey Caruso Emotional Intelligence Test (MSCEIT) which makes its use problematic: (1) there is no other comprehensive measure of ability EI; (2) it takes too long to administer.

The MSCEIT is the only comprehensive measure of ability EI which assesses skills across the four theoretically described dimensions proposed by Mayer and Salovey (1997), and this has been commented on by a number of researchers as problematic (e.g. Rivers, Bracket, Salovey & Mayer, 2007). It is desirable to compare comprehensive measures to investigate the extent to which variances in participant responses are a true reflection of variance in their emotional intelligence. While there is no other comprehensive ability EI tests, there are tests which measure individual aspects of ability EI, such as either perception or understanding of emotion (these are reviewed both by MacCann, Matthews, Zeidner & Roberts, 2004; and Rivers et al, 2007). Branches one, two and three of the Ability model (Mayer & Salovey, 1997) could be assessed in this way, although there is limited evidence for the convergent validity of conceptually related ability measures with the MSCEIT (Rivers et al., 2007). However, at present no alternative to the MSCEIT has been identified as an effective way to measure branch four 'emotional facilitation of thinking'. Currently, then, it is not possible to test the MSCEIT for convergent validity with other ability EI tests, across all the dimensions proposed by Mayer and Salovey (1997).

Research exploring the value of ability EI as a predictor variable will find it problematic that the ability measure MSCEIT takes a long time to administer. Participants with lower concentration skills might be expected to obtain lower scores both on the MSCEIT and other outcomes, because results were confounded by attentional deficits rather than because of a real relationship between ability EI and academic achievement (Matthews, Zeidner & Roberts, 2002).

2.1.2 Trait EI

The 'Trait' model

In opposition to the ability model, a trait model has been put forward (Petrides, 2001), which considers trait EI to be a group of affect-related traits (Petrides & Furnham, 2003). Petrides' trait model claims to encompass variance of two kinds: one portion drawn from higher order dimensions of established personality taxonomies (e.g., Big Five, Giant Three) and one portion of variance that lies outside these dimensions. In operationalising trait EI (using the trait EI questionnaire; TEIQue) Petrides & Furnham include subscales measuring happiness, self esteem, optimism and social competence. However, not all authors are in agreement of how appropriate this is, and consider such breadth inconsistent with what measures of EI should attempt to assess. For example self esteem (included in the TEIQue; Petrides, 2001; Petrides & Furnham, 2003) does not directly measure emotion or intelligence or their intersection (Matthews et al., 2004, p. 185, cited Mayer Salovey & Caruso, 2008). Further, it seems illogical to decide to include optimism in a measure (i.e. the TEIQue, 2001) and then control for personality when using it (E.g. Petrides, Perez-Gonzalez, & Furnham, 2007; Mikolajczak, Luminet, Leroy & Roy, 2007).

The overlap of Trait EI with Personality

Trait EI is a range of non cognitive traits and theoretically should correlate with personality measures (Bar-On, 1997; Petrides & Furnham, 2001). Empirical evidence shows that self report measures of EI tend to have a significant overlap with personality measures (O'Connor & Little, 2003; Davies, Stankov & Roberts, 1998; Dawda & Hart, 2000), which has lead to critique that trait EI lacks divergent validity from the construct of personality (Davies, Stankov, & Roberts, 1998). For this reason authors have argued that when testing EI for predictive power, personality should be controlled; it establishes whether EI makes a distinct contribution in predicting outcomes (Brody, 2004). In line with this movement, the current programme of research will measure the big five personality factors to establish the extent to which measures of trait can explain unique variance in outcome variables.

Measurement of Trait EI

Proponents of trait EI consider the construct to a set of behavioural dispositions and self-perceived abilities (Petrides and Furnham, 2001). As such, it is a low order personality trait, in other words, trait EI is viewed to be a facet of personality, distinct

but with less predictive power than the big five or Eysenckian three (Petrides, Pita & Kokkinaki, 2007). For this reason, several authors (E.g. Bar-On & Parker, 2000) assert that trait EI should be assessed using self report measures, where measures ask participants to confirm the extent to which they are able to perceive, understand, regulate and use emotional information.

Trait EI is criticised for the following reasons: (1) for measuring perceived rather than actual emotional intelligence, and requiring self insight on the part of the participant (Ciarrochi, Forgas & Mayer, 2001); (2) for allowing answers to be distorted by participants who wish to appear more emotionally skilled (Ciarrochi, Chan, Caputi & Roberts, 2001); (3) for lacking utility on the grounds that the large overlap of trait EI with personality means the development of the construct has little practical advantage (Roberts, Zeidner & Matthews, 2007); (4) given that trait EI demonstrates low correlation with cognitive ability and high correlation with personality, it lacks convergent and construct validities (Van Rooy, Viswesvaran & Pluta, 2005); and (5) on psychometric grounds, since trait EI is not sufficiently distinct from personality to demonstrate discriminant validity (Daus & Ashkanasy, 2005).

Further, it seems paradoxical to expect people low in EI to have sufficient emotional insight to be able to rate their own ability (Matthews, Emo, Roberts & Zeider, 2006). Research findings support this criticism, as studies comparing self-reported versus objectively measured emotion perception have found no significant relationship (Ciarrochi, Deane & Anderson, 2002).

Despite these criticisms, self report measures of EI are widely used in current EI research. Therefore, further psychometric information about them should still be sought. Data for predictive power of competing trait EI tests is still desirable as such data will provide evidence of the extent to which individual tests provide idiosyncratic results.

2.1.3 Comparing Trait and Ability EI

In summary of the above, trait EI measures perceived emotional intelligence, while ability EI measures claim to assess actual emotional skill. Both may be important, but independent, predictors of life outcomes; perceived skill may be just as important as actual skill. However the two divergent conceptualisations are not suited to being

compared to assess convergent validity of emotional intelligence for three reasons: (1) the measures are not significantly associated; (2) different control variables are required for each type of EI; and (3) measures do not predict the same outcomes.

Due to their theoretical differences it is not appropriate to compare trait and ability measures to seek convergent validity. The divergence in conceptualising EI is reflected in research findings that only low correlations exist between measures of trait and ability EI (O'Connor & Little, 2003; Warwick & Nettelbeck, 2004). While trait EI is expected to have convergence with personality, ability EI should converge with cognitive skills. Indeed, a meta analysis found that the relationship between EI and General Mental Ability (GMA) is considerably stronger when using an ability measure of EI (.33) rather than a trait measure (.09), a difference so substantial that the authors posit that it is likely that different constructs are being measured (Van Rooy & Viswevaran, 2004). This finding also supports the conclusion of a previous comparative study (O'Connor & Little, 2003). Additionally, this meta-analysis revealed that ability EI evidenced incremental validity over personality but not over GMA, although GMA did evidence incremental validity over ability EI. This may suggest that trait measures of EI have greater ability to explain unique variance in outcomes.

A further reason not to compare trait and ability measures of EI is the empirical finding that they do not converge to predict the same outcomes. For example, ability but not trait EI was found to predict social competency when personality was controlled for (Brackett, Rivers, Shiffman, Lerner & Salovey, 2006), while Goldenberg, Matheson and Mantler, (2006), found that trait but not ability EI predicted coping style and depressive affect. Furthermore, ability but not trait EI has been found to be predictive of education and receiving psychotherapy (Goldenberg et al. 2006). In combination, this evidence suggests that trait and ability EI are discrete constructs. Therefore, it is not appropriate to compare them to seek evidence of the convergent validity.

In conclusion, when reviewing Emotional Intelligence research, care should be taken to note which type of EI has been assessed, and which measure used. It cannot be assumed that findings from ability EI can be replicated with trait EI.

2.1.4 Decision to explore Trait but not Ability EI

The current study explores trait but not ability emotional intelligence for a number of theoretical reasons: (1) it is not possible to operationalise a test of ability EI which comprehensively assesses the EI domain; (2) it is impossible to compare the results of the MSCEIT with other ability measures, due to there being no other comprehensive measure of ability EI, or if looking at branches separately, no measure which can assess branch 4. Therefore, comparison of ability EI measures to assess comparative predictive power is not possible, and neither is seeking evidence of convergent validity. This means that ability EI does not have the same theoretical appeal as trait EI; and (3) it is useful for future research to have comparative data on competing measures of trait EI. A substantial proportion of published EI research uses trait EI, presumably for reasons of time, cost and ease of implementation. Testing measures of trait EI is therefore desirable because there is a lack of data exploring the predictive power of the extant range of trait EI measures (Gardner & Qualter, 2010).

2.1.5 Explaining unique variance

Since the publication of Goleman's (1995) book, there has been a litany of studies investigating the power of EI to explain variance in a range of different outcomes. Initially these studies regularly failed to use sufficient scientific rigour; i.e. failing to control for intelligence (therefore not establishing incremental validity), and were therefore criticised on the grounds that this failed to confirm the utility of EI (Matthews, Zeidner and Roberts, 2002). For this reason a large proportion of new studies in the field responded, measuring and controlling for personality when investigating trait EI.

2.2 Negative impact of Stress on health: Environment, biology and psychology.

The studies presented in this thesis are designed to investigate the extent to which trait emotional intelligence (EI) is associated with health. The rational for this is as follows: exposure to stressors is negatively associated with health (Turyk et al., 2008), although there are individual differences in susceptibility to the health damaging effects of stress (Kessler et al., 1985). It is therefore desirable to understand protective factors; EI is posited to be such a factor protecting against either the behavioural or physiological affects of stress. To introduce these concepts fully, first stress and its influence on

health is discussed. This is followed by discussion considering the empirical evidence linking EI and health.

2.2.1 The Stress process

The study of stress investigates the process of an individual dealing with environmental demand. Confusingly, researchers tend to use the word 'stress' to mean either the stressor, or the stress response experienced by an individual (Cohen, Kessler & Gordon, 1997). In the current research programme, to avoid confusion, the environmental demands will be referred to as the stressor, and the outcome will be referred to as the stress response.

The transactional model of stress developed by Lazarus and Folkman (1987) introduced the idea that psychological appraisals of both the environmental demand and of individual resources to deal with stressors are key antecedents of stress responses. Contemporary models of stress build on this transactional model and comprise three components of the stress process: (1) Environmental factors; (2) Biological factors; and (3) Psychological factors (Cohen et al, 1997). The environmental perspective looks at how the characteristics of stressors or major life events impact upon an individual's health and well being; biological perspectives consider individual differences in patterns of physiological activation; and psychological perspectives consider how individual differences in perception and evaluation of the environmental demands. These three aspects of the stress process are integrated in models of stress as represented in figure 2.1, as illustrated by Cohen et al, 1997 (p.10).

This model is transactional in nature as it splits the stress process into causal antecedents, mediating factors, and outcome effects. *Antecedents* include environmental demands (including situational demands, resources, and ambiguity of harm); *appraisal* includes the assessment both for stressor to impact upon the individual, and for the individual to meet the demands this creates; *physiological responses* can include increased heart rate, blood pressure or elevated cortisol levels; finally, *behavioural responses* to stress may included any coping thoughts or behaviours employed by the individual. While this heuristic model is presented as unidirectional, there may be feedback loops or short cuts; for example, environmental demand may directly illicit a physiological or behavioural responses. Additionally, negative

emotional responses to perceived stress may feed directly into increased risk of psychiatric disease.

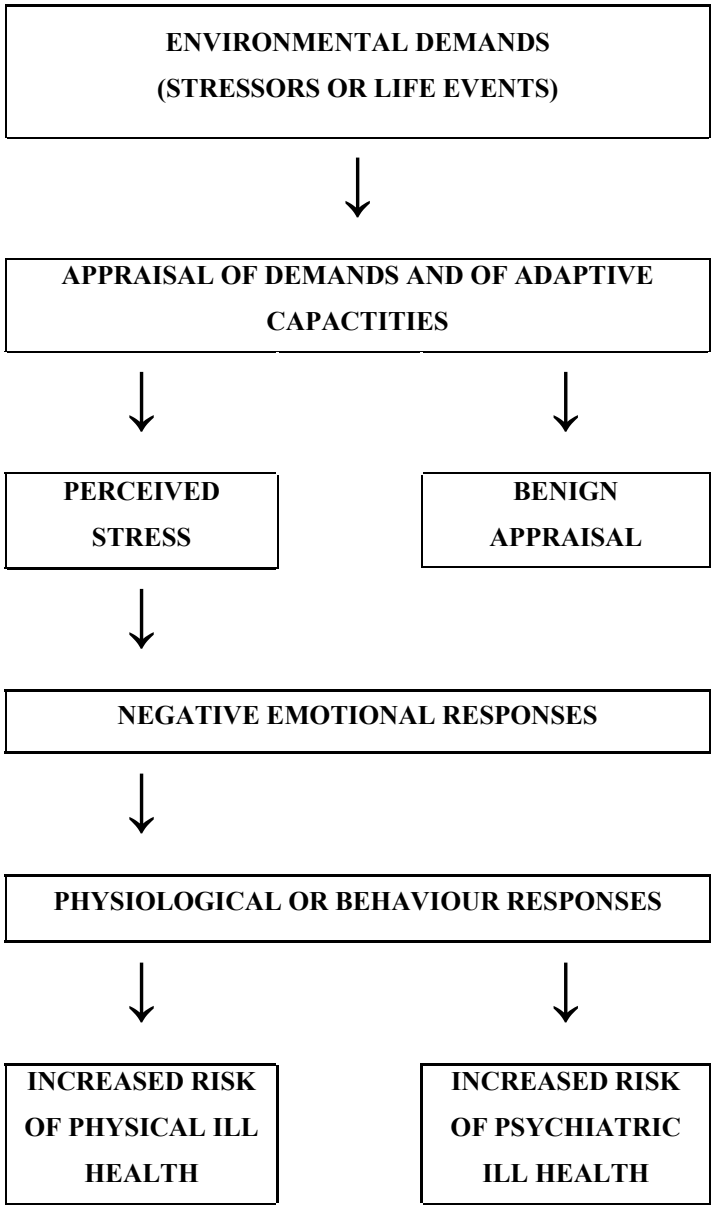

Figure 2.1 An heuristic model of the stress process designed to illustrate the potential integration of the environmental psychological and biological approaches to stress

2.2.2 Environmental factors: Methodological issues with measurement of stressors

One method of understanding the level of stressor someone is experiencing is simply by asking them to self report the extent of that stressor. To a degree, these inventories are subject to assessment error, reporting being influenced by memory, affect and salience (Cohen et al, 1997). To reduce the influence of attrition to memory when giving participants stressor inventories to complete, participants are usually instructed to report

major life events that have occurred within a recent time span, usually the past year (e.g. the life events questionnaire; Paykel, 1983). Scales are often used rather than interviews to keep biases to a minimum. Such scales ask respondents to indicate the extent of the stress they have felt in various areas of their lives. Such measurements are less susceptible to underreporting of stress than open ended questionnaires or interviews.

Whether one uses inventories or scales, researchers have the option to ask either about event frequency (i.e. to indicate which events have occurred, e.g. Holmes and Rahe, 1967), or severity (i.e. to report on a likert scale the extent of anxiety of panic the stressor caused; e.g., Rand, Hoon, Massey, Johnson, 1990). The latter can be problematic as asking participants to report perceived stress can confound the objective assessment of the stressor with subjective experience of stress, making it difficult to separate stimulus and response (Ogden, 2007). For this reason it is often preferable to measure frequency rather than severity of stressor events (Cohen et al, 1997).

An alternative traditional approach was for researchers rather than participants to weight particular events as more or less stressful (Marks, Murray, Evans, Willig, Woodall & Sykes, 2005) Weighting means that some events are considered to be more or less important, serious, or imposing of change. However, this becomes problematic as the salience of the items to the individual cannot be presumed by the researchers (Cohen et al, 1997). Additionally, there is no evidence that weighted indices produce greater correlations with outcome (Zimmerman, 1983). For these reasons the current study will not use event weightings.

Life events stressors

The main type of inventories used in assessing self reported stress, and used by the current studies, are life event inventories. Pioneering research on the stressful life events that people experience was undertaken by Holmes and Rahe (1967), the results of their work led to the construction of a life events inventory which aims to capture the frequency of events experienced. Life events scales ask participants to indicate which events from a list have happened within a set time frame (typically within the past year). These events may relate to the following areas: work (unemployment, retirement, job change); financial matters (financial difficulties); health (illness of self or family members); legal matters (victim of crime, bringing or facing legal action); or domestic

arrangements (marriage, divorce, becoming a parent, moving home). A high event score is seen as signifying a high demand on them for adaptation (Marks, Murray, Evans, Willig, Woodall & Sykes, 2005). Event stressors may include positively toned events such as marriage and holidays; although positive in tone, some events still evoke significant demand. While negative events may play a greater role in stress related illness (Lazarus, 1999), those creating a scale or inventory cannot presume to know which life events the individual will find to be positive or negative experiences, hence scales contain both aspects.

An alternative to the life events scale, the daily hassle scale was later put forward (Kanner, Coyne, Schaefer & Lazarus, 1981) to capture the day to day stresses that people are exposed to. Both daily hassles and life events scales are criticised equally for the reporting biases that they are prone to, however these biases (particularly mood) are consider to impact more significantly on reporting of daily hassles than on life events (Ogden, 2007).

Life event stressors as an influence on health

Exposure to stressful life events has been found to be predictive of illness (e.g. Theorell &Rahe, 1975; Turyk, Hernandez, Wright, Freels, Slezak, Contraras, Piorkowskie, & Persky, 2008). Also, there are individual differences in susceptibility to the health damaging effects caused by environmental stressors (Kessler, Price & Wortman, 1985). Studies investigating the time course between stressor exposure and health status have produced mixed findings: while some studies suggest that the influence of life events stressor upon health will manifest within a year (Holmes, 1979), studies using longer time intervals have found higher levels of correlation between life events and health (Eaton, 1978, cited Cohen et al, 1997).

Research findings support the utility of measuring life event stressors, and explaining the current drive to explain differential vulnerability. The resilience of individuals has been previously explored in terms of physiological (Clements & Turpin, 2000), psychological characteristics and resources (Clarke & Singh, 2005), including social support (Major, Zubek, Cooper, Cozzarelli & Richards, 1997) and coping (Schroevers, Kraaij & Garenefski, 2007). The current study seeks to extend this by considering Emotional Intelligence as a potential moderator of the harmful effects of stressors.

2.2.3 Biology of stress responses

Self report measures of stressors can be considered problematic because they provide subjective assessment; the scores produced are significantly impacted upon by memory and reporting biases (Marks et al., 2005). In contrast, physiological measures can provide and objective assessment of an individual's response to a stressor, provided measures are reliable and valid in the way they operationalise stress responses.

The psychobiological perspective looks at physiological activation of the body in response to (perceived or real) environmental demand, and a common way to do this is to assess activation of the Hypothalamic-Pituitary-Adrenocortical Axis (HPA axis), through measurement of salivary cortisol levels (Dom, Lucke, Loucks & Berga, 2007; Porter & Gallagher, 2006). Cortisol has a role in both normal and stress states; under normal conditions, cortisol is needed for metabolic and autonomic functioning, and has pronounced diurnal rhythm peaking before waking at around 6am, with a second smaller peak around noon (Lovallo, 2005). Under stress states, cortisol is required for the synthesis and function of both alpha- and beta-adrenoreceptors aiding the effectiveness of adrenaline, and aiding the release of stored glucose and fat (Dziewulska-Szwajkowska Magorzata; Adamowicz, Wojtaszek, Dzugaj, 2003). Stress states can be aroused by both psychological (e.g. excitement, fear, danger) and physical (e.g. infection, exercise) stimuli (Ogden, 2007).

Measurement of salivary cortisol is seen as a reliable and convenient method of assessing an individual's physiological response to stressors (Kirschbaum & Hellhammer, 1989). Salivary cortisol levels have been found to have a strong positive correlation with blood cortisol levels (Gallagher et al. 2006), and therefore provide a reliable measure of cortisol levels. Additionally, salivary cortisol avoids issues specific to blood cortisol collection, these include confounding resuts by stressing participants with use of needles, or confining research to laboratory settings (Jessop & Turner-Cobb, 2008). Therefore, non invasive salivary cortisol collection aids recruitment and retention of participants. Ethically the choice of physiological reactivity measure was important for study four as participants were being assessed during a presentation as part of their undergraduate coursework; intrusive, uncomfortable or distracting methods of assessment may have impacted upon their academic performance and affected results.

Within the current research programme, Study 4 investigates physiological responses to acute stressors in this way. In order to experimentally test the relationship between personal variables and cortisol, participants are exposed to the same stimulus, and their cortisol levels are measured before and after. Meta analysis has found that there are critical factors which impact upon the effect size of cortisol responses (Dickerson & Kemeny, 2004): Studies with the greatest cortisol responses had stress tasks with an aspect of evaluation by peers, participants lacked control, and were conducted in the afternoon. Other factors which impact upon cortisol responses include smoking status (Wurst, Kirschbaum & Hellhammer, 1993), and food intake by participants (Gonzalez-Bono, Rohleder, Hellhammer, Salvador & Kirschbaum, 2002).

Stress Physiology as an influence on health

In several empirical studies, individual differences in measures of stress exposure were found to be associated with differences in markers of health, including immunity (Kiecolt-Glaser, Ricker, George, Messick, Speicher, Garner, Glaser, 1984b), and susceptibility to illness (Cohen, Frank, Doyle, Skoner, Rabin & Gwaltney, 1998). Research also connects these studies, finding that alterations in immunological and endocrinological functioning (physiological indicators or immunity), predicts health outcomes (Volkmann & Weekes, 2006). Additionally, research suggests that individual differences in stress reactivity have long-term consistency (Burleson, Poehlmann, Hawkley, Ernst, Berntson, Malarkey, Kiecolt-Glaser, Glaser & Cacioppo, 2003). Study 4 of this thesis will investigate the extent to which EI can explain variance in physiological stress responses (salivary cortisol) to an acute stress task.

2.2.4 Psychology of stress responses:

Psychological perspectives consider individual differences in both perception and evaluation of environmental demands, and resources to respond to the demand. Two factors explored by the stress literature as explanations for the individual differences in the process of appraisal are coping and social support. Coping refers to the process of managing stressors appraised as taxing (Lazarus & Launier, 1978), while social support refers to either perceived or actual support provided by a social network.

Coping with stress

The current studies consider coping to be part of the process of dealing with a stressor, defining coping as "a person's constantly changing cognitive and behavioural efforts to

manage specific external and/or internal demands that are appraised as taxing or exceeding the person's resources" (Lazarus & Folkman, 1984 p. 141). Most studies propose that coping styles are behavioural or cognitive strategies, either avoidant or engaging in attention and approach to the stressor (Moos & Scharfer, 1993; Holahan & Moos, 1987). Indeed, researchers frequently group coping responses according to the supposed function of the thought or behaviour, typically 'problem focussed coping' which refers to an individuals attempt to reduce the stressor by managing the problem rationally; or 'emotion focussed coping' which refers to an individual's attempt to reduce emotional distress. It is generally considered that individuals engaged in problem focussed coping when they perceive that they can take constructive action, and emotion focussed coping when they feel that the stressor must be endured (Folkman & Lazarus, 1980).

As the field of stress and coping has developed, the above distinction has increasing been considered too simplistic, and authors proposed instruments with many more subscales. An example of this is the COPE scale (Carver, Scheier & Weintraub, 1989), which includes thirteen conceptually different scales which the authors developed theoretically. The subscales are *Active Coping*, *Planning*, *Suppression of competing activities*, *Restraint coping*, *Seeking social support for instrumental reasons*; *Seeking social support for emotional reasons*, *Positive reinterpretation and growth*, *Acceptance*, *Turning to religion*, *Focus on and venting of emotions*, *Denial*, *Behavioural disengagement*, *Mental disengagement*, *Alcohol- drug disengagement*. This range of subscales demonstrates the wide array of coping styles suggested in the literature. While scales with a large number of subscales may be of interest, the time demands they place on participants can be problematic and for this reason shorter measures such as the brief cope (Carver, 1997) have been developed.

Studies investigating the impact of coping styles have found them to be predictive of a range of outcomes. For example, active coping has been found to negatively correlate with academic adjustment (Pritchard & McIntosh, 2003), detrimental coping has been found to be negatively associated with health outcomes (Shen, McCreary & Myers, 2004), and negative coping styles have been found to positively correlate with higher cortisol concentrations (Walter, Gerhard, Gerlach, Weijers, Boening & Wisbeck, 2006).

It should be noted that no coping behaviour in itself can be considered more or less adaptive (Lazarus, 1999). For example, if an individual has power to control a situation then action focussed coping may be most appropriate; if not, emotion focussed may be more adaptive. For this reason when investigating the impact of coping, not only stress responses, but also the outcomes of stress the stress process such as health or goal attainment should be considered. Additionally, the individual's adaptability or flexibility in choice of coping style should be considered advantageous, as a diverse range of skills means that an appropriate coping response can be executed to meet the needs of a specific situation.

Building on findings that coping styles can predict adaptive outcomes, researchers have investigated coping as a mediator of the relationship between stressor and stress responses. Such research has found that stressors can predict coping styles, and that coping styles in turn can predict stress responses (Bolger, 1990; Pruchno & Resch, 1989). Such research has supported the position of transactional models (e.g. Lazarus, 1999), that coping arises from the dynamics between the individual and their environment.

Cognitive and Emotional coping responses as an influence on health

Research suggests that coping styles can moderate the relationship between stressor exposure and illness. Avoidant coping styles (which may include cognitive and emotional strategies such as self distraction; denial, disengagement and self blame) have been found to be negatively associated with health (Holahan & Moos, 1986; Shen, McCreary & Myers, 2004), and positively correlated with higher cortisol concentrations (Walter, Gerhard, Gerlach, Weijers, Boening & Wisbeck, 2006). Meanwhile engaged coping strategies have been found by meta-analysis to be associated with better health longitudinally (Suls & Fletcher, 1985).

Behavioural coping responses to stress as an influence on health

Some individuals may respond to perceptions of threat by engaging in behaviours whose functions are to reduce feelings of anxiety, but which are detrimental to health. Research evidence suggests that exposure to stressors or life events is related to a range of unhealthy behaviours, which include the following: smoking status and intensity (Kouvonen, Kivimaki, Virtanen, Pentti & Vahtera, 2005); alcohol use and misuse (Aseltine & Gore, 2000; Hoffman & Su, 1998); drug abuse (Harrison, Fulkerson &

Beebe, 1997; Najavits, 1997); and deliberate self harm (McLaughlin, Miller & Warwick, 1996). The current study seeks to investigate EI as a potential moderator of the relationship between stress and both positive and negative health behaviours. Existing research evidence in support of this proposition is discussed in more detail below.

Social support as a moderator of the stressor- response relationship

The construct of social support can be defined as assistance provided to individuals who are coping with stressful events (Thoits, 1986, cited Hyman, Gold & Cott, 2003). However, this can be broken down further to consider social support as a resource, as behaviours, or as an appraisal (Vaux, 1992, cited Hutchinson, 1999). In this way the subjective (perceived) and objective (actually received or offered) support can be separated. This distinction is important in terms for measurement as an individual may have a large social network but not perceive it as supportive (Hyman, et al, 2003**)**. Additionally social support is often seen as multidimensional, and measures of social support often look at aspects such as availability of support, practical support, reciprocity, emotional support, and event support (e.g. the social support network inventory; SSNI; Flaherty, Gaviria, Pathak, 1983).

Social support is said to buffer an individual from the effects of stress in four ways: (1) by providing emotional support, acceptance and self worth; (2) by providing social companionship, affiliation and contact; (3) by providing practical, concrete aid, including money or other resources; (4) and by providing information to help the individual understand and cope with the stressor (Haslam, O'Brien, Jetten, Vormedal & Penna, 2005). Conversely, some research findings suggest that social networks may be unhelpful at stressful times, for example when the network is perceived as demanding or critical (Lincoln, Chatters & Taylor, 2003); failing to provide the above positive functions; by providing poor advice (Ogden, 2007); or by the social learning of maladaptive coping strategies such as alcohol abuse (Cooper, Russell & George, 1988).

Research evidence supports the notion that perception of social support can moderate the relationship between stressor and stress response; for example between a critical incident and PTSD (Declercq & Palmans, 2006), victimisation in school and distress from bullying (Davidson & Demaray, 2007), race-related stress and quality of life in black Americans (Utsey, Lanier, Williams, Bolden & Lee, 2006), daily hassles and

psychological well being (Nezlek & Allen, 2006). Additionally, there is evidence that social support has a positive effect on the HPA axis (Rosal, King, Ma & Reed, 2004), and that this attenuation of neuroendocrine stress responses is through neural pathways (Eisenberger, Taylor, Gable, Hilmert & Lieberman, 2007).

Social Support as an influence on health

Research suggests that social support influences health indirectly and directly. Evidence of indirect relationship includes reports that social support influences the relationship between stressor and stress response (Declercq & Palmans, 2006; Davidson & Demaray, 2007; Utsey, Lanier, Williams, Bolden & Lee, 2006; Nezlek & Allen, 2006), and in turn that health is impacted upon by stress responses (Kiecolt-Glaser et al., 1984b; Cohen et al., 1998; Volkmann & Weekes, 2006). Direct evidence reports that social support is predictive of both attenuated stress responses (Rosal, King, Yunsheng, & Reed, 2004), and general health (Syme, 1986). Further, research reports that increased levels of social support are associated with better health and well being (Bowling, 1991), that sociability is predictive of decreased probability of developing a cold (Cohen, Doyle, Turner, Apler, Skoner, 2003a), that social support is associated with positive health outcomes as assessed longitudinally with a health index (Goode, Haley, Roth & Ford, 1998) and cross sectionally assaying blood samples for physiological immunity (Kiecolt-Glaser, Dura & Speicher, 1991).

Cohen, Gottlieb and Underwood, (2000) suggest two pathways linking social support with health. First that the direct effect of positive affect and self esteem result in improved immune and endocrine function, and greater impetus to engage in healthy behaviours. Second, it is proposed that social support moderates the negative effects of stress on health.

2.3 Evidence that EI protects health from the effects of stress

2.3.1 EI: Protecting health from the negative impact of stressors

Previous research has found that emotional skills are predictive of a range of physical health outcomes, including cardiovascular consequences (Karmack & Jenning, 1991; Smith, 1992), general health (Ioannis & Ioannis, 2005), and susceptibility to the common cold (Cohen, Doyle, Turner, Cuneyt, Alper & Skoner, 2003b). Moreover, trait

emotional intelligence has been found to be predictive of self reported health (Dawda & Hart, 2000; Mikolajczak, Luminet & Menil, 2006).

However, while these studies provide evidence of an association between EI and health, other researchers have sought to understand the paths by which EI might impact upon health (Lumley, Stettner & Wehmer, 1996). One posited mechanism through which EI promotes better health is that EI reduces the negative influence of stress on health (Cohen, Frank, Doyle, Skoner, Rabin & Gwaltney, 1998). Research evidence suggests that EI can mediate the relationship between stressor exposure and health **(**Mikolajczak et al., 2007), that high EI is predictive of lower self reported feelings of stress (Landa, López-Zafra, Martos & Aguilar-Luzón, 2008; Oginska-Bulik, 2005), and feelings of inability to control life events (Gohm Corser & Dalsky, 2005).

Two of the four branches of the Mayer and Salovey (1997) ability model have particular appeal in research on stress and health: Branch 1, which refers to effective regulation of emotion, and branch 4, perception appraisal and expression of emotion. A systematic process was undertaken to select a Trait EI measure which mapped well on to the Mayer and Salovey (1997) ability model (See Appendix A), and this process resulted in the section of the Swinburne University Emotional Intelligence Test (SUEIT; Palmer & Stough, 2001). The SUEIT maps well onto the Mayer and Salovey (1997) ability model (see table A2), and two of its subscales Emotional Control and Emotional recognition and expression suitably cover the two ability EI branches of interest.

Extensive literature on regulation of emotion exists suggesting that skills in emotion regulation are related to better health (John & Gross, 2004). Two SUEIT subscales (Emotional Management and Emotional Control) relate to emotion regulation. However of these two subscales Emotional Control has particular interest for two reasons. First, because past research suggests that emotion control may be a predictor or worse not better health (Ioannis & Ioannis, 2005) – a finding which is incongruent with research on emotional intelligence and health. Second, emotional control is more distinct from coping than emotion management; emotional control relates to inhibiting strong emotions, while emotional management refers to dealing with emotions after they have arisen. As the aims of this research include investigating coping as a mediator of the relationship between emotional intelligence and health, it would be undesirable for coping and emotional intelligence measures to be too similar as

significant relationships would not reveal anything meaningful. Therefore, the SUEIT subscale Emotional Control was selected for use in analyses.

Emotional control relates to the ability to effectively control strong emotional states such as anger, anxiety and frustration. Individuals who score highly on emotional control subscales are able to inhibit strong emotions from affecting their thoughts actions and behaviours, while those with low scores find this more difficult (Palmer & Stough, 2001). Past research has found that that Emotional Control has a consistent negative relationship with physical health (Ioannis & Ioannis, 2005; Gardner & Stough, 2003). Further, past studies have reported that Emotional control moderates the relationship between stress and health, where high stress and high emotional control predict a greater likelihood of reporting symptoms of illness (Goldman, Krammer & Salovey, 1996).

In addition to branch 1, previous research has revealed that components of branch 4 of the Mayer and Salovey (1997) ability model (perception appraisal and expression of emotion), are related to positive health (Taylor, Bagby & Parker, 1999; Pennebaker, 1997). As branch 4 of the ability model is captured in the SUEIT subscale emotional recognition and expression, this subscale would therefore be expected to predict health in the presence of stress. The SUEIT subscale Emotional recognition and expression was therefore selected for use in analyses

Emotional recognition and expression refers to the ability to identify feelings and emotional state in oneself, and to express inner feelings to others (Palmer & Stough, 2001). Emotional expression has been found by past research to be an important predictor of health (Taylor, Bagby & Parker, 1999), and an extensive body of work supports the notion that emotional expression as a coping response to stress is beneficial to health (e.g. Pennebaker, 1997; Smyth, 1998).

Mechanisms for the relationship between emotional recognition and expression, and emotional control and health are thought to be both behavioural and physiological. Negative emotional mood has been found to have an effect on behaviours such as smoking (Brandon, 1994) and drinking alcohol (Cooper, Frone, Russell, & Mudar, 1995); those with high emotional control are likely to seek coping mechanisms, which cause them health difficulties (Ioannis & Ioannis, 2005). Those individuals naturally

high on emotional expression are more likely to cope in an expressive way, making them likely to feel the health benefits associated with emotional expression. Indeed, suppression and denial of feelings have been associated with poorer health outcomes (Gross & Levenson, 1997). Interestingly some authors consider emotional control to be indicative of a reluctance to explore or express feelings (Helgeson & Lepore, 2004), therefore considering emotional control and emotional recognition and expression together is appealing theoretically.

Most studies exploring the relationship between trait EI and health have used total EI scores (E.g. Slaski & Cartwright, 2002; Oginska-Bulik, 2005), and have reported that global EI scores are predictive of good health. However, as past research has reported that emotional control is negatively related to positive health (Burns & Mahalik, 2008), and emotional expression positively related to health (Broderick, Junghaenel & Schwartz, 2005), an aggregated global emotional intelligence score could be less informative than individual subscales.

The current programme of research will test three main pathways between subscales Emotional recognition and expression (ERE), Emotional Control (EC) and health: (1) testing a physiological pathway, where ERE and EC influence physiological stress responses; (2) a coping pathway where ERE and EC influence coping responses that are harmful to health; and (3) a social support pathway where ERE and EC influence social support which in turn has a positive influence on health.

2.3.2 Evidence that EI influences physiological stress responses

If physiological stress responses are moderated by EI, then EI should have differential impacts upon people's health. Previous research provides some evidence that EI predicts physiological responses to stress, for example expressive writing attenuates cortisol responses to trauma related memories in PTSD patients (Smyth, Hockemeyer & Tulloch, 2008), and more specifically that EI is predictive of cortisol secretion (Mikolajczak et al., 2007). Elsewhere, emotional expression has been found to be related to enhanced physical health in breast cancer patients (Stanton, Danoff, Cameron et al, 2000); and to enhance physical health but not health behaviours (Smyth, 1998). Overall, the low number of studies to date linking physiological outcomes to EI promote the furthering of research in this field to ensure generalisability across measures.

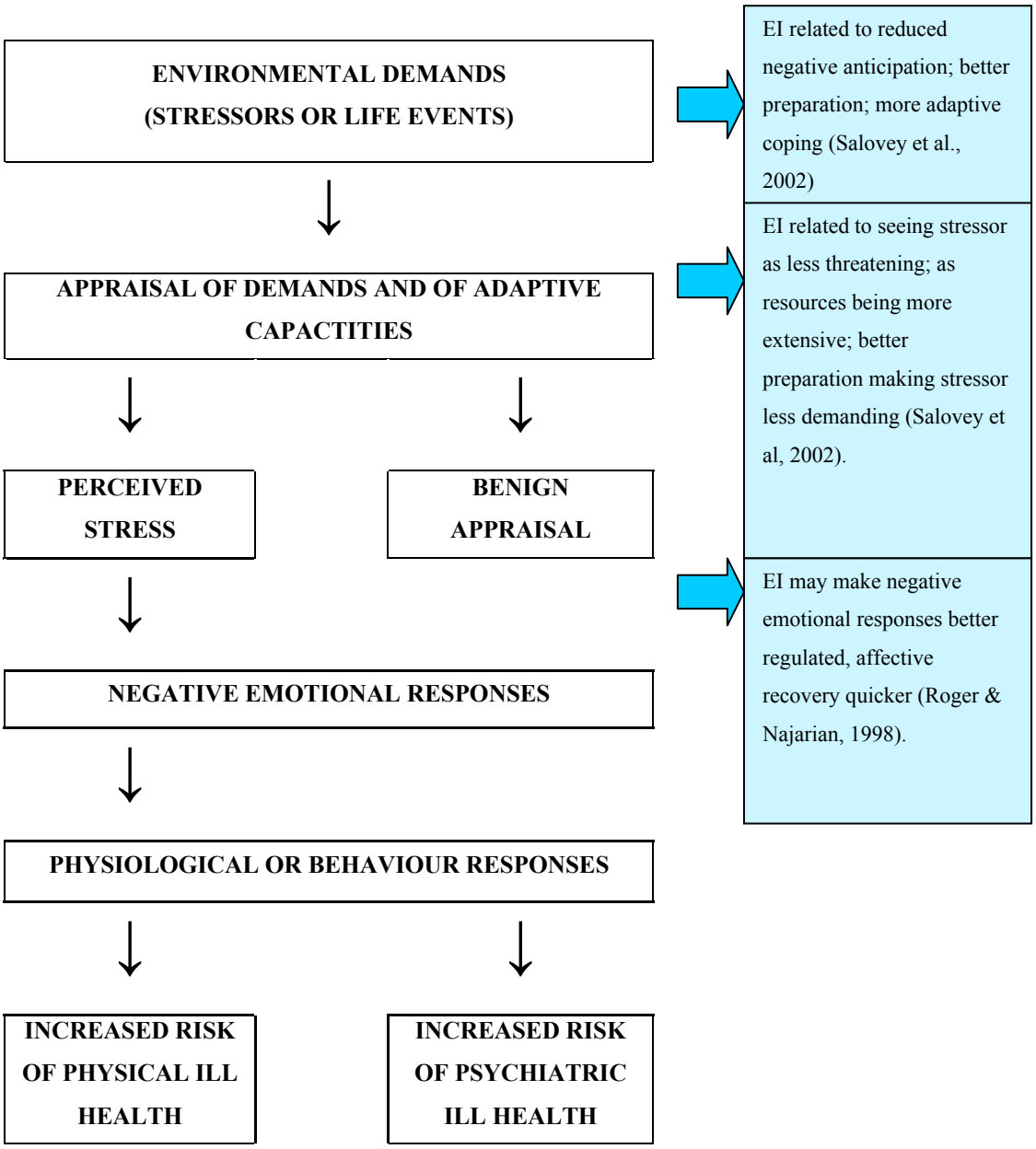

Figure 2.2 the place of EI within a heuristic model of the stress process

The relationship between cortisol reactivity and affective states has also been explored by research reporting that emotional rumination and emotional inhibition are related to significantly higher cortisol levels following an acute stressor (Roger & Najarian, 1998). Theoretically these studies suggest how EI might impact on models of stress, and these notions are displayed in figure 5.01 in an adaptation of the illustration by Cohen et al 1997 (p.10). From this, and based on past research, a number of potential mechanisms for EI to impact on physiological responses to stress can be posited. **First**, those with high EI may have low physiological responses before stressor onset. Research has found that those with high EI have reduced negative anticipation of

stressors better preparation for expected stressors; more adaptive or effective coping strategies (Salovey, Stroud Woolery & Epel, 2002; Parker, Taylor & Bagby, 1998). **Second**, those with high EI may have a reduced peak in their physiological response following the stressor; potentially because they experience stressors as less threatening; or because successful preparation means that they have better resources to deal with the stressor (Mikolajczak, Roy, Luminet, Fillee & De Timary, 2007; Salovey et al., 2002) **Third**, those with high EI experience a quicker fall in cortisol levels following a stressor (Mikolajczak et al. 2007); this may be the result of better affective recovery after experiencing stressors. **Fourth**, it may be that those with High EI have a generally lowered physiological response to stressors at all time points (Mikolajczak et al.,2007); this could be the case if EI is associated with more effective social support networks (social support has been found to be associated with reduced cortisol reactivity, and EI has been found to be predictive of social support).

Few studies have looked experimentally at the relationship between emotional intelligence and stress, objectively measuring stress through salivary cortisol reactivity. The first study to do this (Salovey et al., 2002) found evidence that higher EI predicted lower cortisol secretion under stress conditions ($r=-.30$, $p<.05$). However, the EI measure used did not cover the whole EI domain (the trait meta mood scale). Additionally, the authors failed to control for personality. Thus, results could demonstrate the predictive power of personality, rather than trait EI.

A second experimental study used a measure (The TEIQue) which is broader than the EI domain (as defined by Salovey and Mayer, 1997). They found that EI had incremental validity in predicting cortisol reactivity over the big five personality factors (Mikolajczak et al., 2007), again finding that higher trait EI predicted lowered cortisol in the stress condition ($r=-.54$, $p<.005$). The highlighted methodological issues associated with these studies make interpretation of their results difficult; it is equivocal as to whether their findings are in fact due to correlates of EI (personality, self esteem, happiness) rather than EI itself being predictive of lowered cortisol concentrations.

Both previous studies reported that EI was associated with smaller increases in cortisol levels following lab stress tasks and concluded that indeed psycho-physiological responses to stress may be the mechanism that underlies the relationship between EI and health. However, as both studies used either over-inclusive or narrow EI measures, and

in one case failed to control for personality (Salovey et al, 2002), these findings requires replication.

An additional methodological problem with the previous studies to look at stress responses and EI is that they were conducted under laboratory conditions using experimental stress procedures. While conducting research in this way allows for tighter control of environmental stimulus, it does not divulge as much information about real world behaviour in stressful situations. For this reason the current study sought to investigate cortisol reactivity in a group of students who were giving a public speaking performance in front of their peers as part of course assessment. Meta analysis has found that motivated performance tasks with an element of socio evaluative threat (in other words that those performing the task could be seen negatively by others) are reliably associated with large cortisol responses (Dickerson & Kemeny, 2004). Therefore assessed presentations given by students were considered to provide both a suitably stressful stimulus and ecological validity of results.

2.3.3 Evidence that EI predicts coping influences on health

Research suggests that EI influences appraisal of demand, and resources to cope. Specific findings are that low EI is related to avoidant coping (Parker, Taylor & Bagby, 1998); and that alexithymia (an overlapping but narrower construct than EI) is related cross sectionally to both binge drinking and long term alcohol use (Taylor, Bagby, & Parker, 1997). Additionally, panic disorders have a high cross sectional occurrence in Alexithymic patients (67% according to research by Parker, Taylor, Bagby, & Acklin, 1993) suggesting that an inability to regulate emotions means susceptibility to high anxiety and avoidant coping under stress. Other authors have taken this further, suggesting that EI is a moderating factor between stressor and coping (Jordan, Ashkanasy & Hartel, 2002), although they did not test this proposition.

Research evidence testing the relationship between EI and coping is rather inconclusive. For example, in a series of studies, Salovey et al. (2002) found that EI was correlated in one study with active coping, whilst in another it was related to less trait and state passive coping. However, Salovey et al. (2002) failed to control for personality or cognitive ability, and in a contrasting study including both ability- and self reported- EI, Bastian, Burns and Nettlebeck (2005) found after controlling for personality and

cognitive ability, that both self report, and ability-EI, contributed only a maximum of 6% of the variance in coping scores.

2.3.4 Evidence that EI predicts behavioural influences on health

A high percentage of mortality in industrialised countries is due to behaviour which is modifiable (Strobe & Strobe, 1995). For this reason it is desirable to explain and predict behaviours which impact either positively or negatively upon health. Such behaviours may include smoking, drinking alcohol, or taking illegal recreational drugs. Some individuals may respond to perceptions of threat by engaging in behaviours whose functions are to reduce feelings of anxiety. While some such behaviours might be considered healthy, such as taking exercise, other behaviours impact adversely upon health. Research evidence has found that higher EI is predictive of less health damaging behaviours for those suffering high stressor exposure (Pau, Croucher, Sohanpal, Muirhead, & Seymour, 2004) lower rates of smoking initiation (Trinidad & Johnson, 2002); that alexithymia is related to both alcohol (Ioannis & Ioannis, 2005; Haviland, Shaw, Cummings & MacMurray, 1988) substance use (Taylor, Parker & Bagby, 1990; Pinard, Negrete, Annable & Audet, 1996), and taking longer to seek medical care (Kenyon, Ketterer, Gheorghiade & Goldstein, 1991).

Behaviours adverse to health such as smoking, drinking alcohol, or drug taking may be seen as dysfunctional ways of coping. Research evidence suggests that EI is predictive of coping (Bastian et al., 2005), and that coping is also predictive of health (Shen et al., 2004): this suggests that there is a behavioural pathway linking EI to health. Further, this suggests that coping mediates the relationship between EI and health. Evidence that coping is related to health outcomes is widespread in research literature. Findings support the notion that distraction is related to poorer health quality of life in cystic fibrosis patients (Abbott, Hart, Morton, Gee & Conway, 2008); that affective coping is associated with impaired quality of life, and passive coping to pain intensity (Anie, Steptoe & Bevan, 2002); and that in diabetic adolescents active coping is related to improved health (better metabolic control, decreased HbA-1c), and disengaged coping worsens health outcomes (Graue, Wentzel-Larsen, Bru, Hanestad & Sdegreesvik, 2004).

2.3.5 Evidence that EI predicts social support influences on health

Research evidence suggests that social support can predict health outcomes (as discussed above). Therefore, if EI is predictive of social support this would explain why EI has differential impact upon health. Indeed, evidence suggests that Ability EI is predictive of quality of social interactions (Lopes, Brackett, Nezlek, Schutz, Sellin & Salovey, 2004), perceived quality of social relationships (Lopes, Salovey, & Straus, 2003), and better social support (Ciarrichi, Chan & Bajgar, 2001). While trait EI research has found EI to be positively related to peer-rated social competence (Mavrovelo, Petrides, Rieffe & Bakker, 2007), and social network size and quality (Austin, Saklofske & Egan, 2005). Additionally, Austin et al (2005) found that social network size was more strongly associated with trait EI than with personality.

2.3.6 Controlling for personality

To provide evidence of incremental validity, researchers suggest that when exploring the predictive power of trait EI, personality should be controlled for (Brody, 2004). This is especially the case if personality has previously been found to have significant associations with the outcome variables under investigation.

Research evidence finds that personality is related to both health status (Kenney & Bhattacharjee, 2000), disease progression (Matthews, Raikkonen, Stutton-Tyrrell, & Kuller, 2004), and health behaviour (Booth-Kewley & Vickers, 1994). Therefore, it is important to control for personality when investigating the relationship between EI and health. Specific findings are that neuroticism is related to greater symptomology and worse health (Schiffer, Denollet, Pederson, Broers, & Widdershoven, 2008), and that this is especially the case in combination with introversion (Denollet, 2005). Neuroticism also seems to be related to risky behaviour; while conscientiousness and agreeableness relate to healthy behaviours (Bermudez, 2006).

Given research has found that EI is negatively related to neuroticism and positively to conscientiousness, EI would therefore be expected to predict healthy behaviour and protect against risky behaviour. Mechanisms for the relationship between personality and health include the seeking of social support or choice of coping strategy (Bermudez, 2006), the same behavioural mechanisms which are hypothesised to link EI to better health.

Controlling for personality when investigating cortisol responses to stress

Research has found that personality can account for variance in cortisol secretion under stress conditions, although findings appear not to be consistent. Some research has found that higher cortisol levels are related to higher neuroticism (Roger & Najarian, 1998; Houtman & Bakker, 1991), and some to lower neuroticism (LeBlanc & Ducharme, 2005); some studies have found that higher cortisol is related to higher extroversion (LeBlanc & Ducharme, 2005), and lower extroversion (Dettling, Gunnar & Donzella, 1999); elsewhere, no significant relationship has been found between personality and cortisol levels (Schommer, Kudielka, Hellhammer, & Kirchbaum, 1999). Despite the inconsistencies, the evidence that personality can explain significant variance in cortisol within regression models, along with the relationship between trait EI and personality, underline the need to control for personality when exploring the relationship between EI and cortisol reactivity.

Controlling for personality when investigating coping

Past research reports that facets of personality are predictive of different dimensions of coping; research has found extroversion to be positively related to problem focussed coping (McCrae & Costa, 1986), and low extraversion to be related to avoidance of social support, (Gallagher, 1996); neuroticism has been found to be positively related to avoidant coping (Gomez, Holmberg, Bounds, Fullarton & Gomez, 1999) irrational coping (Gallagher, 1996), and emotion focussed coping while inversely to problem focussed coping (Endler & Parker, 1990). Research specifically using the Brief Cope and the big five personality variables, has found neuroticism to be positively related to emotional support and avoidant behaviours (substance abuse, behavioural disengagement, self blame, venting); extroversion, conscientiousness, openness to be positively related to both problem focussed (active coping, planning) and emotion focussed coping (reframing, humour, acceptance); while agreeableness was positively related to active coping and humour (Roesch, Wee & Vaughn, 2006). In a prospective study, neuroticism was found to predict coping efforts (wishful thinking and self blame) which accounted for half the relationship between neuroticism and pre-exam anxiety (Bolger, 1990). In summary, as personality has been found to be related to coping, it is important to control for personality when investigating the relationship between EI and coping.

Controlling for personality when investigating social support

Past research has revealed that personality is predictive of the availability and effectiveness of social support (Cukrowicz, Franzese, Thorp, Cheavens, & Lynch, 2008). Specifically, neuroticism, openness to experience and agreeableness have been found to be negatively related to social support (Nicolas, 2009; Cutrona & Russell, 1987), while conscientiousness and extraversion are significant positive predictors of perceived social support (Kitamura et al., 2002). For this reason personality will be controlled for when investigating the relationship between EI and social support.

2.4 Summary

The overall aims of this thesis were to investigate the relationship between EI, stressor exposure and health, while refining and expanding past research. The relationship between Trait EI and health was explored, first by investigating whether the relationship between stressor exposure and health was moderated by EI, and second by exploring whether the relationship between EI and health was mediated by coping, unhealthy behaviours, or social support. Personality was controlled for wherever the predictive power of EI was explored to provide evidence of incremental validity. Finally, both subjective (self report) and objective (physiological measure using salivary cortisol) assessments of stress were used, conducting the latter in a naturalistic setting to provide greater ecological validity.

The aims of study one were:

1. To explore whether trait Emotional Intelligence (EI) subscales Emotional recognition and Expression (ERE) and Emotional Control (EC) could explain unique variance in health outcomes.
2. To investigate whether ERE or EC influence coping style, which in turn impacts on health.
3. To investigate whether ERE or EC influence social support which in turn influences health.
4. To investigate whether ERE or EC moderate the physiological effect of stress on health.

The aims of study two were:

1. To extend study one by focussing on mediating unhealthy behaviours, rather than general coping (with includes cognitive and affective components).

2. Exploring whether the relationship between ERE or EC and health could be explained by the mediating presence of either unhealthy behaviours or social support.
3. Exploring whether ERE or EC moderate the relationship between stressor exposure and health.

The aims of the study three were:

1. To provide an original contribution to knowledge by investigating the longitudinal relationship between Emotional intelligence subscales and health.
2. To explore longitudinally whether ERE or EC moderate the relationship between stressful life events and health.
3. To explore longitudinally whether the relationship between ERE or EC and health was mediated by coping or social support.

The aim of study four were:

1. To extend studies one to four by investigating whether ERE or EC moderate the relationship between the acute stress of a public speaking task and related cortisol and mood reactions.
2. To provide an original contribution to knowledge by investigating EI subscales and cortisol in a naturalistic setting, thus extending previous research though methodology with greater ecologically validity.

Chapter Three: Cross Sectional Investigation of Trait Emotional Intelligence, Life Stressors, Coping and Health Outcomes

The resilient response of individuals to the negative effects of stressors on health has been previously explored in terms of physiology (Clements & Turpin, 2000), psychological characteristics & resources (Clarke & Singh, 2005), social support (Major, Zubek, Cooper, Cozzarelli & Richards, 1997), and coping styles (Schroevers, Kraaij & Garenefski, 2007). The current study seeks to extend this by considering Emotional Intelligence (EI) subscales emotional recognition and expression (ERE) and emotional control (EC) as potential moderators of the harmful effects of stressors on health. Second, social support and coping are considered as mediators of the relationship between EI subscales and health.

The aims of study one are as follows: (1) to explore whether trait Emotional Intelligence (EI) subscales ERE or EC can explain unique variance in health outcomes; (2) to investigate whether ERE or EC influence coping styles which in turn impact on health; (3) to investigate whether ERE or EC influence social support which in turn influences health; and (4) to investigate whether ERE or EC moderate the physiological effect of stress on health.

3.1 Method

3.1.1 Design

The relationships between ERE and EC, coping, and general health were investigated through correlational and regressional analysis. Personality was measured as a control variable.

3.1.2 Participants and Procedure

First year undergraduate students at the University of Central Lancashire during the 2006-2007 academic year were recruited through verbal requests in lectures and workshops, and additionally through poster advertisements. As an incentive to participate, participants were entered into a prize draw for a £50 book voucher and

university participation pool points were offered. Due to the high number of study variables already taken, ethnicity information was not requested from participants.

Participants were given a booklet of questionnaires which contained the Swinburne University Emotional Intelligence Test (SUEIT); life events questionnaires, the health status questionnaire; the Social Support Network Inventory (SSNI; Flaherty, Gaviria & Pathak, 1983); and the International Personality Item Pool (IPIP; Goldberg, 1999). A week after completion participants were given a second questionnaire booklet, this contained the social support network inventory and the brief cope questionnaire.

167 students completed booklet one, and of these 118 completed booklet two. For the students involved in the study, ages ranging from 18 to 55 (mean age 20.76). 41 participants (24.6 %) were male, and 126 (75.4%) were female. Although some previous research has found no significant effect of gender on emotional intelligence (Van Rooy, Alonsa & Viswesvaran, 2005), others have found females to have higher EI scores (Ciarrochi, Caputi & Mayer, 2003; Mayer, Salovey & Caruso, 2000). For this reason sample means and standard deviations for the current study are compared against technical manual data for the SUEIT below.

3.1.3 Materials

Measures for Study 1

EI Measure

(See **appendix A** for justification of choice of trait EI measure).

The Swinburne University Emotional Intelligence Test (SUEIT; Palmer & Stough, 2001) demonstrates good content validity as the measure's five factors represent good coverage of the EI domain mapping well on to the (1997) Mayer & Salovey model. The SUEIT also demonstrates good focus on the EI domain, and items do not refer to constructs other than EI (See table A2). Moreover, the SUEIT has demonstrated utility by explaining unique variance in a number of published studies predicting outcomes such as life satisfaction (Gannon & Ranzijin, 2005), leadership (Downey, Papageorgiou & Stough, 2006), and critical and detached behaviour (Moss, Ritossa & Nga, 2006). The SUEIT has also been shown to have good internal reliability (Rajendran, Downey & Stough, 2007) and test re-test reliability (Palmer & Stough, 2001). For the current

study cronbach alpha coefficients were as follows: Emotional Recognition & expression (α=.80) and Emotional Control (α=.71).

A pilot study was conducted to establish convergent validity of the SUEIT with other trait EI measures (see **appendix B**). This revealed highly significant intercorrelations between SUEIT total and score totals for TEIQue-SF and Schutte SSRI (r=.57 and r=.64); all SUEIT subscales with Schutte Total (r=.18 to r= .50). All but one SUEIT subscales ('emotions direct cognition') demonstrated highly significant positive correlations with the TEIQue-SF total (r= .39 to r=.60); SUEIT subscales reveal small to significant correlations (r=.14 to r=.55) with the three main Schutte subscales but not with the final Schutte factor Utilisation of Emotion which had small and mostly non significant correlations. In summary the SUEIT displays significant evidence of convergence with other measures of EI.

Past research has suggested that the SUEIT may not be accurately described as a five factor model. For example Gignac (2005) reported that a seven factor solution may be more appropriate than the existing five factor; this research suggested that 'emotional recognition and expression' was better represented by two separate factors – 'emotional recognition in the self' and 'emotional expression', while emotional management was more accurately represented as two factors 'emotional management of self' and 'emotional management of others'. However, the current studies did not have access to the subscale scoring key and therefore could not explore how the factor structure in the current study related to findings of previous research. Subscale scores and internal reliabilities were however provided by the scale providers which revealed that internal reliabilities were of an acceptable level (over .70), and therefore factor structure was not considered problematic.

Personality Measure

The International Personality Item Pool (IPIP; Goldberg, 1999) has been developed as a free measure of personality, has good reliability and validity, e.g. Austin, Dore, and O'Donovan (2008) report cronbach alpha coefficients as follows: *Neuroticism* α=.87, *Extroversion*: α=.89, *Openness*: α=.81, *Agreeableness*: α=.78; *Conscientiousness*: α=.81. In the current study reliability was found to be: *Neuroticism*: α=.86, *Extroversion*: α=.89, *Openness*: α=.79, *Agreeableness*: α=.70; *Conscientiousness*: α=.78. The IPIP correlates well to the NEO-FFI (Gow, Whiteman & Pattie, 2005). It

was developed to provide a public domain measure of personality. It has 50 statements scored on a scale of 1 (Very inaccurate for me) to 5 (Very accurate for me). The scale yields 5 subscale scores: Neuroticism; Extroversion; Agreeableness; Openness; and Conscientiousness. For each subscale the possible scores range from 0 to 50.

Stressor Measure

The Life Events Questionnaire is an inventory of 34 stressful life events which participants have to indicate if they have experienced in the last year, and if so how upsetting they found the event on a scale of 1 (not upsetting at all) to 4 (very upsetting). The questionnaire was derived from Paykel's (1983) interview for recent life events. In analysis only the frequency of life events was used, not the total score, as this cannot be argued to be impacted upon by mood or affective disorder (Roy, Steptoe, & Kirschbaum, 1998). This measure is an inventory and as such does not have reliability or validity information.

Coping Measure

The Brief COPE (Carver, 1997), was derived from the Ways of Coping questionnaire (Carver, Scheier & Wientraub, 1989), a longer measure which was originally based upon both the Lazarus model of stress (1966), and a model of behavioural self regulation (Carver & Scherier, 1981) The Brief Cope is a frequently used measure of coping style, has 28 items, assessed using a four point scale where one is low (I haven't been doing this at all) and four is high (I've been doing this a lot). In line with suggestion by the scale's authors Carver et al., (1989) a factor analysis of the brief cope was performed, finding a three factor solution: *Engaged coping (*α=.82); *Social coping (*α=.88) and *Disengaged coping (*α=.81);. A three factor solution is in line with previous research (e.g. Ng & Leung, 2006). See **Appendix C** for factor analysis. Cronbach alpha coefficients were found to be good; Disengaged Coping (α=.81); Engaged Coping (α=.82); Social Coping (α=.88). The brief cope has acceptable concurrent validity and test re-test reliability (Carver, 1997).

Health Measures

The Health Status Questionnaire (Roy, 1994) provides basic demographic information such as GP visits and participants perceived general health. It aims to provide further evidence of stress correlates. Three items from this measure were of interest in the current study; (1) how would you describe your health generally? (rated on a scale of a-

excellent, to e-very bad); (2) When did you last consult your GP about your own health, other than for a check-up required for work or insurance, or for a vaccination? (rated on a scale of a-in the last week, to g-so long ago I can't remember); (3) If you had a consultation with your GP or with a specialist within the last year, how many consultations did you have? (rated on a scale of a-more than 4 per month, to d-less that 4 per year). General health was reverse scored on all items so that a larger number indicated better health. The possible range of scores were; general health (1-5); last GP visit (1-7); and frequency of GP visits (1-4). Although there is no published data on the reliability and validity of this particular measure, it is common practice in health research to use GP visits as an indication of ill health (E.g. Gortner & Pennebaker, 2003; Graybeal, Sexton, & Pennebaker, 2002), as is assessing general health by asking participants to self report using a single question (E.g. Axelsson & Ejlertsson, 2002; Idler, & Angel, 1990).

Social Support Measure

The Social Support Network Inventory (SSNI; Flaherty, Gaviria & Pathak, 1983) asks participants to consider the five most important people in their lives. They are then asked to rate them on a number of statements using a scale of 1 (not true at all) to 5 (Very true). The scale assesses five subscales (*with internal reliabilities for current study):* Availability of support *(*α=.72); practical help *(*α=.78); reciprocity *(*α=.85); emotional support *(*α=.70); and event related support *(*α=.87). Inventory authors (Flaherty, Gaviria & Pathak, 1983) report cronbach alpha coefficients as follows; Availability (α=.76); practical help (α=.84); reciprocity (α=.81); emotional support (α=.91); and Event related support (α=.85). Test re-test reliability was found to be high (r=.87). Convergent validity with clinicians ratings was acceptable (r= .68, p<.01).

3.2 Results

3.2.1 Missing data

Following data collection, and after as much missing data was recouped from students as possible, missing data routines were run. Only random missingness was recovered in this way. EM missing data routines were used to overcome such missing data in questionnaires at item level, before subscales were calculated. Normal distribution of data was assumed, a maximum of 25 iterations were used, and no nominal data was included in the MDR. Analyses revealed that only a maximum of 3% missingness was

found in the variables therefore and the extent of substitution performed was acceptable. Tabachnick and Fidell (2001) recommend a general guideline of more than 5% missing data as being potentially problematic.

3.2.2 Data screening

Assumptions of multivariate analysis (Tabachnick & Fidell, 2001) were investigated prior to analyses. Before conducting the multiple regressions, basic data screening was completed to test dependent variables for normality and outliers, and to identify multicollinearity. Screening began with checks for errors within the data file, then the missing data routine were applied. Checks for multicollinearity ($r > .8$) revealed no evidence of multicollinearity within variables, except between social support total score and its subscales. As multiple regression is sensitive to singularity (Pallant, 2006), either total scores or subscales scores were used in analyses, but not both at the same time.

Outliers, both univariate and multivariate, were identified using procedures outlined in Tabachnick and Fidell (2001), and it was intended that univariate outliers (extreme scores on one variable only) would be retained while cases with multivariate outliers (those with unusual combinations of scores on more than one variable) would be deleted. Extreme cases were identified using box plots, defined as more than three box-lengths from the edge of the box. No multivariate outliers were found in this way, so assumptions of normality of distribution of the variables were then explored.

In checking for normality of distribution, some variables (Life events stress, EI subscale *Emotional Recognition and Expression,* all three coping subscales, social support subscale *emotional support*, all health measures, plus personality subscales *extroversion* and *agreeableness*) presented evidence of non normal distribution (Kolmogorov-Smirnov values $p<0.05$). However as the 5% trimmed means and inspection of histograms (and skewness and kurtosis values) revealed that the assumptions of univariate normality were not severely violated, this was not considered problematic.

Additionally, positively skewed distributions would be expected in health, stress and coping, as while the majority of participants would be expected to be in good health and experiencing a low level of life event stress, some individuals will be experiencing major health issues or stressors and their scores will affect tests of normality. It would

not be desirable to remove such scores as they provide necessary variance in both independent and dependent variables.

3.2.3 Background characteristics of the population

The characteristics of the sample for study one are shown in Table 3.1

Table 3.1. Characteristics of sample for study one

CHARACTERISTIC		MEANS AND STANDARD DEVIATIONS FOR EACH MEASURE (n=118)	
		Mean	S. D.
Age		20.77	5.89
SUEIT	Emotional Recognition & Expression	35.78	5.81
	Emotional Control	26.14	5.73
Personality	Neuroticism	31.19	7.14
	Extroversion	32.61	7.48
	Openness	32.01	4.80
	Agreeableness	39.44	4.65
	Conscientiousness	32.28	5.91
Coping	Disengaged	19.69	5.51
	Engaged	21.77	4.47
	Social	9.70	3.22
Health	General Health	3.88	.78
	Last GP Visit	3.53	1.61
	Frequency of GP visits	3.57	.74
Social Support	Availability	11.47	1.53
	Practical support	7.91	1.17
	Reciprocity	8.11	1.11
	Emotional support	12.12	1.65
	Event support	7.20	1.50
	TOTAL support	46.66	5.47
Life events stress frequency		6.69	3.49

Mean age of this sample was 20.77 years (standard deviation of 5.89). This is a young sample and some previous research has found trait EI to increase significantly with age, therefore age will be entered as a covariate into analyses.

Normative data

Means and standard deviations for both the current sample and published normative data (using large samples sizes) for the SUEIT are given in Table 3.2. Significant

differences are highlighted, indicating the extent of deviation by current sample from the scores of general population.

Normative data for the CDC health related quality of life questionnaire is not available. However data from the British household survey for England 2008 includes responses to one identical question relating to the participants own perceived health status. This question asks 'How is your health in general? Participants rated their health on a scale of 1- Very Good to 5 Very Bad. Population responses indicate a mean score of 1.83, indicating better perceived health at population level than the student samples in study 1 who report a mean score of 2.12 (this was later reverse scored to 3.88 so that higher scores indicated better health, allowing more intuitive interpretation). It is surprising that this student sample report worse than average health given their young age. However, worse than average health along with the large standard deviation (and thus variance in health scores) indicate that analyses are more likely to find statistically significant relationships where they exist.

Table 3.2. Means and SD for SUEIT in study one sample & from technical manuals

		STUDY ONE SAMPLE AGE = 20.76		SUEIT TECHNICAL MANUAL DATA		GANNON & RANZIJN (2005). SAMPLE AGE = 35.94**	
		Mean	SD	Mean	SD	Mean	SD
SUEIT	Emotional Recognition & Expression	35.78	5.81	**38.51****	4.90	**39.27****	5.87
	Emotional Control	26.14	5.73	**31.66****	3.94	**28.53****	4.96

Difference from study one mean ** Significant at p<.01 level.

One-sample t-tests revealed that SUEIT scores were significantly lower for the current sample than previously technical manual data; for Emotional Recognition & Expression t (166)= 6.08, p<.01; and Emotional Control t (166) = 12.25, p< .01. For comparisons with Gannon and Ranzijn (2005), two tailed one sample t-tests revealed the current study to have significantly lower means for all subscales: Emotional Recognition & Expression t (166) = 7.78, p<.01; and Emotional Control t (166) = 5.24, p< .01.

Past research suggests that EI increases with age (Mayer, Caruso & Salovey, 2000), and therefore this predominantly young sample would be expected to have lower EI scores than previously published data with older samples. The SUEIT technical manual does

not provide means ages of their sample. However, support of this notion comes from Gannon and Ranzijn (2005) who showed higher means for all SUEIT subscales with an older sample.

3.2.4 Intercorrelations between variables

Relationships between Perceived general health, GP visit frequency and GP last visit

Table 3.3 presents intercorrelations between general health (higher scores indicate better perceived health), GP visit frequency (higher scores indicate less frequent visits), and GP last visit (higher scores indicates less recent visits) for study one. Intercorrelations reveal that as perceived general health (participants' ratings of their health) increase, GP visits decrease, frequency of visits to GP decrease, and depression scores decrease. In line with previous research (e.g. Pennebaker & Beall, 1986) this suggests that GP visits do reflect ill health, rather than health seeking behaviour.

Table 3.3. Correlations between Health subscales

		LAST GP VISIT	FREQUENCY OF GP VISITS
Health	Perceived general health	**.29****	**.33****
	Last GP visit	1	.42**
	Frequency of GP visits in past year		**1**

*** Significant at p< .05 level; ** Significant at p<.01 level.**

Relationship between stressors, coping and health

To examine the extent of relationship between frequency of stressors and related coping and health subscales, analyses are presented in Table 3.4.

Table 3.4 Correlations between Stressors and the coping and health subscales

		LIFE EVENTS STRESS
Coping	Disengaged Coping	**.29****
	Engaged Coping	.06
	Social Coping	**.22****
Health	General health	**-.24****
	Last GP visit	**-.25****
	Frequency of GP visits in past year	**-.31****

*** Significant at p< .05 level; ** Significant at p<.01 level.**

As expected, it can be seen that as stressor frequency increases health decreases (GP visits increase, frequency of GP visit increase and perceived general health decrease). Additionally there are significant positive associations between coping subscales (Disengaged, Social) and stress.

Relationship between Trait EI and personality

Table 3.5 presents correlation coefficients for personality (Agreeableness; Extroversion; Conscientiousness; Neuroticism and Openness) and EI variables (Emotional Recognition and Expression and Emotional Control).

Table 3.5. Relationships between trait EI (SUIET) subscales and personality.

	PERSONALITY				
	Neuroticism	Extroversion	Openness	Agreeableness	Conscientious-ness
Emotional Recognition & Expression	-.07	**.44****	.17*	**.34****	.12
Emotional Control	**-.53****	.08	.13	.03	.02

*** Significant at p< .05 level; ** Significant at p<.01 level.**

Two tailed spearman's correlations reveal significant relationships between trait EI and facets of personality, specifically that trait EI subscales ERE and EC are significantly and negatively related to neuroticism and significantly positively related to extroversion, and agreeableness. Consistent with previous data, this suggests that when investigating the predictive power of trait EI, personality subscales need to be considered as control variables to provide evidence of the divergent validity of EI from personality. The correlations reveal no evidence of multicollinearity (where r >.7).

Relationships between trait EI, coping, social support and health

Correlations between EI subscales coping and social support at time one are displayed in table 3.6. These identify that only two health subscales (perceived general health and last GP visit) are correlated with EI subscales and will therefore be included in regressional analyses

Correlations between the potential control variables, EI subscales, and health time two are displayed in Table 3.7. Only control variables which are significantly correlated

with both EI subscales and dependent variables will be included in step one of regressional analyses. Potential control variables were identified as being personality subscales, age and gender. Results reveal that the only control variable for perceived health will be Gender, for GP visit frequency no control variables have been identified, while last GP visit is not correlated with EI subscales and therefore is not explored in regressional analyses.

Table 3.6 Correlations between Trait EI, social support, coping and health

		SOCIAL SUPPORT					COPING			HEALTH		
		Available	Practical	Reciprocity	Emotion	Event	Dis-engaged	Engaged	Social	General-Self reported	Last GP visit	GP visit Freq
SUEIT	Emotional Recognition & Expression	**.38****	**.20***	**.30****	.17	**.35****	**-.36****	.08	**.22****	.02	.05	**.13***
	Emotional Control	.03	.04	.12	**.32****	.08	**-.28****	**.16***	**-.10**	**.27****	.01	**-.09***
Social Support	Availability	1	**.65****	**.64****	**.35****	**.70****	.01	.13	**.35****	-.05	**-.19***	-.11
	Practical Support		1	**.57****	**.29****	**.43****	-.03	-.08	**.19***	.08	-.06	-.09
	Reciprocity			1	**.57****	**.67****	-.15	.02	**.19***	.07	-.09	-.04
	Emotional Support				1	**.37****	-.30**	.03	.06	**.21***	-.01	.04
	Event support					1	-.03	.12	**.38****	-.09	**-.21***	-.08
Coping	Disengaged Coping						1	**.15***	**.22****	**-.20****	-.13	**-.14***
	Engaged Coping							1	**.34****	.00	-.09	-.07
	Social Coping								1	-.12	-.09	-.03

*** Significant at p< .05 level; ** Significant at p<.01 level.**

Table 3.7 Identifying control variables for Path A: correlations between potential control variables, EI subscales and related health variables

	ERE	EC	LIFE EVENTS STRESSORS	PERCEIVED HEALTH 07	LAST GP 07	GP FREQ 07
Neuroticism	-.03	-.02	**.24****	**-.29****	-.13	.-.16
Extroversion	**.38****	-.02	.10	-.00	-.03	-.11
Openness	.12	.09	.01	-.01	-.14	-.15
Agreeableness	**.32****	-.04	.07	-.09	-.09	-.04
Conscientiousness	.12	-.09	-.13	**.17***	.02	.10
Age	-.09	**.18***	-.06	-.13	-.13	-.14
Gender	-.03	**-.22****	**.23****	**-.21****	**-.27****	-.16

*** Significant at p< .05 level; ** Significant at p<.01 level.**

All control variables along with EI subscales, life events stress and health dependent variables are included within table to allow identification of control variables in later moderation analyses (table 3.9).

3.2.5 Analyses of variance and Regressions

Mediation of the EI health relationship

Baron and Kenny (1986) state that a variable is a mediator of a relationship if the following conditions are met: (i) variations in the levels of the independent variable significantly account for variations in the presumed mediator; (ii) variations in the mediator significantly account for variations in the dependent variable; (iii) when paths (i) and (ii) are controlled for a previously significant relationship between independent and dependent variables is no longer significant, or is significantly decreased (Baron & Kenny, 1986).

Therefore, for the current study, if health behaviours or social support mediate the relationship between EI and health, EI will explain variance in health status (Path A); EI will explain variance in mediating variables (Path B); mediating variables will explain variance in health (Path C); significant amounts of variance of health explained by EI will reduce or become non significant when mediating variables are added into regressional analyses on a previous step (Baron & Kenny, 1986).

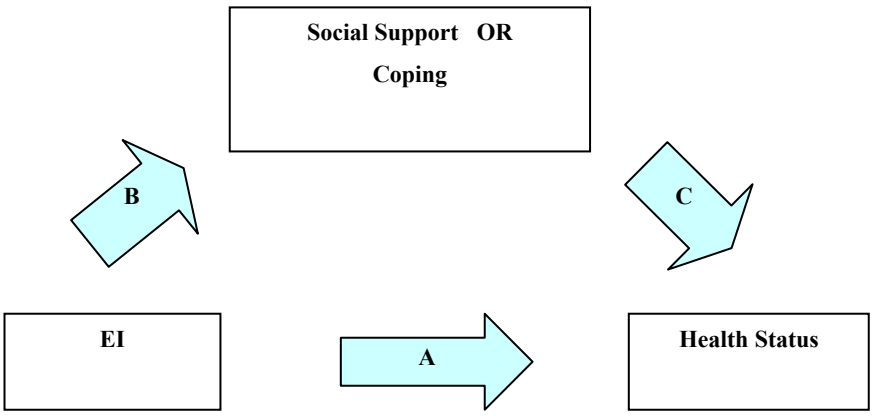

Figure 3.1 Mediation of the relationship between EI and health status

Inferential analyses tested whether the relationship between EI and health was mediated by coping: Regressional analyses examined (path A) where EI explained variance in health, (path B) where EI explained variance in coping and social support, and (path C) where coping and social support explain variance in health.

In analyses an alpha level of .05 was applied. Although it was desirable to reduce this level to .01 or apply the Bonferroni procedure to account for multiple testing, the small sample made such a procedure too conservative potentially resulting in type two errors (Shaffer, 1995). Where regressional analysis was required, hierarchical multiple regressions were used to enter control variables in the first regression step. This method was selected to evaluate each independent variable in terms of its predictive power (over and above that offered by the other IVs), but more importantly because this is appropriate when the order of entry is determined theoretically (Tabachnick & Fidell, 2001), as is the case here with the EI literature suggesting personality be considered as control variables.

Mediation Path A: EI explaining variance in health

Regressions were performed to investigate how EI reduces the harm to health that stressor exposure creates. Hierarchical multiple regressions for the measures of health were conducted with control variables entered in step one, and trait EI subscales entered at step two. These analyses assessed the extent to which trait EI explained unique variance in health. This is the first step in understanding whether either coping or social support mediate the relationship between EI and health.

For each of the three health variables (perceived general health; last GP visit; frequency of GP visits in the past year) collinearity diagnostics revealed no tolerance value less than .10 or VIF value above 10, suggesting no evidence of multicollinearity (Pallant, 2000). Visual inspection of each of the normal probability plots suggests no major deviation from normality, except in the case of perceived general health for which the standardised residual scatterplot had a distinctive pattern, likely to be a result of the rating scale which participants used to rate their health. Results of the two hierarchical multiple regressions are presented in Table 3.8.

Table 3.8. Multiple regression models with EI subscales as predictors of health variables

PREDICTED HEALTH VARIABLES	STEP 1 R^2	STEP 1 CONTROL VARIABLES	ß	STEP 2 R^2 CHANGE	STEP 2 EI SUBSCALES	ß	OVER-ALL F VALUE
Perceived general health	**.05**	Gender	**-.21****	.02	EC	-.13	**5.40****
Freq of GP check ups	.	None	.	.02	ERE EC	.11 -.04	1.21

*** Significant at p< .05 level; ** Significant at p<.01 level.**

Regressional analyses reveal that neither ERE nor EC are significant predictors of health as measured by the current study. There will therefore be no further mediational analyses.

EI as a moderator of the relationship between life event stress and health

Baron and Kenny (1986) state that if a variable is a moderator of a relationship there *may* be significant main effects (although these are not required to evidence to the moderator hypothesis), however, the interaction effect between predictor variables *must* be significant. Therefore, the current study seeks evidence of a significant interaction between exposure to life event stress and emotional intelligence in predicting health.

If either ERE or EC are moderators of the relationship between stress and health, it is expected that: (1) there *may* be a significant main effect for the subscale; however (2) there *must* be a significant interaction effect (so the product of the EI subscale and life events stress must be a significant predictor).

To investigate moderation effects between EI subscales and life events stress, interaction terms (EI subscale x stress) were entered in a third step of the multiple regression predicting health variables. To do this, the independent variables were centred (as advised by Aiken & West, 1991) by calculating raw scores minus mean scores. Then interaction terms were calculated by multiplying centre scored life events stress and centre scored EI subscales.

Results of moderation analyses (presented in Table 3.9) reveal evidence of significant interactions between Trait EI subscales ('emotional recognition and expression', 'and 'emotional control') and life events stress when predicting frequency of GP visits.

Table 3.9 Moderational analysis of the stress health relationship by EI subscales.

PREDICTED HEALTH VARIABLES	STEP 1 R^2 CHANGE	STEP 1 CONTROL VARIABLES	ß	STEP 2 R^2 CHANGE	STEP 2 EI SUBSCALES	ß	STEP3 R^2 CHANGE	STEP 3 INTER-ACTIONS	ß	OVER-ALL F
Perceived general health (*Higher number = better health)*	**.10***	**Neuroticism** Gender	**-.25**** -.314	.04	ERE EC Life events stress	.05 -.11 -.15	**.04***	ERE x Stress **EC x Stress**	-.05 **.19***	**4.59****
Last GP check up.	**.07***	**Gender**	**-.27****	.04	ERE EC Life events stress	.03 .05 -.20**	.00	ERE x Stress EC x Stress	.04 .04	3.43*
Freq of GP check ups	.	None	.	**.12****	ERE EC **Life events stress**	.13 -.03 **-.32****	**.04***	**ERE x Stress** EC x Stress	**.20**** .04	5.79***

*** Significant at p< .05 level; ** Significant at p<.01 level.**

.

3. Interpretation of significant interactions

The significant interactions between EI subscales and stress predicting health are plotted in figures 3.2 and 3.3

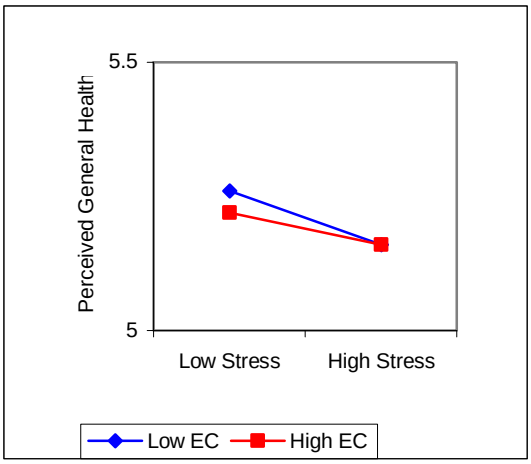

Figure 3.2 Interaction between Stress and *Emotional Control* predicting Perceived General Health

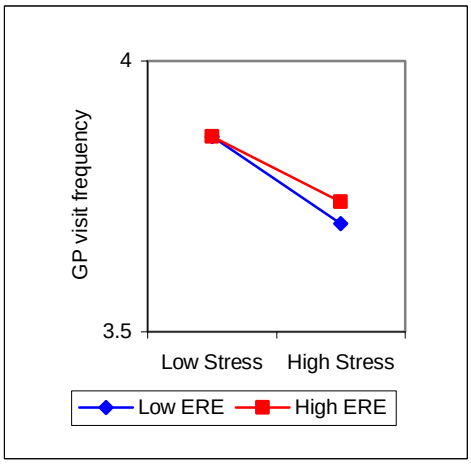

Figure 3.3 Interaction between *Stress and Emotional Recognition & Expression* predicting Frequency of GP Check ups

Figure 3.2 reveals that health is worse when stress is high and EC is low, while figure 3.3 reveals that health is worse when stress is high and ERE is low

3.2.6 Summary of findings for regressional analyses.

Study 1 analyses reveal that neither ERE nor EC explain significant amounts of variance in health. However, both ERE and EC moderate the relationship between stressor exposure and health (GP visit frequency and Perceived general health respectively): in each case inspection of the interactions reveal that health is worse when stress is high and EI is low.

3.3 Discussion

This study investigated the relationship between trait EI, stressor exposure, health, coping and social support. It sought to understand whether the relationship between EI and health was mediated by coping style or social support; and second, whether the relationship between stressor exposure and health was moderated by trait EI. Contrary to predictions, analyses did not reveal either ERE or EC to explain significant amounts of variance in health, a finding contrary to previous meta analytic findings (Martins, Ramalho & Morin, in press). However, moderational analyses found significant interactions between EI and stress were found when predicting health, specifically that under high stress conditions low EI is related to worse health.

That the current study fails to find that either ERE or EC explain significant amounts of variance in health is surprising given previous research for global EI, emotional expression and emotional control. Incongruence of findings with previous research leads to several possible explanations: (1) that there is a relationship between EI and health which is mediated by social support and/or coping, but that these relationships emerge over a longer trajectory than the current study investigated; (2) that there is a relationship between stressors, EI, social support, coping and health but the measures used by the current study do not reveal it; (3) that there is a relationship between EI, health, social support and coping, but characteristics of the current sample prevent this from being revealed; (4) that there is a real relationship between EI and health, however effect sizes are small and the current study did not have sufficient power to reveal them; (5) the null hypothesis- the relationship between EI and health is not mediated by either coping or social support.

First, although there is an assumption that the influence of life events stressor upon health will manifest within a year (Holmes, 1979), studies using longer time intervals have found higher correlations between life events and health (Eaton, 1978, cited Cohen et al, 1997). This may indicate that longer time frames may be more appropriate, especially since stressful life events reported by participants within the last year, will generally have occurred less than a year ago. For this reason, study 3 employs a longitudinal design tracking health 18 months from the time participants report their life event stress.

Second, non-significant results may indicate that the measures used in the current study did not accurately assess the underlying constructs. The current study assessed health using only three items on a health questionnaire, which provides a limited range of variance in the outcome measure problematic (Clark-Carter, 2004). To overcome this issue, longitudinal study 2 uses a more comprehensive measure of health with more questions, including other aspects of health including physical health, sleep and pain.

Third, it is possible that characteristics of this sample mean that a relationship between EI health and coping was not revealed, for example, because this sample was predominantly young and female. For this reason, age and gender will continue to be considered as control variables in future studies. Additionally, it may be that the young sample creates a ceiling effect of good health, and this further emphasises the need to improve the sensitivity of the health measure used in future studies. It is possible that other factors relating to a student sample have also impacted on results (such as social economic status), however due to the large amount of information requested of participants further demographics were not sought to be controlled for.

Fourth, it is possible that the failure of the current study to find ERE or EC as a significant predictor of health is a type II error. However, sample sizes were calculated a-priori for regressional analyses (see appendix D) and based on reported meta-analytic effect sizes for trait EI predicting health (Martins, Ramalho & Morin, in press) the current study should have sufficient power to detect the expected moderate effect size.

Mediational analyses were not conducted because of the lack of significant relationships between EI and health. However, it is interesting to note that both ERE and EC have significant negative correlations with disengaged coping. These correlations lend support to the idea that EI may support health by reducing engagement in unhealthy coping behaviours when coping with stressful events. Unhealthy behaviours could be considered aspects of disengaged coping if purpose is to reduce feelings of anxiety. This notion is consistent with previous research which has found that EI predicts coping (Bastian, Burns & Nettlebeck, 2005), and that coping predicts health (Shen, McCreary & Myers, 2004). Study 2 will investigate this proposal by exploring whether EI is predictive of unhealthy behaviours such as drinking, smoking, and drug taking. If ERE or EC are predictive of unhealthy behaviours then this may provide evidence of a

mechanism between EI and health, even if EI subscales cannot explain variance in health cross sectionally.

Results of the current study also reveal that ERE and EC have significant positive correlations with social support subscales. These correlations lend support to the notion that EI may support health by increasing social support, a resource which in turn assists in coping with stressful events. This is consistent with previous research indicating that EI is predictive of social network size (Austin et al., 2005), that social support is predictive of attenuated stress responses (Rosal, King, Yunsheng, & Reed, 2004), and that social support is related to health (Syme, 1986). Therefore social support will again be investigated in study two, more comprehensive measures of health may help to reveal whether social support does indeed mediate the relationship between EI and health.

In conclusion, the current study does not find trait EI to be a significant predictor of physical health, but does find that trait EI moderates the relationship between stressor exposure and health. However, measures and methods need to be refined to provide support to these findings.

Chapter Four: EI and Health, Mediation by unhealthy behaviours, and moderation by EI of the impact of life stress on Health.

Following from study 1, the current study aims to investigate the relationship between trait EI (ERE and EC) and health. First, it seeks to further investigate findings from study 1 that trait EI subscales could not explain variance in health, this time using a more comprehensive measure of health. Second, if a relationship between trait EI and health is discovered, unhealthy behaviours will be explored as mediators. If ERE or EC are predictive of unhealthy behaviours then this may provide evidence of a mechanism between EI and health, even if trait EI subscales cannot explain variance in health cross sectionally.

Unhealthy behaviour can be considered a facet of coping whose purpose is to reduce feelings of anxiety in an individual exposed to stressors (Moos & Scharfer, 1993; Holahan & Moos, 1987). Engagement in unhealthy behaviour has been found to be preceded and exacerbated by stress, with past research suggesting that the purpose of some unhealthy behaviours may be to reduce feelings of anxiety: For example as stressor exposure increases so does smoking status and intensity (Kouvonen, Kivimaki, Virtanen, Pentti & Vahtera, 2005); alcohol use and misuse (Aseltine & Gore, 2000; Hoffman & Su, 1998); drug abuse (Harrison, Fulkerson & Beebe, 1997; Najavits, 1997) and deliberate self harm (McLaughlin, Miller & Warwick, 1996). Moreover, research evidence has found that higher trait EI is negatively related to smoking initiation (Trinidad, Unger, Chih-Ping, & Johnson, 2005; Trinidad, Unger, Chih-Ping, Azen & Johnson, 2004; Trinidad & Johnson, 2002); and alcohol consumption (Austin, Saklofske & Egan, 2005), while the related construct of alexithymia (narrower in concept than trait EI, characterised by difficulty identifying and describing subjective feelings) is predictive of alcohol consumption (Ioannis & Ioannis, 2005; Haviland, Shaw, Cummings & MacMurray, 1988) substance use (Taylor, Parker & Bagby, 1990; Pinard, Negrete, Annable & Audet, 1996), and taking longer to seek medical care (Kenyon, Ketterer, Gheorghiade & Goldstein, 1991).

Social support will again be investigated as a mediator of the relationship between trait EI and health. Study one reveal a large number of significant positive correlations between trait EI and social support subscales, therefore with an improved health measure analyses may reveal these relationships to be a mechanism by which trait EI can impact positively upon health status.

The current study sought to first, replicate findings from studies 1 that trait EI moderates the relationship between stressor exposure and health, and second to investigate whether the relationship between trait EI and health is mediated by either unhealthy behaviours or social support. Based on previous research, it was predicted that (1) ERE and EC moderates the relationship between exposure to stressors and health; (2) that social support mediates the relationship between ERE and EC and health status; and (3) unhealthy behaviour mediates the relationship between ERE and EC and health.

4.1 Method

4.1.1 Design

The relationships between trait EI subscales ERE and EC, health behaviours and health quality of life, were investigated through correlational and regressional analysis. Personality age and gender were controlled.

4.1.2 Participants and Procedure

Participants were 109 first and second year students at the University of Central Lancashire in the academic year 2007-2008, who had been contacted through verbal requests in lectures and workshops and asked to take part in an emotional intelligence study. Participants were also given an incentive to take part. Participants were given the Swinburne University Emotional Intelligence Test (SUEIT); the International Personality Item Pool (IPIP; Goldberg, 1999); the healthy days Health Related Quality of Life questionnaire (HRQOL; CDC); the health behaviour questionnaire; the health care access questionnaire, the Social Support Network Inventory (SSNI; Flaherty, Gaviria & Pathak, 1983); and the life events questionnaire (Paykel, 1983).

The ages of participants ranged from 18 to 39, (mean age 19.69 years, standard deviation 4.43). As this is a young sample age will be considered as a control variable

4.1.3 Materials

EI Measures

Swinburne University Emotional Intelligence Test (SUEIT; Palmer & Stough, 2001)
The SUIET demonstrates good content validity as the measure's five factors represent good coverage of the EI domain mapping well on to the (1997) Mayer & Salovey model. They also demonstrate good focus on the EI domain, and items do not refer to constructs other than EI; for example in addition to EI the TEIQue includes optimism, while the Schutte assesses social skills. The SUEIT has demonstrated utility by explaining unique variance in a number of published studies predicting outcomes such as life satisfaction (Gannon & Ranzijin, 2005), leadership (Downey, Papageorgiou & Stough, 2006), and critical and detached behaviour (Moss, Ritossa & Nga, 2006). The SUEIT has also been shown to have good internal reliability (Rajendran, Downey & Stough, 2007) and test re-test reliability (Palmer & Stough, 2001). For the current study cronbach alpha coefficients were as follows: Emotional Recognition and expression α=.80; Emotional Control α=.71.

Personality Measure

International Personality Item Pool (IPIP)
The IPIP has been developed as a free measure of personality, has good reliability and validity, and correlates well to the NEO-FFI (Gow, Whiteman & Pattie, 2005). It was developed to provide a public domain measure of personality. It has 50 statements scored on a scale of 1 (Very inaccurate for me) to 5 (Very accurate for me). The scale yields 5 subscale scores: Neuroticism; Extroversion; Agreeableness; Openness; and Conscientiousness. For each subscale the possible scores range from 0 to 50. For participants from cohort one their personality scores from study one were used. For cohort two participants reliability was found to be: *Neuroticism*: α=.85, *Extroversion*: α=.90, *Openness*: α=.68, *Agreeableness*: α=.84; *Conscientiousness*: α=.79. For Openness removal of any item would decrease internal reliability.

Stressor Measure

The Life Events Questionnaire
This is an inventory of 34 stressful life events which participants have to indicate if they have experienced in the last year, and if so how upsetting they found the event on a scale of 1 (not upsetting at all) to 4 (very upsetting). The questionnaire was derived from Paykel's (1983) interview for recent life events. In analysis only the frequency of

life events was used, not the total score, as frequency cannot be argued to be impacted upon by mood or affective disorder (Roy, Steptoe, & Kirschbaum, 1998). This measure is an inventory and as such does not have reliability or validity information.

Social Support Measure

The Social Support Network Inventory (SSNI; Flaherty, Gaviria & Pathak, 1983)
This measure asks participants to consider the five most important people in their lives. They are then asked to rate them on a number of statements using a scale of 1 (not true at all) to 5 (Very true). The scale assesses five subscales: Availability of support; practical help; reciprocity; emotional support and event related support. In the current study reliability was found to be: Availability of support α=.68; practical help α=.75; reciprocity α=.82; emotional support α=.54; event related support α=. 84; and overall total score α=.89. For the subscales with poor internal reliability removing items would not have increased reliability to an acceptable level (of above α=.70).

Health Measures

The Behavioral Risk Factor Surveillance System (BRFSS; Center for Disease Control and Prevention [CDC], 2006).
Questions from this measure were used to assess health impacting behaviours carried out by participants. As an inventory without subscales or total scores this questionnaire does not have reliability or validity information. Responses to each question are treated as a separate measure.

Smoking information is measured with three questions: 'have you smoked at least 100 cigarettes in your entire life?' (a= yes, b=no); 'do you now smoke cigarettes everyday, some days or not at all?' (a= everyday, b= some days, c= not at all); 'during the past 12 months have you stopped smoking for one day or longer because you were trying to quite smoking?' (a= yes, b= no);

Alcohol intake is assessed with four questions: 'during the past 30 days on approximately how many days did you have at least one alcoholic drink'; 'on the days you drank about how many units did you drink?' (units are explained and examples given); 'How many times during the past 30 days did you have 5 units or more on one occasion?'; 'During the past 30 days, what is the largest number of units of alcohol you had on any occasion?'.

Drug taking is assessed with two questions: 'have you taken non prescribed drugs or used substances in your entire life?' (a=yes, b=no); 'During the past 30 days on approximately how many days have you taken non prescribed drugs or used substances?'.

Health Related Quality of Life questionnaire (HRQOL; CDC);
The HRQOL asks about how many of the past 30 days the participant has experienced several health related problem, including the following: had *poor physical health*; had been prevented from normal activities by poor physical health; found it hard to complete normal activities due to *Pain*; not had enough rest or sleep; been very health and full of life. The questionnaire also asks about the participants perceived general health (from a=excellent, to e= poor). As an inventory without subscales or total scores this questionnaire does not have reliability or validity information. Responses to each question are treated as a separate outcome measure.

4.2 Results

4.2.1 Missing data

After data collection as much missing data was recovered as possible. Then missing data routines were run to recover random missingness. EM missing data routines were used to overcome such missing data in questionnaires at item level, before subscales were calculated. Normal distribution of data was assumed, a maximum of 25 iterations were used, and no nominal data was included in the MDR. Analyses revealed that only a maximum of 1.6% missingness was found in the variables therefore and the extent of substitution performed was acceptable. Tabachnick and Fidell (2001) recommend a general guideline of more than 5% missing data as being potentially problematic.

4.2.2 Data screening

Assumptions of multivariate analysis (Tabachnick & Fidell, 2001) were investigated prior to analyses. Before conducting the multiple regression, basic data screening was completed to test dependent variables for normality and outliers, and to identify multicollinearity. Screening began with checks for errors within the data file, then the missing data routine were applied. Checks for multicollinearity ($r > .8$) revealed no evidence of multicollinearity within variables. As multiple regression is sensitive to

singularity (Pallant, 2006), either total scores or subscales scores were used in analyses, but not both at the same time.

Outliers, both univariate and multivariate, were identified using procedures outlined in Tabachnick and Fidell (2001), and it was intended that univariate outliers (extreme scores on one variable only) would be retained while cases with multivariate outliers (those with unusual combinations of scores on more than one variable) would be deleted. Extreme cases were identified as extreme outliers using box plots, defined as more than three box-lengths from the edge of the box. As with study one, no multivariate outliers were found in this way, so assumptions of normality of distribution of the variables were then explored.

In checking for normality of distribution, some variables (Stressful life events, *Emotional control*, all health and depression measures, all social support variables, plus personality subscales *neuroticism, extroversion, openness*, and *agreeableness*) presented evidence of non normal distribution (Kolmogorov-Smirnov values $p<.05$). However as the 5% trimmed means and inspection of histograms (and skewness and kurtosis values) revealed that the assumptions of univariate normality were not severely violated, this was not considered problematic. Additionally positively skewed distributions would be expected in health, stress and coping, as while the majority of participants would be expected to be in good health and experiencing a low level of life event stress, some individuals will be experiencing major health issues or stressors and their scores will effect tests of normality. It would not be desirable to remove such scores as they provide necessary variance in both independent and dependent variables.

Table 4.1 Characteristics of sample

CHARACTERISTIC		MEANS AND STANDARD DEVIATIONS FOR EACH MEASURE (n=109)	
		Mean	S. D.
Age		19.83	4.16
SUEIT	Emotional Recognition & Expression	36.77	5.96
	Emotional Control	26.08	4.46
Personality	Neuroticism	31.22	6.43
	Extroversion	32.66	7.50
	Openness	32.06	4.57
	Agreeableness	40.20	4.77
	Conscientiousness	33.18	6.02
Health behaviours	Smoked 100 cigarettes in life (1-yes, 2- no)	1.33	.79
	Tried to stop in past 12 months (1-yes, 2- no)	1.86	.35
	No of days of past 30 had alcohol	7.85	5.95
	Average units per drinking day	6.98	6.80
	No of days of past 30 had over 5 units	3.79	4.76
	Highest no of units in one session	8.32	6.69
	Ever taken drugs or used substances (1-yes, 2- no)	1.67	.47
	No of days of past 30 taken drugs	.50	2.52
Health	Perceived general health (*Higher number = worse health)*	2.78	1.00
	Days physical health poor in past 30	3.96	6.39
	Days poor health stopped usual activities	2.65	5.07
	Days in pain of past 30	1.65	4.41
	Days healthy in past 30	11.72	9.37
	Last GP check up. (Higher number = better health)	2.57	1.30
	Frequency of GP check ups (Higher number = better health)	4.63	.59
	Times to a & e in past year	.27	.71
	Time since last dental visit	1.43	.86
Social Support	Availability	12.01	1.55
	Practical support	8.02	1.36
	Reciprocity	8.22	1.26
	Emotional support	12.17	1.59
	Event support	7.38	1.75
	TOTAL support	47.97	5.79
Life events stress frequency		5.46	3.49

4.2.3 Background characteristics of the population

Characteristics of the sample are presented in table 4.1.

Normative Data

Means and standard deviations for both the current sample and published normative data (using large samples sizes) for the SUEIT are given in table 4.2. Significant differences are highlighted, indicating the extent of deviation by current sample from the scores of general population.

Normative data for the CDC health related quality of life questionnaire is not available. However data from the British household survey for England 2008 includes responses to one identical question relating to the participants own perceived health status. This question asks 'How is your health in general? Participants rated their health on a scale of 1- Very Good to 5 Very Bad and responses indicate a mean score of 1.83, indicating better perceived health at population level than the student samples in study 2 who report a mean score of 2.78 (this was later reverse scored to 3.22 so that higher scores indicated better health, allowing more intuitive interpretation). It is unexpected that this student sample report worse than average health given their young age, although findings are consistent with study 1. However, worse than average health along with the large standard deviation (and thus variance in health scores) indicate that analyses are more likely to find statistically significant relationships where they exist.

Table 4.2. Means and SD for SUEIT in study two sample & from technical manuals

		STUDY THREE		SUEIT TECHNICAL MANUAL DATA		GANNON & RANZIJN (2005).	
		Mean	SD	Mean	SD	Mean	SD
SUEIT	ERE	36.77	5.96	**38.51****	4.90	**39.27****	5.87
	EC	26.08	4.46	**31.66****	3.94	**28.53****	4.96

Difference from study one mean ** Significant at p<.01 level.

One-sample t-tests revealed that for Study two SUEIT scores were all significantly lower than previously reported results and technical manual data.

For technical manual comparisons, two tailed one sample t-test revealed the cohort of the current study to have significantly lower means for both subscales: Emotional Recognition & Expression $t(108) = 3.05$, $p<.01$; Emotional Control $t(108) = 13.05$, $p<.01$. For comparisons with Gannon and Ranzijn (2005), two tailed one sample t-tests

revealed the current study to have significantly lower means for both subscales: Emotional Recognition & Expression t (108)= 4.38, p<.01, and Emotional Control t (108) = 5.73, p< .01. Past research suggests that EI increases with age (Mayer, Caruso & Salovey, 2000), and therefore this predominantly young sample would be expected to have lower EI scores than previously published data with older samples. The SUEIT technical manual does not provide means ages of their sample, however, in support of this notion Gannon and Ranzijn (2005) showed higher means for all SUEIT subscales with an older sample.

4.2.4 Intercorrelations between variables

Relationship between Trait EI and personality

Table 4.3 presents correlation coefficients for personality (Agreeableness; Extroversion; Conscientiousness; Neuroticism and Openness) and EI variables (Emotional Recognition and Expression; Understanding the Emotions of Others; Emotions Direct Cognition; Emotional Management; Emotional Control; Total EI).

Table 4.3. Relationships between trait EI (SUIET) subscales and personality.

	PERSONALITY				
	Neuroticism	Extroversion	Openness	Agreeableness	Conscientiousness
ERE	.01	**.21***	**.28****	**.50****	.13
EC	**-.47****	.01	.13	.09	.08

*** Significant at p< .05 level; ** Significant at p<.01 level.**

Two tailed Spearman's correlations revealed significant positive correlations between ERE and personality subscales Extroversion, Openness and Agreeableness; and between EC and Neuroticism.

Relationship between EI and health variables

Two tailed Pearson's correlations (see Table 4.4) were conducted to identify significant relationships between EI subscales and health variables. Correlations revealed that EC was significantly related to health; positively with perceived general health and negatively with days healthy. ERE was not significantly correlated with health, therefore only EC was explored in regressional analyses as a predictor of health, and only perceived general health and days health explored as dependent variables. For potential mediational analyses correlations between EI, social support and unhealthy

behaviours are displayed in table 4.5. These reveal only one significant relationship between EI and unhealthy behaviours; EC is significantly and negatively correlated with days taken drugs.

To establish which control variables should be included in regressional analyses correlations between potential control variables, health and EC are displayed in table 4.6. Only control variables which correlate significantly with both EC and the dependent variable will be included in regressional analyses. Correlations between control variables health and EC are displayed for later moderation analyses.

Table 4.4 Correlations between Trait EI, unhealthy behaviours & health related quality of life

		HEALTH RELATED QUALITY OF LIFE								
		Perceived general health	Days physical health poor in in past 30	Days poor health stopped usual life	Days in pain of past 30	Days healthy in past 30	Last GP check up.	Frequency of GP check ups for illness injury or other condition	Times to a & e in past year	Time since last dental visit
SUEIT	ERE	.04	-.50	.00	-.05	-.02	.13	.04	.02	-.18
	EC	**.26****	-.09	-.15	-.18	**.31****	-.01	.18	.00	.02

*** Significant at p< .05 level; ** Significant at p<.01 level.**

Table 4.5 Correlations between Trait EI, unhealthy behaviours & social support.

		UNHEALTHY BEHAVIOURS									SOCIAL SUPPORT					
		Smoked 100 cigarettes in life	Smoking habit now	Tried to stop in past 12 months	No of days of past 30 had alcohol	Average units per drinking day	No of days of past 30 had over 5 units	Highest no of units in one session	Ever taken drugs or used sub-stances	No of days of past 30 taken drugs	Availability	Practical Support	Reciprocity	Emotional Support	Event support	Mean support
SUEIT	ERE	.15	-.00	-.02	.02	.11	.08	.06	-.05	-.16	**.31****	.06	**.33****	**.25****	**.30****	**.31****
	EC	-.00	.01	-.03	.01	-.05	.11	.04	-.02	**-.19***	-.06	-.18	.06	.04	-.04	-.08

*** Significant at p< .05 level; ** Significant at p<.01 level.**

Table 4.6 Identifying control variables for Path A: correlations between potential control variables, EI subscales & related health variables

	ERE	EC	LIFE EVENTS 07	**PERCEIVED HEALTH 08**	DAYS PHYSICAL HEALTH POOR	DAYS NOT ACTIVE 08	DAYS IN PAIN OF PAST 30	DAYS WITH POOR SLEEP	**DAYS HEALTHY IN PAST 30**	LAST GP CHECK UP.	GP VISIT FREQ.	TIMES TO A & E IN PAST YEAR	TIME SINCE LAST DENTAL VISIT
Neuroticism	-.02	**-.48****	.15	**-.30**	.17	**.36****	.16	**.22***	**-.45****	.07	**-.31****	.09	**-.19***
Extroversion	**.25***	-.01	.12	**.07**	-.03	-.08	-.09	-.01	**.23***	.03	.09	-.02	-.05
Openness	**.26****	.17	.09	**-.03**	-.01	.15	.05	**.22***	**-.01**	**.26****	-.07	.15	-.04
Agreeableness	**.52****	.04	.00	**-.06**	.11	.03	.07	.06	**-.08**	.15	.18	.00	-.13
Conscientiousness	.12	.02	-.07	**.02**	**-.20***	.02	-.12	-.04	**-.06**	.11	.11	.08	-.19
Age	**.21***	.08	.11	**.03**	-.10	-.02	.00	.01	**.03**	.07	-.15	.01	.03
Gender	.13	**-.32****	-.08	**-.31****	.13	.11	.07	.09	**-.41****	.06	.09	**-.30****	-.13

*** Significant at p< .05 level; ** Significant at p<.01 level.**

NB. Only the two health variables in bold are significantly correlated with the EI subscales, therefore only these are considered in regressional analyses. The additional variables are included to inform selection of control variables included in later moderation analyses.

Correlational analyses of potential control variables (Table 4.6) reveal which control variables are significantly correlated with both EC and health variables: In regressional analyses for perceived general health, gender will be controlled, while for days healthy neuroticism and gender will be controlled.

4.2.5 Regressional Analyses

Mediation of the EI health relationship

If health behaviours or social support mediate the relationship between EI and health; EI will explain variance in health status (Path A); EI will explain variance in mediating variables (Path B); mediating variables will explain variance in health (Path C); significant amounts of variance of health explained by EI will reduce or become non significant when mediating variables are added into regressional analyses on a previous step (Baron & Kenny, 1986).

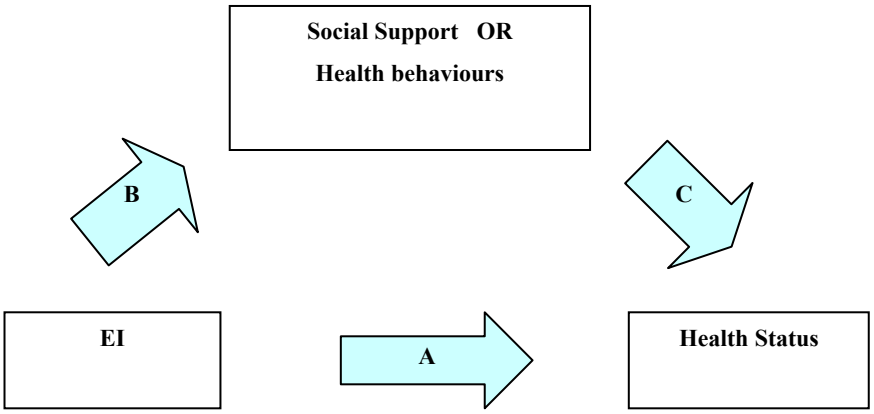

Figure 4.1 Mediation of the relationship between EI and health status

Mediation Path A: EI explaining variance in health

The first step in investigating mediation of the EI health relationship is to reveal which health variables emotional intelligence can explain significant amounts of unique variance in. Hierarchical multiple regressions for the four measures of health were conducted with control variables entered in step one, and trait EI subscales entered at step two. Results are presented in table 4.7.

Table 4.7 PATH A: Multiple regression models with EI subscales as predictors of health related QOL variables

PREDICTED HEALTH VARIABLES	STEP 1 R^2	STEP 1 CONTROL VARIABLES	ß	STEP 2 R^2 CHANGE	STEP 2 EI SUBSCALES	ß	OVER-ALL F VALUE
Perceived general health 08	**.10***	**Gender**	**-.31****	.30	Emotional control	.18	7.13**
Days Healthy 08	**.12****	Neuroticism Gender	-.34 .16	.00	Emotional control	.07	4.15**

*** Significant at p< .05 level; ** Significant at p<.01 level.**

Results of the regressional analysis in table 4.7 reveal that emotional control is not a significant predictor of health as measured by perceived general health or Days healthy. R^2 change was not significant for any of the regressions and therefore no further mediation analyses was conducted.

Moderation by EI of the stress health relationship.

EI was investigated as a moderator of life event stress by applying guidance of Baron and Kenny (1986) which states that if EI is a moderator of the relationship between stress and health, there should be (1) significant main effects but these are not required to evidence to the moderator hypothesis; and (2) there must be a significant interaction effect.

To investigate moderation effects between EI subscales and life events stress, interaction terms will be entered in a third step of the multiple regression predicting health variables. Moderated multiple regression is considered the appropriate analysis for detecting the effects of moderator variables (Cohen & Cohen, 1983) and was therefore selected a priori to data being collected. Before moderated multiple regressions were carried out the independent variables were centred (as advised by Aiken & West, 1991) by calculating raw scores minus mean scores. Then interaction terms were calculated by multiplying centre scored life events stress and centre scored EI subscales.

In regressional analysis control variables are included where they demonstrate significant correlation with the dependent variable, plus Emotional control, Emotional

recognition and expression, or stressful life events. These correlations are displayed in table 4.6.

Results of regressional analyses are displayed in table 4.8. These regressions reveal no significant interactions (where R^2 for the step was significant) between EI and life events stress. Therefore, the current study finds that EI does not moderate the cross sectional relationship between Life events stress and health.

Summary of findings.

Analyses reveal that trait EI subscales do not explain unique variance in health for the current sample. Therefore, no further mediational analyses were conducted. Moderation analyses also revealed no significant interactions between EI subscales and life events stress when predicting health. Therefore, the current study concludes that neither emotional control nor emotional recognition and expression are significant moderators of the relationship between Stressor exposure and physical health.

Table 4.8 Moderational analysis for Study 2 health variables.

PREDICTED HEALTH VARIABLES	STEP 1 R^2 CHANGE	STEP 1 CONTROL VARIABLES	ß	STEP 2 R^2 CHANGE	STEP 2 EI SUBSCALES	ß	STEP3 R^2 CHANGE	STEP 3 INTER-ACTIONS	ß	OVER-ALL F
Perceived general health (*Higher number = better health)*	.01	Gender	.09	.14**	ERE EC LE Stress	.69 .06 .00	.03	ERE x Stress EC x Stress	.19 .01	3.03*
Days physical health poor in in past 30	-	None	-	.01	ERE EC LE Stress	-.05 -.04 .09	.03	ERE x Stress EC x Stress	.01 .16	.75
Days poor health stopped usual activities	-	None	-	**.09***	ERE **EC** LE Stress	-.08 **-.22*** .16	.03	ERE x Stress EC x Stress	-.19 .03	2.55*
Days in pain of past 30	-	None	-	.03	ERE EC LE Stress	-.05 -.07 .13	.04	ERE x Stress EC x Stress	.20 .07	.61
Days with poor sleep	**.10**	**Neuroticism** **Openness**	**.24*** **.23***	.02	ERE EC LE Stress	-.09 -.05 .07	.00	ERE x Stress EC x Stress	.05 .01	1.90
Days healthy in past 30	**.34**	**Neuroticism** **Extroversion** **Gender**	**-.36**** **.18*** **-.33****	.03	ERE EC LE Stress	-.04 .09 -.16	.04	ERE x Stress EC x Stress	.21* .01	7.53
Last GP check up.	**.07****	**Openness**	**.26****	.06	ERE EC LE Stress	.02 -.05 -.23*	.02	ERE x Stress EC x Stress	-.07 .11	2.72*
Freq of GP check ups for illness injury or other condition	**.10***	**Neuroticism**	**-.31****	**.08***	ERE EC **LE Stress**	.09 04 **-.28****	.05	ERE x Stress EC x Stress	.24* .03	4.17**
Times to a & e in past year	.09	Gender	-.30	.02	ERE EC LE Stress	.05 -.12 .06	.00	ERE x Stress EC x Stress	.04 .00	2.00
Time since last dental visit	.04	Neuroticism	-.19	.02	ERE EC LE Stress	-.13 -.02 .02	.02	ERE x Stress EC x Stress	-.14 .11	1.41

*** Significant at p< .05 level; ** Significant at p<.01 level.**

4.3 Discussion

Regressional analyses revealed that trait EI subscales did not explain unique variance in health for the current sample. Therefore, no further mediation analyses were conducted. The finding that neither ERE nor EC could explain significant unique variance in health measures replicates findings from study one. These findings could indicate that the relationship between EI and health is not visible cross sectionally but is seen longitudinally. This notion fits with previous research suggesting that the impact of stressor exposure on health may take months or years to manifest (Eaton, 1978, cited Cohen et al, 1997). Study 1 reported significant correlations between trait EI and both social support and coping, and also reported significant correlations between social support and health. In combination, results could indicate that at onset of a stressor, EI may impact upon social support or coping, but that the benefits for health may not be seen for several months. This implies that when investigating the relationship between EI, coping, and health, longitudinal exploration of the relationship between EI and health may be more revealing than cross sectional investigation. Furthermore, although there is an assumption that the influence of life events stressor upon health will manifest within a year (Holmes, 1979), studies using longer time intervals have found higher levels of correlation between life events and health (Eaton, 1978, cited Cohen et al, 1997). This may indicate that longer time frames may be more appropriate, especially since stressful life events reported by participants within the last year, will generally have occurred less than a year ago. For this reason, study three employs a longitudinal design tracking health 15 months from the time participants report their life event stress.

Contrary to previous research, of the nine unhealthy behaviours investigated, the current study found only one significant relationship between EI and unhealthy behaviours, specifically ‘days taken drugs’. This finding is unexpected as a recent systematic review of EI and addiction (Kun & Demetrovics, 2010) concluded that low EI was associated with more intensive smoking, alcohol use and illicit drug use, moreover reporting that subscales relating to ‘emotion regulation’ and ‘decoding and differentiating emotions’ were the most important predictors; subscales which mirror the EI subscales used in the current study. Such incongruence suggests that the results of the current study are due to the EI measures used; low statistical power is deemed unlikely given that a-priori

sample size calculations (Appendix D) base on effect sizes reported in meta analyses indicate that sufficient sample sizes were obtained.

Also contrary to study 1, findings from study 2 reveal that EI subscales do not significantly moderate the relationship between exposure to life event stressors and health status. These interactions will be further investigated, using a longitudinal design in study 3.

Chapter Five: The Longitudinal Relationship Between Trait Emotional Intelligence and Physical Health.

The aim of study 3 was to extend studies 1 and 2 by investigating the longitudinal relationship between Emotional intelligence (EI) and health, asking if ERE or EC moderated the relationship between stressful life events and health, and whether the relationship between these EI subscales and health was mediated by coping or social support.

While studies 1 and 2 found that ERE and EC moderate the relationship between stressor exposure and health, they provided no evidence that EI subscales can explain variance in health scores cross-sectionally. Previous research suggests that the impact of stressor exposure on health may take months or years to manifest (Eaton, 1978, cited Cohen et al, 1997). Therefore if, as moderation results suggest, EI does protect health from the effects of stress, main effects between trait EI and health may not be visible cross sectionally. Interestingly, study 1 also reported significant correlations between social support and health suggesting that at onset of a stressor, EI may impact upon social support or coping, but that the benefits for health may not be seen for several months. This implies that when investigating the relationship between EI, coping, and health, longitudinal exploration of the relationship between EI and health may be more revealing than cross sectional investigation.

The benefits of mediating variables may not be visible cross sectionally if the negative impact of stress on health takes a longitudinal time course. Indeed, research investigating the effects of coping on health has found that passive coping predicts ill health symptomology in AIDs patients longitudinally but not cross sectionally (Stein & Rotheram-Borus, 2004). The current study will investigate the proposition that ERE or EC are associated with better health longitudinally, and that this relationship is mediated by coping styles and social support. Previous research reports that EI is predictive of social support and coping styles; further, both coping styles and social support may buffer individuals from the impact of stressful life events. It is, therefore, reasonable to propose that following stressful life events, those with higher EI will be found to have

better health longitudinally, while those with lower EI will have worse health when the effects of stressor exposure manifest.

The current study investigates the ability of Trait EI subscales ERE and EC to predict health longitudinally over 12 and 15 months. Based on previous research, it was predicted that (1) ERE and EC would explain unique variance in health over personality; (2) That social support would mediate the longitudinal relationship between EI subscales and health status; (3) that coping responses would mediate the longitudinal relationship between EI subscales and health; and (4) that Trait EI subscales would moderate the longitudinal relationship between exposure to stressors and health.

5.1. Method

5.1.1 Design

The relationships between Trait EI subscales ERE and EC, health behaviours and health quality of life were investigated longitudinally through correlational and regressional analysis. Hierarchical regressions were used to test whether Trait EI could predict health at time two (T2) or three (T3), controlling for health at time one (T1). In all regressions, personality was measured and assessed for inclusion as a control variable as is the best practice when investigating trait EI; this is required if ERE and EC are to provide evidence of incremental validity as previous studies have found that trait EI shares variance with personality (O'Connor & Little, 2003; Davies, Stankov & Roberts, 1998; Dawda & Hart, 2000). Age and gender were also controlled as the sample was predominantly female and under the age of 21.

5.1.2 Participants and Procedure

At time one (T1) 169 participants were recruited. A year later at time two (T2) these participants were contacted, 83 of whom participated. A further three months later at time three (T3) all time one participants were contacted again, 45 of whom participated.

Participants were students at the University of Central Lancashire who were contacted through verbal requests in lectures and workshops and asked to take part in a 15-month longitudinal study looking at the relationship between emotional intelligence and health.

In April 07, participants were recruited and were followed up in April 2008 and July 2008.

These participants completed a number of questionnaires. In April 2007 they were given the Swinburne University Emotional Intelligence Test (SUEIT); the brief cope questionnaire, the life events questionnaire, the Social Support Network Inventory (SSNI; Flaherty, Gaviria & Pathak, 1983), and the International Personality Item Pool (IPIP; Goldberg, 1999). In July 2008, participants were given the healthy days Health Related Quality of Life questionnaire (HRQOL; CDC); the health behaviour questionnaire; the health care access questionnaire, the life events questionnaire (Paykel, 1983); and the social support network inventory (SSNI; Flaherty, Gaviria & Pathak, 1983). 169 participants were recruited, 83 of whom completed longitudinal follow up at either time two or three (or both). Of the 83 participants, 70 completed follow up at T2 (12 months later), and 45 completed follow up at T3 (15 months later). Some of the participants who completed time three had not completed time two measures.

Table 5.1 Cross time comparison for ERE and EC

		TIME 1 (N=165)		**TIME 2 (N=83)**		T2 DIFF FROM T1 T-TEST	**TIME 3 (N=45)**		T3 DIFF FROM T1 T-TEST
		Mean	S.D.	Mean	S.D.		Mean	S.D.	
SUEIT (Trait EI)	Emotional Recognition & Expression	35.78	5.81	37.37	5.45	**2.45***	38.11	5.54	1.57
	Emotional Control	26.14	5.73	27.62	5.71	.08	28.98	6.15	.76

Difference from norm data ** Significant at p<.01 level.

The loss of participants from T1 to T2 was 59%, and from T1 to T3 was 74%. Inspection of the sample across time points (table 5. 1) reveals that of the trait EI scores in the smaller samples at T2 and T3, only the T2 ERE score is significantly different to T1. This suggests that the retained longitudinal sample is not substantially different on EI scores to the full T1 cohort.

5.1.3 Materials

EI Measures

Swinburne University Emotional Intelligence Test (SUEIT; Palmer & Stough, 2001)
The SUIET demonstrates good content validity as the measure's five factors represent good coverage of the EI domain mapping well on to the (1997) Mayer and Salovey model. The SUEIT has demonstrated utility by explaining unique variance in a number of published studies predicting outcomes such as life satisfaction (Gannon & Ranzijin, 2005), leadership (Downey, Papageorgiou & Stough, 2006), and critical and detached behaviour (Moss, Ritossa & Nga, 2006). The SUEIT has also been shown to have good internal reliability (Rajendran, Downey & Stough, 2007) and test re-test reliability (Palmer & Stough, 2001). For the current study cronbach alpha coefficients were as follows: Emotional Recognition and expression (α=.80) and Emotional Control (α=.71).

Personality Measure

International Personality Item Pool (IPIP)
The IPIP has been developed as a free measure of personality, has good reliability and validity, and correlates well to the NEO-FFI (Gow, Whiteman & Pattie, 2005). It was developed to provide a public domain measure of personality. It has 50 statements scored on a scale of 1 (Very inaccurate for me) to 5 (Very accurate for me). The scale yields 5 subscale scores: Neuroticism; Extroversion; Agreeableness; Openness; and Conscientiousness. For each subscale the possible scores range from 0 to 50. For participants from cohort one their personality scores from study one were used. For cohort two participants reliability was found to be: *Neuroticism*: α=.85, *Extroversion*: α=.90, *Openness*: α=.68, *Agreeableness*: α=.84; *Conscientiousness*: α=.79. For Openness removal of any item would decrease internal reliability.

Stressor Measure

The Life Events Questionnaire
This is an inventory of 34 stressful life events which participants have to indicate if they have experienced in the last year, and if so how upsetting they found the event on a scale of 1 (not upsetting at all) to 4 (very upsetting). The questionnaire was derived from Paykel's (1983) interview for recent life events. In analysis only the frequency of life events was used, not the total score, as this cannot be argued to be impacted upon by

mood or affective disorder (Roy, Steptoe, & Kirschbaum, 1998). This measure is an inventory and as such does not have reliability or validity information.

Social Support Measure

The Social Support Network Inventory (SSNI; Flaherty, Gaviria & Pathak, 1983)
This measure asks participants to consider the five most important people in their lives. They are then asked to rate them on a number of statements using a scale of 1 (not true at all) to 5 (Very true). The scale assesses five subscales: (1) availability of support; (2) practical help; (3) reciprocity; (4) emotional support; and (5) event related support. In the current study reliability was good: availability of support α=.68; practical help α=.75; reciprocity α=.82; emotional support α=.54; event related support α=. 84; and overall total score α=.89. For the subscales with poor internal reliability removing items would not have increased reliability to an acceptable level (of above α=.70).

Health Measures

Health Related Quality of Life questionnaire (HRQOL; Centre for Disease Control);
The HRQOL asks about how many of the past 30 days the participant has: had poor physical health; been prevented from normal activities by poor physical health; found it hard to complete normal activities due to Pain; not had enough rest or sleep; been very healthy and full of life. The questionnaire also asks about the participants perceived general health (from a=excellent, to e= poor). As an inventory without subscales or total scores this questionnaire does not have reliability or validity information. Responses to each question are treated as a separate outcome measure.

5.2 Results

5.2.1 Missing data

Following data collection, and after as much missing data was recouped from students as possible, missing data routines were run. Only random missingness was recovered in this way. EM missing data routines were used to overcome such missing data in questionnaires at item level, before subscales were calculated. Normal distribution of data was assumed, a maximum of 25 iterations were used, and no nominal data was included in the MDR. Analyses revealed that only a maximum of 1.6% missingness was found in the variables therefore and the extent of substitution performed was

acceptable. Tabachnick and Fidell (2001) recommend a general guideline of more than 5% missing data as being potentially problematic.

5.2.2 Data screening

Assumptions of multivariate analysis (Tabachnick & Fidell, 2001) were investigated prior to analyses. Before conducting the multiple regression, basic data screening was completed to test dependent variables for normality and outliers, and to identify multicollinearity. Screening began with checks for errors within the data file, then the missing data routine were applied. Checks for multicollinearity ($r > .8$) revealed no evidence of multicollinearity within variables. Outliers, both univariate and multivariate, were identified using procedures outlined in Tabachnick and Fidell (2001), and it was intended that univariate outliers (extreme scores on one variable only) would be retained while cases with multivariate outliers (those with unusual combinations of scores on more than one variable) would be deleted. Extreme cases were identified as extreme outliers using box plots, defined as more than three box-lengths from the edge of the box. As with study one, no multivariate outliers were found in this way, so assumptions of normality of distribution of the variables were then explored.

In checking for normality of distribution, some variables (Stressful life events, *Emotional control*, all health and depression measures, all social support variables, plus personality subscales *neuroticism, extroversion, openness*, and *agreeableness*) presented evidence of non normal distribution (Kolmogorov-Smirnov values $p<0.05$). However as the 5% trimmed means and inspection of histograms (and skewness and kurtosis values) revealed that the assumptions of univariate normality were not severely violated, this was not considered problematic. Additionally, positively skewed distributions would be expected in health, stress and coping, as while the majority of participants would be expected to be in good health and experiencing a low level of life event stress, some individuals will be experiencing major health issues or stressors and their scores will affect tests of normality. It would not be desirable to remove such scores as they provide necessary variance in both independent and dependent variables.

5.2.3 Background characteristics of the final sample

The means and standard deviations for the cohort are given in tables 5.2 and 5.3. These data include T2 and T3.

Table 5.2 Characteristics of cohort

CHARACTERISTIC		MEANS & STANDARD DEVIATIONS		
		Mean	S. D.	n
Age		19.52	4.41	169
SUEIT	Emotional Recognition & Expression	37.08	5.38	169
	Emotional Control	25.53	4.87	169
Personality	Neuroticism	31.15	6.76	169
	Extroversion	33.43	6.72	169
	Openness	32.11	4.49	169
	Agreeableness	39.68	4.26	169
	Conscientiousness	33.47	5.62	169
Health T1	General Health	3.88	.78	169
	Last GP Visit	3.53	1.61	169
	Frequency of GP visits	3.57	.74	169
Coping	Disengaged	18.98	4.81	169
	Engaged	21.65	4.68	169
	Social	9.88	3.57	169
Social Support	Availability	11.52	1.53	169
	Practical support	7.95	1.09	169
	Reciprocity	8.23	1.07	169
	Emotional support	12.19	1.69	169
	Event support	7.22	1.62	169
	TOTAL support	46.95	5.33	169
Life events stress frequency T1		6.17	3.26	169

Table 5.3 [Continued] Characteristics of cohort

CHARACTERISTIC		MEANS & STANDARD DEVIATIONS		
		Mean	S. D.	n
Health time two (T2)	Perceived general health (*Higher number = better health)*	3.98	.77	83
	Days physical health poor in past 30	3.72	5.97	83
	Days poor health stopped usual activities	2.27	4.37	83
	Days in pain of past 30	.89	2.05	83
	Days healthy in past 30	12.13	8.91	83
	Last GP check up. (Higher number = better health)	2.63	1.29	83
	Frequency of GP check ups (Higher number = better health)	4.66	.58	83
	Times to a & e in past year	.25	.70	83
	Time since last dental visit	1.46	.95	83
Health time Three (T3)	Perceived general health (*Higher number = better health)*	3.56	.89	45
	Days physical health poor in past 30	2.84	5.54	45
	Days poor health stopped usual life	1.87	4.24	45
	Days in pain of past 30	1.51	3.39	45
	Days healthy in past 30	11.91	9.32	45
	Last GP check up. (Higher number = better health)	2.38	1.57	45
	Frequency of GP check ups (Higher number = better health)	4.69	.60	45
	Times to a & e in past year	.13	.41	45
	Time since last dental visit	4.64	.92	45
	Days poor sleep in past 30	6.53	7.87	45
	Number of times taken exercise in past month	8.81	7.26	45
	Weight	2.29	.55	45
	Extent of health worries in past 3 months	3.31	.67	45

Normative Data

Means and standard deviations for both the current sample and published normative data (using large samples sizes) for the SUEIT are given in table 5.4. One-sample t-tests explored the differences between the norm data and the SUEIT subscales scores for the study sample at T1, T2, and T3 Significant differences are highlighted, these indicate the extent of deviation by current sample from the scores of general population.

Normative data for the CDC health related quality of life questionnaire is not available. However data from the British household survey for England 2008 includes responses to one identical question relating to the participants own perceived health status. This

question asks ‘How is your health in general? Participants rated their health on a scale of 1- Very Good to 5 Very Bad and responses indicate a mean score of 1.83, indicating better perceived health at population level than the student samples in study 3 who at T2 report a mean score of 2.02 (this was later reverse scored to 3.98), and at T3 2.44 (later reversed scored to 3.56). It is unpredicted that this student sample report worse than average health given their young age, although findings are consistent with study 1 and 2. However, worse than average health along with the large standard deviation (and thus variance in health scores) indicate that analyses are more likely to find statistically significant relationships where they exist.

T1 sample

For technical manual comparisons, two tailed one sample t-test revealed the cohort of the current study to have significantly lower means for both subscales: Emotional Recognition & Expression $t(164) = 7.47$, $p<.05$; and Emotional Control $t(164) = 6.17$, $p< .01$. For comparisons with Gannon and Ranzijn (2005), two tailed one sample t-tests reveal the current study to have significantly lower means for both subscales: Emotional Recognition & Expression $t(164) = 2.55$, $p<.05$; and Emotional Control $t(164) = 11.86$, $p< .01$.

T2 sample

For technical manual comparisons, two tailed one sample t-test revealed the cohort of the current study to have significantly lower means for both subscales: Emotional Recognition & Expression $t(82) = 2.42$, $p<.05$; and Emotional Control $t(82) = 11.47$, $p< .01$. For comparisons with Gannon and Ranzijn (2005), two tailed one sample t-tests reveal the current study to have significantly lower means for both subscales: Emotional Recognition & Expression $t(82) = 3.71$, $p<.01$; and Emotional Control $t(82) = 5.61$, $p< .01$

Table 5.4 Means and SD for SUEIT in study four at the three time points & from technical manuals.

		NORM DATA				**TIME 1 (N=165)**		T-TEST SIG	**TIME 2 (N=83)**		T-TEST SIG	**TIME 3 (N=45)**		T-TEST SIG
				Mean	S.D.	Mean	S.D.		Mean	S.D.		Mean	S.D.	
SUEIT (Trait EI)	Emotional Recognition & Expression	1	SUEIT TECHNICAL MANUAL	**39.27**	5.87	35.78	5.81	**.00****	37.37	5.45	**.00****	38.11	5.54	.17
		2	Gannon & Ranzijn (2005).	37.08	5.38	35.78	5.81	**.01***	37.37	5.45	.84	38.11	5.54	.22
	Emotional Control	1	SUEIT TECHNICAL MANUAL	**28.53**	4.96	26.14	5.73	**.00****	27.62	5.71	.15	28.98	6.15	.63
		2	Gannon & Ranzijn (2005).	25.53	4.87	26.14	5.73	**.00****	27.62	5.71	**.00****	28.98	6.15	**.00****

Difference from norm data ** Significant at p<.01 level.

T3 sample

For technical manual comparisons two tailed one sample t-test revealed the cohort of the current study to have significantly lower means for both subscales: Emotional Recognition & Expression t (44)=1.40, p<.05; and Emotional Control t (44) = .49, p< .01. For comparisons with Gannon and Ranzijn (2005), two tailed one sample t-tests revealed the current study to have significantly lower means for both subscales: Emotional Recognition & Expression t (44)= 1.25, p<.01; and Emotional Control t (44) = 3.77, p< .01.

In summary, participants retained at each time point are significantly lower than previously published norms. However, the retained longitudinal sample does not differ in EI profile significantly form the full T1 cohort (see table 5.1), and therefore EI characteristics are not likely to be impacting upon retention. Past research suggests that EI increases with age (Mayer, Caruso & Salovey, 2000), and therefore this predominantly young sample would be expected to have lower EI scores than previously published data with older samples. The SUEIT technical manual does not provide means ages of their sample, however, in support of this notion Gannon and Ranzijn (2005) showed higher means for all SUEIT subscales with an older sample.

5.2.4 Intercorrelations between variables

Prior to regressional analysis, correlational analyses were conducted to ascertain significant relationships, and to reveal if the personality control variables were related to the trait EI subscales.

Relationship between Trait EI and personality

Table 5.5 presents correlation coefficients for personality (Agreeableness; Extroversion; Conscientiousness; Neuroticism and Openness) and EI variables (ERE and EC).

Table 5.5 Relationships between trait EI (SUIET) subscales and personality.

	PERSONALITY				
	Neuroticism	Extroversion	Openness	Agreeableness	Conscientiousness
ERE	.00	**.24***	.15	**.44****	.14
EC	**-.33****	**.00**	**.12**	**-.01**	.02

*** Significant at p< .05 level; ** Significant at p<.01 level.**

Two tailed Pearson's correlations reveal significant relationships between trait EI and facets of personality, specifically that EC is significantly and negatively related to neuroticism and that ERE is significantly positively related to extroversion and agreeableness. Therefore personality subscales will be considered as control variables to provide evidence of divergent validity between trait EI and personality. The correlations reveal no evidence of multicollinearity.

Correlations between trait EI, coping, social support and longitudinal health related quality of life.

For the correlational and mediational analyses three paths between variables will be tested. These represent the paths detailed by Baron and Kenny (1986) and are illustrated in Figure 5.1.

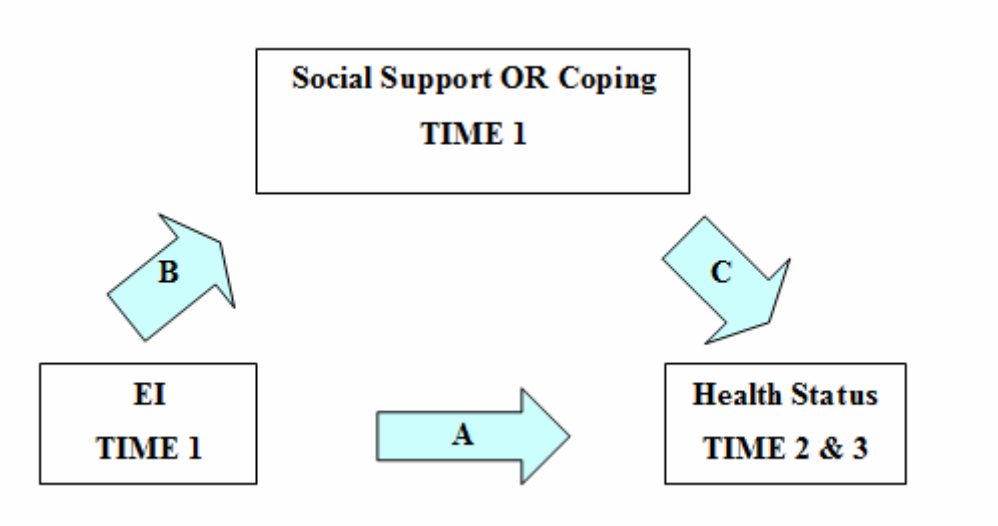

Figure 5.1 Mediation of the relationship between EI and health status

Path A intercorrelations between Trait EI and health related QOL were calculated for health at T2 and T3. These results are presented in Tables 5.6 and 5.7 respectively. Two tailed Pearson's correlations for Path A with health T2 reveal that EC is significantly and positively related to Perceived health, while ERE is significantly and positively related to health (measured by frequency of GP check ups) and significantly and negatively related to the extent to which ill health reduced participant activity levels. At T3 correlations indicated that EC was significantly and negatively related to number of days health was poor, and days poor health reduced activity levels; and also significantly and positively related to concern about health

Correlations between trait EI and longitudinal health related quality of life.

Correlations between EI and health T2 and T3 are presented in Tables 5.6 and 5.7 respectively. Analyses reveal that only three health variables at T2 and three at T3 have significant relationships with EI subscales. Only these health variables are therefore further investigated as having significant amounts of variance explained by EI subscales. At T2 ERE was significantly and negatively correlated with the number of days ill health stopped usual activities, and positive correlated with health as measured by frequency of GP check ups; EC was significantly and positively associated with perceived general health. At T3 ERE was not significantly correlated with any health variables, however EC was significantly and positively associated with concern about health, and significantly negatively associated with days physical health was poor, and days ill health reduced usual activities.

So that only appropriate control variables were included in subsequent hierarchical regressional analyses, correlation analyses were performed to identify which of the personality and demographic variables demonstrated significant relationships with both the health and appropriate EI subscales. (See tables 5.8 and 5.9). Potential control variables were identified as being personality subscales, age, gender, and the three health variables taken at time one.

Correlations between the potential control variables, EI subscales, and health T2 reveals that only three of the control variables (Neuroticism, perceived health time one, and agreeableness) have significant correlations with either of the two EI subscales, therefore as only these variables are explored as control variables. For perceived general health, neuroticism and perceived health 07 will be controlled, for days ill health reduced activity no control variable is identified, and for frequency of GP visits, agreeableness will be controlled for. At T3 no control variables correlate with both EI subscales and the identified health variables, therefore no control variables will be entered in regressions for T3.

Table 5.6 PATH A: Correlations between Trait EI, Personality and health related quality of life T2

		HEALTH RELATED QUALITY OF LIFE T2								
		Perceived general health (*Higher number = better health)*	Days physical health poor in in past 30	Days poor health stopped usual activities	Days in pain of past 30	Days healthy in past 30	Last GP check up.	Freq of GP check ups for illness injury or other condition	Times to a & e in past year	Time since last dental visit
SUEIT	ERE	.09	-.03	**-.29***	-.12	-.04	.17	**.27***	-.04	.02
	EC	**.28***	-.08	-.17	-.23	.26	.04	.20	.07	.08

*** Significant at p< .05 level; ** Significant at p<.01 level.**

Table 5.7 PATH A: Correlations between Trait EI, Personality and health related quality of life T3

		HEALTH RELATED QUALITY OF LIFE T3												
		Perceived general health (*Higher number = better health)*	Days physical health poor in in past 30	Days poor health stopped usual life	Days in pain of past 30	Days healthy in past 30	Last GP check up.	Freq of GP check ups	Times to a & e in past year	Time since last dental visit	Freq Exercise in past months	Weight class according to BMI (Higher number = heavier)	Concern about health	Days sleep was poor
SUEIT	ERE	.11	-.09	-.15	.09	.11	-.13	-.23	-.02	.01	.05	.00	-.04	-.20
	EC	.31	**-.40****	**-.36***	-.12	.23	.19	.28	-.24	.05	.25	-.07	**.38***	-.13

*** Significant at p< .05 level; ** Significant at p<.01 level.**

Table 5.8 Identifying control variables for Path A: correlations between potential control variables, EI subscales and health variables T2

	ERE	EC	LIFE EVENTS 07	**PERCEIVED HEALTH 08**	DAYS PHYSICAL HEALTH POOR	**DAYS NOT ACTIVE 08**	DAYS IN PAIN OF PAST 30	DAYS WITH POOR SLEEP	DAYS HEALTHY IN PAST 30	LAST GP CHECK UP.	**GP VISIT FREQ.**	TIMES TO A & E IN PAST YEAR	TIME SINCE LAST DENTAL VISIT
Neuroticism	.10	**-.41****	**.26***	**-.25***	.08	**.38****	.06	.16	**-.40****	.14	**-.30***	.00	**-.25***
Extroversion	.23	-.01	.07	**.16**	.07	**-.14**	-.12	-.14	**.27***	-.02	**-.04**	.07	-.06
Openness	.16	.07	.22	**-.08**	-.10	**.15**	.09	.15	-.08	.14	**-.05**	**.24***	-.01
Agreeableness	**.48****	-.06	.22	**-.16**	.10	**-.08**	.02	-.07	-.04	.04	**.27***	-.10	-.10
Conscientiousness	.12	.04	-.02	**-.13**	-.16	**.20**	.12	.04	-.15	.05	**.10**	.13	**-.24***
Age	-.13	.13	-.05	**-.07**	.05	**.13**	-.03	-.06	.03	-.02	**.00**	-.02	**.30***
Gender	.06	**-.35****	.15	**-.20**	.11	**.05**	.05	.02	**-.31***	.00	**.12**	**-.36****	-.12
Last GP 07	-.07	.12	**-.24***	**.36**	-.02	**-.17**	-.01	.02	.05	.13	**.24**	-.02	.17
GP freq 07	.23	.21	-.05	**.24**	.03	**-.25**	.02	-.21	.11	-.11	**.27***	.02	.07
Perceived health 07	.10	**.35****	-.06	**.63****	-.02	**-.28***	-.03	-.11	**.27***	.07	**.18**	.04	.15

*** Significant at p< .05 level; ** Significant at p<.01 level.**

NB. Only the three health variables in bold are significantly correlated with the EI subscales, therefore only these are considered in regressional analyses. The additional variables are included to inform selection of control variables included in later moderation analyses.

Table 5.9 Identifying control variables for Path A: correlations between potential control variables, EI subscales and related health variables T3

	ERE	EC	LIFE EVENTS 07	PERCEIVED HEALTH	**DAYS PHYSICAL HEALTH POOR**	**DAYS ACTIVITY REDUCED**	DAYS IN PAIN OF PAST 30	DAYS HEALTHY IN PAST 30	LAST GP CHECK UP.	FREQ. OF GP CHECK UPS	TIMES TO A & E IN PAST YEAR	TIME SINCE LAST DENTAL VISIT	FREQ EXERCISE IN PAST MONTHS	WEIGHT CLASS ACCORDING TO BMI	**CONCERN ABOUT HEALTH**	DAYS SLEEP WAS POOR
Neuroticism	.10	**-.41****	**.26***	-.23	**-.05**	**-.30**	.01	**-.34****	-.04	-.09	.03	.09	-.03	.05	**-.10**	.14
Extroversion	.23	-.01	.07	.01	**.01**	**.09**	.11	.05	.03	-.09	.13	.16	-.02	.04	**-.02**	.12
Openness	.16	.07	.22	-.21	**.07**	**.18**	.04	-.03	-.06	-.09	-.01	.04	**-.28***	**.33****	**-.11**	05
Agreeableness	**.48****	-.06	.22	-.14	**.14**	**.19**	.17	.05	.15	-.14	.05	-.04	**-.25***	.18	**-.18**	.10
Conscientiousness	.12	.04	-.02	.19	**.04**	**.19**	.11	-.05	.13	.13	.01	**.25***	-.05	.06	**-.09**	-.09
Age	-.13	.13	-.05	-.11	**-.08**	**-.11**	-.05	-.06	-.07	.03	-.04	-.14	-.01	.15	**-.04**	-.13
Gender	.06	**-.35****	.15	**-.28***	**.09**	**.09**	.09	-.24	-.06	-.12	.10	.07	-.20	.11	**-.23**	.20
Last GP 07	-.07	.12	**-.24***	**.38***	**-.11**	**-.11**	-.13	.10	.00	-.06	-.04	.01	.06	-.16	**.18**	-.19
GP freq 07	.23	.21	-.05	-.15	**-.01**	**.02**	-.05	-.05	-.17	-.24	-.11	-.07	.06	.14	**-.19**	.03
Perceived health 07	.10	**.35****	-.06	**.43***	**.17**	**.20**	.23	.25	-.31	**-.36***	.22	-.10	-.04	-.27	**.01**	.04

*** Significant at p< .05 level; ** Significant at p<.01 level**

NB. Only the three health variables in bold are significantly correlated with the EI subscales, therefore only these are considered in regressional analyses. The additional variables are included to inform selection of control variables included in later moderation analyses

5.2.5. Regressional analyses

Mediation of the EI health relationship

If coping or social support mediate the relationship between EI and health, EI will explain variance in health status (Path A); EI will explain variance in mediating variables (Path B), and mediating variables will explain variance in health (Path C). Significant amounts of variance of health explained by EI will reduce or become non significant when mediating variables are added into regressional analyses on a previous step (Baron & Kenny, 1986). For illustration of this mediation relationship see Figure 4.01.

Regressions for T2 (presented in Table 5.10) reveal that Emotional recognition and expression explain a significant amount of unique variance (above control variables selected from correlational analyses) in health at T2 as measured by the number of days ill health reduced participants activity levels. Neither ERE nor EC could explain significant amounts of variance in either perceived general health or frequency of GP check ups. Regression for health T3 (Table 5.11) reveal that EI subscales can not explain significant amounts of variance in health at T3.

Table 5.10. PATH A: Multiple regression models with EI subscales as predictors of health related QOL variables Time 2

PREDICTED HEALTH VARIABLES	STEP 1 R^2	STEP 1 CONTROL VARIABLES	ß	STEP 2 R^2 CHANGE	STEP 2 EI SUBSCALES	ß	OVERALL F VALUE
Perceived general health 08	.40**	Neuroticism, Perceived health 07	-.06 .61**	.01	Emotional control	.05	14.80**
Days poor health stopped usual activities 08	n/a	n/a	n/a	**.01***	**Emotional recognition and expression**	**.10***	**6.63***
Freq of GP check ups 08	.07*	Agreeableness	.27*	.02	Emotional recognition and expression	.14	2.70

*** Significant at p<.05 level. ** Significant at p<.01 level.**

Table 5.11 PATH A: Multiple regression models EI predicting health related QOL variables T3

PREDICTED HEALTH VARIABLES	Step 1 R^2	Step 1 EI Subscales	ß	Over-all F Value
T3 Days physical health poor in past 30	.02	ERE	-.18	2.22
T3 Days poor health stopped usual life	.00	ERE	-.05	.15
T3 Concern about health	.01	ERE	.03	.07

*** Significant at p<.05 level. ** Significant at p<.01 level.**

To further investigate mediational analyses ERE was investigated as a predictor of social support and coping (Path B) at time two. However, correlational analyses (Table 5.12) reveal that ERE is not significantly related to either social support or coping variables and therefore no further moderation analyses were undertaken. Study 2 therefore concludes that 'Emotional recognition and expression' is a significant predictor of health at T2, but that there this relationship is not the result of mediation by either social support or coping.

Table 5.12 PATH B: Correlations between Trait EI, social support, and coping (at T1)

	SOCIAL SUPPORT						COPING		
	Mean support score	Available support	Practical support	Reciprocity of support	Emotional support	Event support	Disengaged	Engaged	Social
Emotional Recognition & Expression	.18	.78	-.01	.19	.12	.23	-.19	.00	.18
Emotional Control	.07	-.08	-.21	.03	**.30***	-.01	-.20	.19	-.01

*** Significant at p< .05 level; ** Significant at p<.01 level**

Moderation by EI of the longitudinal stress health relationship.

To investigate moderation effects between EI subscales and life events stress, interaction terms will be entered in a third step of the multiple regression predicting health variables. Moderated multiple regression is considered the appropriate analysis for detecting the effects of moderator variables (Cohen & Cohen, 1983) and was therefore selected a priori to data being collected. Before moderated multiple regressions were carried out the independent variables were centred (as advised by Aiken & West, 1991) by calculating raw scores minus mean scores. Then interaction terms were calculated by multiplying centre scored life events stress and centre scored EI subscales.

In regressional analysis control variables are included where they demonstrate significant correlation with the dependent variable, plus Emotional control, Emotional recognition and expression, or stressful life events. These correlations are displayed in Tables 5.8 and 5.9. Regressional analyses investigating the moderation by EI of the relationship between life event stress and health are presented in tables 5.13 (health time two) and 5.14 (health time three). To allow interpretation, significant interactions are plotted (Figures 5.2 to 5.4).

Table 5.13. Moderational analysis for T2 health variables.

PREDICTED HEALTH VARIABLES	STEP 1 R^2 CHANGE	STEP 1 CONTROL VARIABLES	ß	STEP 2 R^2 CHANGE	STEP 2 EI SUBSCALES	ß	STEP3 R^2 CHANGE	STEP 3 INTER-ACTIONS	ß	OVER-ALL F
Perceived general health (*Higher number = better health)*	**.40****	Neuroticism **Perceived health 07**	-.06 **.61****	.01	ERE EC LE Stress	.03 .05 -.09	.02	ERE x Stress EC x Stress	-.14 .02	6.30**
Days physical health poor in in past 30	-	none	-	.03	ERE EC LE Stress	-.11 .02 .27*	.00	ERE x Stress EC x Stress	.04 .01	1.03
Days poor health stopped usual activities	**.14****	**Neuroticism** Perceived health 07	**.32*** -.18	**.18****	ERE EC LE Stress	**-.36**** .00 **.29***	**.11****	**ERE x Stress** EC x Stress	**-.37**** .17	**6.87****
Days in pain of past 30	-	None	-	.02	ERE EC LE Stress	-.16 -.14 .10	.01	ERE x Stress EC x Stress	.10 .03	.96
Days with poor sleep	-	None	-	**.15****	ERE EC LE Stress	**-.27*** .01 **.37****	.05	ERE x Stress EC x Stress	.05 .20	3.64**
Days healthy in past 30	**.18***	**Neuroticism** Gender Perceived health 07	**-.32*** .12 -.22	.02	ERE EC LE Stress	.06 .28 .35	.06	ERE x Stress EC x Stress	.29* -.14	2.92**
Last GP check up.	-	None	-	-.04	ERE EC LE Stress	.05 -.05 -.05	.01	ERE x Stress EC x Stress	-.04 .11	.22
Freq of GP check ups for illness injury or other condition	.15	Neuroticism Agreeableness	-.34** .31*	.05	ERE EC LE Stress	.14 .10 -.16	**.11***	**ERE x Stress** EC x Stress	**.30*** .07	**3.64****
Times to a & e in past year	**.12***	**Gender**	**-.36****	.01	ERE EC LE Stress	.02 -.04 .07	.01	ERE x Stress EC x Stress	.12 -.04	1.77
Time since last dental visit	**.05***	**Neuroticism**	**-.25***	.02	ERE EC LE Stress	-.11 -.05 -.02	.03	ERE x Stress EC x Stress	-.16 -.03	1.23

*** Significant at p< .05 level; ** Significant at p<.01 level**

Table 5.14. Moderational analysis for T3 health variables.

PREDICTED HEALTH VARIABLES	STEP 1 R^2 CHANGE	STEP 1 CONTROL VARIABLES	ß	STEP 2 R^2 CHANGE	STEP 2 EI SUBSCALES	ß	STEP3 R^2 CHANGE	STEP 3 INTER-ACTIONS	ß	OVERALL F
Perceived general health (*Higher number = better health)*	.39	Neuroticism Perceived health 07	.33* -.44**	.08	ERE EC LE Stress	.24 -.16 .05	.02	ERE x Stress EC x Stress	.17 -.11	3.26*
Days physical health poor	-	None	-	.11	ERE EC LE Stress	-.15 -.24 -.07	.01	ERE x Stress EC x Stress	.07 .06	.90
Days not active	.07	Neuroticism Perceived health 07	.22 .23	.05	ERE EC LE Stress	-.20 -.02 -.03	.02	ERE x Stress EC x Stress	.15 .07	.74
Days in pain of past 30	-	None	-	.06	ERE EC LE Stress	-.20 -.08 -.06	.02	ERE x Stress EC x Stress	.19 .04	.67
Days healthy in past 30	.14	Neuroticism	-.37*	.05	ERE EC LE Stress	.19 -.17 .01	.09	ERE x Stress EC x Stress	-.13 -.36	2.23
Last GP check up.	-	None	-	.03	ERE EC LE Stress	-.06 .14 .08	.08	ERE x Stress EC x Stress	.32 .15	.82
GP visit freq.	.02	Neuroticism Agreeableness	.05 -.13	.02	ERE EC LE Stress	-.05 .15	.01	ERE x Stress EC x Stress	.11 .08	.23
Times to a & e in past year	-	None	-	.17	ERE EC LE Stress	-.36* -.16 -.02	.05	ERE x Stress EC x Stress	.25 .11	2.00
Time since last dental visit	-	None	-	.09	ERE EC LE Stress	-.06 -.24 .24	.04	ERE x Stress EC x Stress	-.22 -.03	.79
Freq Exercise in past months	.00	Agreeableness	-.03	.01	ERE EC LE Stress	.03 .04 .04	**.41****	**ERE x Stress** **EC x Stress**	**.49*** **.64****	**3.66***
Weight class according to BMI	-	None	-	.02	ERE EC LE Stress	.15 -.02 -.02	.14	ERE x Stress EC x Stress	-.15 .45*	1.30
Concern about health	-	None	-	.09	ERE EC LE Stress	-.03 .25 .14	.01	ERE x Stress EC x Stress	.13 -.10	.79
Days sleep was poor	-	None	-	.04	ERE EC LE Stress	-.21 -.01 .13	.06	ERE x Stress EC x Stress	.01 .32	.82

*** Significant at p< .05 level; ** Significant at p<.01 level**

Moderation analyses reveal that at T2 Emotional Recognition and expression moderated the relationship between life events stress and health, as measured by both GP visit frequency and the extent to which daily activities were reduced by ill health.

Of the health variables at time three the relationship between Stressor exposure and frequency of exercise undertaken was moderated by both Emotional Control and Emotional Recognition and Expression.

5.2.6. Interpretation of significant interactions predicting Health T2.

The significant interactions between EI subscales and stress predicting health T2 were investigated in figures 5.2 to 5.4.

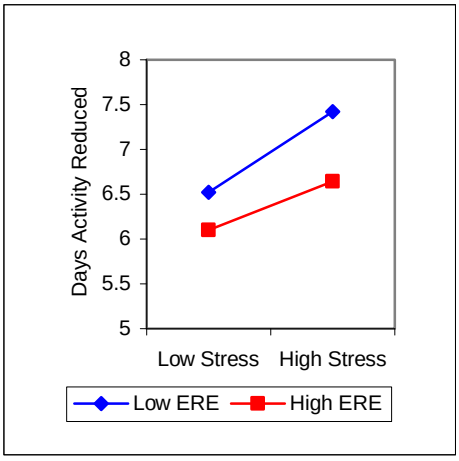

Figure 5.2 Interaction between Stress and *Emotional Recognition & Expression* predicting Low Activity T2

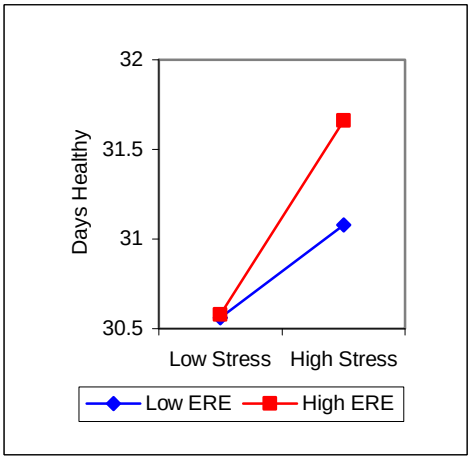

Figure 5.3 Interaction between *Stress and Emotional Recognition & Expression* predicting Days Healthy

Figure 5.2 reveals that days ill health reduced activity was highest for participants with low *Emotional Recognition & Expression* and high stress, while Figure 5.3 reveals that days feeling healthy was highest for participants with high stress and high *Emotional Recognition & Expression*.

5.2.7 Interpretation of significant interactions predicting Health T3.

The significant interactions between EI subscales and stress predicting health T3 were investigated in figures 5.4 and 5.5.

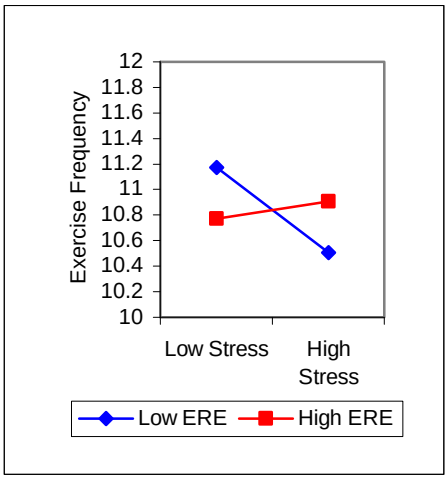

Figure 5.4 Interaction between Stress and *Emotional Recognition & Expression* predicting days T3 Exercise

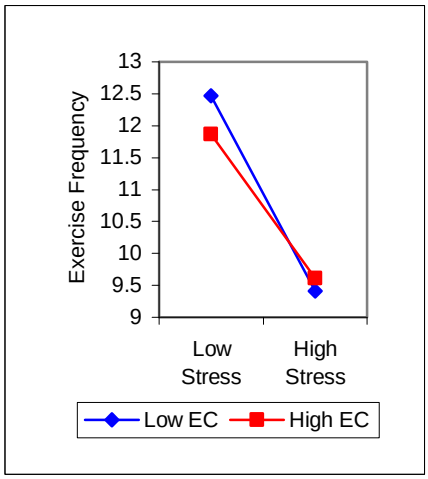

Figure 5.5 Interaction between Stress and *Emotional control* predicting days T3 Exercise

Figure 5.4 reveals that exercise frequency at time three was lowest under high stress for participants with low ERE, while Figure 5.5 reveals that exercise frequency was also lowest under high stress for participants with low EC.

5.2.8 Summary of all regressional findings

Analyses reveal that EI subscale EC is not a significant predictor of health T2, but that subscale ERE explains significant amounts of variance in health at T2, as measured by the number of days ill health stopped usual activities (negatively related so as ERE increased days with low activity decreased). However, as ERE was not significantly correlated with any social support or coping subscales no further mediational analyses were undertaken. At T3, EI subscales could not explain significant amounts of variance in health variables s again no further mediational analyses were undertaken. This study therefore finds that the relationship between EI subscales and health are not mediated by either social support or coping.

Analyses investigating EI as a moderator of the relationship between stressor exposure and health reveal significant interactions between EI subscales and stress when predicting health variables at T2 and T3. At T2 analysis reveals that under high stress when ERE is high, Days healthy are greatest, and days illness reduced activity is lowest.

At T3 interaction plots reveals that exercise is greatest under high stress when ERE is high, and when EC is high.

5.3 Discussion

The current study sought to investigate the longitudinal relationship between EI and health, asking if this relationship is mediated by coping, or social support. EC was not found to explain significant amounts of variance in health T2 or T3, and ERE was not a significant predictor of health T3. However, ERE significantly predicted days ill heath reduced activities; as ERE increased so did days with low activity. This relationship is not in the expected direction, and it seems likely that this one significant result is an artefact of testing a high number of health variables. When combined with all other non-significant results, this study finds that EI does not explain variance in health at T2 or T3.

The finding that trait EI does not explain variance in health longitudinally or cross sectionally (to amalgamate findings with those of studies one and two) is contrary to findings from meta analysis (Martins, Ramalho & Morin, in press). There are a number of possibilities for this discrepancy: **First**, as the current study reveals moderating, but not mediating relationships, it is possible that for this young sample EI is only important for health under high stress conditions. Study four (chapter 6) will investigate this by asking whether trait EI can explain variance in cortisol concentrations after a stressful public speaking task. **Second**, it could be that there is a significant relationship between EI and health, but that effect sizes are small and therefore remained undetected with the current sample size. However, this is not deemed likely given that meta-analysis has previously reported a moderate effect size between trait EI and health. **Third,** sample characteristics (for example, being young and predominantly female) may mean that the current study is not representative of the general population. For this reason age and gender will continue to be considered as control variables; **Fourth,** it could be that there is no main effect between EI and health and that past research has reported results which are artefacts of using measures wider in coverage than the ability EI domain.

Another unexpected finding of the current study was that EI subscales did not show many significant correlations with social support, the only significant correlation found being between EC and emotional support. This is inconsistent with study 1, where ERE

was correlated with four social support dimensions and EC was correlated with emotional support. Also, in contrast to study 1, the current study has revealed no significant relationships between ERE and EC and coping variables, and only one significant relationship between trait EI and social support in study one ERE and EC showed that five out of six correlations to be significant. This inconsistency is likely to be due to idiosyncrasies of the samples in studies 1 to 3.

Moderation analyses have revealed that EI subscales interact with life events stress to predict health variables 12 months and 15 months after the life events were reported. Results reveal that health is better under high stress conditions for individuals with high ERE and EC. This replicates the finding of study 1 that under high stress, higher EI appears to be protective of health. The mechanisms through which EI protects health from stress has not been revealed by studies 1, 2 or 3, therefore study 4 will investigate physiological paths between EI and health to explore whether cortisol reactivity can explain this complex relationship.

Chapter Six: The relationship between Trait Emotional Intelligence and physiological responses to stressors.

To further explore the significant moderation by emotional intelligence (EI) on the relationship between stressor exposure and health identified in previous studies, the current study seeks to explore whether EI can moderate the relationship between stressor exposure and cortisol reactivity. Past research has proposed that EI helps regulate emotions and in turn reduces harmful physiological arousal to stressors (Mikolajczak et al, 2007). To date, only two studies have tested this proposal and they reported that trait EI is a significant moderator of the relationship between stressor exposure and cortisol reactivity (Mikolajczak et al., 2007; Salovey et al., 2002). Such research explains the connection between EI and health as the product of EI moderating the relationship between acute stressors and physiological responses to those stressors. In congruence with the two previous published studies investigating EI and physiological stress reactivity, the current study will measure salivary cortisol.

Supplementary to physiological responses both previous EI-cortisol studies measured participants' affective states as an additional indicator of anticipation of and response to lab based stressors. Psychological responses to stressors may be triggers of physiological responses, coping cognitions and behaviours. Therefore measurement of emotional activation is a useful addition to measuring physiological responses to stressors. Previous studies reported that higher trait EI was related to lower mood deterioration (Mikolajczak, Petrides, Coumans & Luminet, 2009; Mikolajczak et al., 2007) and perceptions of stressors as less threatening (Salovey et al., 2002).

The current study seeks to replicate previous results that higher EI is related to lower levels of cortisol and less mood deterioration, while controlling for personality and using a measure of EI which is neither under nor over inclusive in its coverage of the EI domain. Based on previous results it was predicted that higher EI would be related to lower baseline levels of cortisol at time 1, smaller increases in cortisol immediately after the stressor at time 2, and greater reduction in cortisol from time 2 to time 3. It was also predicted that higher EI would be related to less tense and less energetic mood at time

one, two and three. Such results would help to explain the finding in studies 1 and 3 that EI moderates the relationship between Stressor exposure and health.

6.1. Method

6.1.1 Design

A mixed design was used for the current study. Stress was operationalised on two levels (1. high stress – participants giving oral presentations; 2. controls – participants who were watching but not giving presentations). All participants gave repeated measures for both salivary cortisol and mood at three points in time (before the assessed presentations, 20 minutes after stressor onset, 40 minutes after stressor onset). The relationship between Trait EI, mood and cortisol reactivity was then investigated through correlational and regressional analysis.

6.1.2 Participants

Participants were undergraduate students contacted through verbal requests in lectures and workshops; they were asked if they would take part in a salivary cortisol study during presentations they were due to give for course assessment. 146 participants identified in this way gave saliva samples for analysis. Of these participants, a number gave saliva samples that were too small for analysis or failed to complete mood questionnaires, additionally a number of cortisol results were discarded as unreliable, and 2 participants were removed as extreme outliers. Therefore participant numbers for analyses were reduced to 114. Of the 114 cortisol participants 45 were non presenters (No stress control group) and 69 were presenters (high stress condition). Of the combined 146 participants 40 (27.4%) were male and 106 (72.6%) female. Ages ranged from 18 to 38 (mean 19.67, standard deviation 4.13)

Participants were asked at the time of initial contact to refrain from smoking, drinking alcohol, eating, or consuming caffeine for the 2 hours before the study. Many participants reported ignoring these requests and therefore food, caffeine, smoking, and alcohol were included in analyses as control variables.

6.1.3 Procedure

Participants were giving an in class oral presentation being graded by tutors and peers as part of first year course assessment. Motivated tasks which have elements of social

evaluative threat have been found by meta analysis to reliably produce large cortisol reactions (Dickerson & Kemeny, 2004), therefore assessed presentations given by students were considered to provide both a suitably stressful stimulus and ecological validity of results. The current task also has strong parallels with the Trier Social Stress Test (TSST; Kirschbaum, Pirke & Hellhammer, 1993) used in experimental protocols to and found by meta analysis to provoke the most robust physiological stress responses compared to other stress tasks (Dickerson & Kemeny, 2004). All the experimental data was collected between 2 and 5pm to minimise the effect of circadian hormone rhythms. Participants were given sampling packs which contained name labels with red amber and green colour coded questionnaires and salivettes (saliva collection devices described in section 6.1.4 below). Participants completed red questionnaires (EI, personality and mood) and samples at baseline (T1) on arrival in the room, amber questionnaires (mood) and samples at time two (T2) immediately after their 20 minute presentation, and red questionnaires (mood) and samples at time three (T3) immediately after the next group presentation. Data were therefore collected at three points in time: T1 at 3pm; T2 20 minutes after the start of the stressor, T3 40 minutes after the start of the stressor.

6.1.4 Materials

EI Measures

Swinburne University Emotional Intelligence Test (SUEIT; Palmer & Stough, 2001) The SUIET demonstrates good content validity as the measure's five factors represent good coverage of the EI domain mapping well on to the (1997) Mayer and Salovey model. They also demonstrate good focus on the EI domain as items do not refer to constructs other than EI. The SUEIT has demonstrated utility by explaining unique variance in a number of published studies predicting outcomes such as life satisfaction (Gannon & Ranzijin, 2005), leadership (Downey, Papageorgiou & Stough, 2006), and critical and detached behaviour (Moss, Ritossa & Nga, 2006). The SUEIT has also been shown to have good internal reliability (Rajendran, Downey & Stough, 2007) and test re-test reliability (Palmer & Stough, 2001). For the current study cronbach alpha coefficients were as follows: Emotional Recognition and expression (α=.65); Understanding of Emotions External (α=.77); Emotions Direct Cognition (α=.58); Emotional Management (α=.74); Emotional Control (α=.80). For ERE removing item 7 would have increased reliability to α=.76, and for EDC removing item3 would

increase reliability to α=.61 However it was decided that this was not desirable as it would prevent direct comparison of results with other published data.

Personality Measure

The International Personality Item Pool (IPIP) has been developed as a free measure of personality, has good reliability and validity, and correlates well to the NEO-FFI (Gow, Whiteman & Pattie, 2005). It was developed to provide a public domain measure of personality. It has 50 statements scored on a scale of 1 (Very inaccurate for me) to 5 (Very accurate for me). The scale yields 5 subscale scores: Neuroticism; Extroversion; Agreeableness; Openness; and Conscientiousness. For each subscale the possible scores range from 0 to 50. For the current study cronbach alpha coefficients were as follows: *Neuroticism*: α=.78, *Extroversion*: α=.73, *Openness*: α=.62, *Agreeableness*: α=.81; *Conscientiousness*: α=.61. For Conscientiousness no item could be removed to increase internal reliability. For openness removal of items 15 and 25 would increase reliability by .01 therefore the benefit of removal items was not worth the cost of difficulty in interpreting results.

Affect arousal

The Activation Deactivation Adjective Checklist short form (AD ACL; Thayer, 1989) was used to measure the affective dimensions of arousal. This checklist consists of 16 items asking participants to grade the extent to which they feel a number of emotions on a scale of one to four (four being high), and in combination these items measure four dimensions of affect- energy (active, energetic, vigorous, lively, full-of-pep), tiredness (sleepy, tired, drowsy, wide-awake, wakeful), calmness (placid, calm, at-rest, still, quiet), and tension (jittery, intense, fearful, clutched-up, tense). Energy and reverse scored tiredness are combined to create the scale 'Energetic', while tension and reverse scored calmness are combined to create the subscale 'Tense'. Participants were asked to report how they felt at the moment they completed the checklist. The AD ACL is well established as reliable and valid (Purcell, 1982; Thayer, 1986). For the current study cronbach alpha coefficients were as follows: Energetic mood time 1 α=.85, tense mood time 1 α=. 85; energetic mood time 2 α=.86, tense mood time 2 α=.82; energetic mood time 3 α=.88, tense mood time 3 α=.73.

Salivary Cortisol

Saliva samples were taken using the salivette saliva sampling device (Sarstedt LTD, Leicester, UK). Collection packs were produced and given to participants, these included three salivettes colour coded red, amber and green. At each time point participants were instructed to give unstimulated saliva samples by placing a salivette under their tongue for a two- minute period or until salivettes were soggy with saliva. Following saliva collection samples were stored at -40^{o}C until analysis. Saliva was recovered by thawing the salivette at room temperature for fifteen minutes, then centrifuging samples for fifteen minutes at 1500rpm. Enzyme immunoassays were conducted in duplicate at the University of Central Lancashire using commercial kits. Cortisol concentration (nmol/l) in saliva was determined by a high sensitivity salivary cortisol enzyme immunoassay kit, produced by DRG Instruments GmbH, Germany. One assay gave results which were significantly different to all the other tests ($F(14, 506) = 32.61$, $p<.001$); these results of this assay were discarded as unreliable. Intra and inter-assay coefficients of reliability ranged from 4 to 30%. Each participant gave three samples; baseline, time one and time two. Cortisol *Reactivity* was calculated as T2 minus baseline; and *Total* was the sum of T2 and T3 minus T1. Collection and presentation of cortisol in this way is consistent with clinical advice (Hanrahan, McCarthy, Kleiber, Lutgendorf & Tsalikian, 2006).

6.2 Results

6.2.1 Data screening study 5

Assumptions of multivariate analysis (Tabachnick & Fidell, 2001) were investigated prior to analyses. Before conducting the multiple regression, basic data screening was completed to test dependent variables for normality and outliers, and to identify multicollinearity. Screening began with checks for errors within the data file, then the missing data routine were applied.

Outliers, both univariate and multivariate, were identified using procedures outlined in Tabachnick and Fidell (2001). Inspection of box plots revealed that one of the cortisol assays had produced scores outside of the expected range, and therefore cortisol concentration results from this assay (test 13) were removed as being unreliable. Extreme multivariate outliers (identified in box plots as more than 1.5 box lengths from

the edge of the box) were removed although this only resulted in 2 cases being taken from the sample. In checking for normality of distribution, some variables presented evidence of non normal distribution (Kolmogorov-Smirnov values $p<0.05$). However as the 5% trimmed means and inspection of histograms (and skewness and kurtosis values) revealed that the assumptions of univariate normality were not severely violated, this was not considered problematic. It would not be desirable to remove such scores as they provide necessary variance in both independent and dependent variables.

6.2.2 Background characteristics of the population

The means and standard deviations for the study 4 cohort are given in table 6.1

Table 6.1 Characteristics of cohort in study 4

Characteristic		Means & standard deviations (n=114)	
		Mean	S. D.
Age		19.67	4.13
SUEIT	Emotional Recognition & Expression	36.6	5.99
	Emotional Control	28.35	6.28
Personality	Neuroticism	30.81	7.30
	Extroversion	34.38	7.06
	Openness	32.26	4.57
	Agreeableness	39.97	4.52
	Conscientiousness	33.23	5.67
Cortisol	Reading A – baseline	5.48	1.81
	Reading B – 20 Minutes later	5.39	2.13
	Reading C- 40 minutes after baseline	5.15	1.90
Mood	Time 1 Energetic mood	21.09	4.97
	Time 1 Tense mood	20.06	5.55
	Time 2 Energetic mood	21.61	5.56
	Time 2 Tense mood	19.64	5.13
	Time 3 Energetic mood	19.62	5.35
	Time 3 Tense mood	15.37	3.70

Normative Data

Means and standard deviations for both the current sample and published normative data (using large samples sizes) for the SUEIT are given in table 6.2. Significant differences are highlighted, indicating the extent of deviation by current sample from the scores of general population.

Table 6.2. Means and SD for SUEIT in study four cohort 1 & from technical manuals

		Study 4		SUEIT Technical manual data		Gannon & Ranzijn (2005). Sample age = 35.94**	
		Mean	SD	Mean	SD	Mean	SD
SUEIT (Trait EI)	ERE	36.6	5.99	**38.51***	4.90	**39.27****	5.87
	EC	28.35	6.28	**31.66****	3.94	**28.53****	4.96

Difference from study one mean ** Significant at p<.01 level.

One-sample t-tests revealed that for Study one SUEIT scores were all significantly lower than previously technical manual data. For technical manual comparisons two tailed one sample t-test revealed the cohort of the current study to have significantly lower means for both subscales: Emotional Recognition & Expression t (145)= 3.86, p<.01; and Emotional Control t (145) = 6.37, p< .01. For comparisons with Gannon & Ranzijn (2005), two tailed one sample t-tests revealed the current study to have significantly lower means for both subscales: Emotional Recognition & Expression t (145) = 5.39, p<.01; and Emotional Control t (145) = .35, p= .73.

Past research suggests that EI increases with age (Mayer, Caruso & Salovey, 2000), and therefore this predominantly young sample would be expected to have lower EI scores than previously published data with older samples. The SUEIT technical manual does not provide means ages of their sample, however, in support of this notion Gannon & Ranzijn (2005) showed higher means for all SUEIT subscales with an older sample

Cortisol manipulation check

The salivary cortisol levels obtained from participants are displayed in table 6.3

Table 6.3 Means and standard deviations for cortisol samples by stress condition

	BASELINE CORTISOL (NM/L)		CORTISOL TIME 2 (NM/L)		CORTISOL TIME 3 (NM/L)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
High stressor (n=69)	15.46	5.22	16.28	6.49	15.15	5.71
Low stressor (n=44)	14.60	4.66	12.70	3.97	12.75	4.08

Means and standard deviations (see table 6.3) reveal that for the stress condition cortisol levels peaked at time 2 while for the non stress condition cortisol levels were highest at baseline and failing and remaining stable for times two and three.

A two tailed mixed between-within repeated measure analysis of variance was employed with cortisol within subjects (on three levels) and stress condition as a between subjects factor (on two levels). This allowed investigation of significant interactions between stress condition and time points when predicting cortisol levels.

Analysis revealed no significant main effect for cortisol (Wilks' Lambda= .96, F (1, 112) = 2.08, p=.13, η^2=.04), however did reveal a significant main effect for stress condition (F, (2, 111) = 7.44, p<.01, η^2=.06). This demonstrates that participants in the high stress condition had significantly higher cortisol levels than participants in the low stress conditions. The mixed analysis of variance revealed a significant interaction between stress condition (presenters versus non presenters) and cortisol concentrations at baseline, T2 and T3 (Wilks' Lambda = .93, F (2, 112) = 4.08, p<.05). Two tailed independent samples t-tests reveal cortisol levels to be significantly higher for participants in high stress compared to low stress conditions at T2 (t (111.71)= .3.66, p<.001) and T3 (t (111.01)= 2.63, p< .05) but not at baseline (t (112)= .90, p=.37). Results reveal that the stress manipulation was successful.

Mood manipulation check

The self reported mood levels reported by participants are displayed in table 6.4

Table 6.4 Means and standard deviations for mood samples by stress condition

	ENERGETIC MOOD						TENSE					
	Baseline		Time 2		Mood time 3		Baseline		Time 2		Time 3	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
High stressor (n=69)	20.90	5.17	23.16	5.15	20.37	5.24	22.35	4.86	21.34	4.66	15.45	3.43
Low stressor (n=44)	21.31	4.74	19.08	5.43	18.40	5.28	16.35	4.65	16.98	4.77	15.25	4.21

A two tailed mixed between-within repeated measure analysis of variance was employed with energetic mood a within subjects factor (on three levels) and stress condition as a between subjects factor (on two levels). This allowed investigation of significant interactions between stress condition and time points in mood levels.

Analysis revealed a significant main effect for energetic mood (Wilks' Lambda= .83, F (1, 112) = 10.67, p=<.001, η^2=.7). Bonferroni corrected post hoc test revealed that energy was significantly higher at T2 compared to T3 (p<.05), at T1 compared to T3 (p<.05) and at T2 compared to T1 (p<.05). Analysis also revealed a significant main effect for stress condition (F, (1, 112) = 6.79, p<.05, η^2=.06). The tests show a large significant interaction between stress condition (presenters versus non presenters) and *energetic* mood at baseline, T2 and T3 (Wilks' Lambda = .73, F (2, 112) = 14.25, p<.001). Two tailed independent samples t-tests reveal that there are significant differences between the high and low stress conditions for energetic mood at T2 (t (136)= 4.43, p<.001) and T3 (t(136)= 2.13, p<.05) but not baseline (t (136) = .47, p=.64). This suggests that the stress manipulation successfully impacted upon mood.

A second two-tailed mixed between-within repeated measure analysis of variance was employed with energetic mood a within subjects factor (on three levels) and stress condition as a between subjects factor (on two levels). This allowed investigation of significant interactions between stress condition and time points in mood levels.

Analysis revealed a significant main effect for tense mood (Wilks' Lambda= .47, F (1, 112) = 59.89, p=<.001, η^2=.53). Bonferroni corrected post hoc test revealed that energy was significantly higher at T2 compared to T3 (p<.05), at T1 compared to T3 (p<.05) and at T2 compared to T1 (p<.05). Analysis also revealed a significant main effect for stress condition (F, (1, 112) = 28.98, p<.01, η^2=.22). The tests show a large significant interaction between stress condition (presenters versus non presenters) and *energetic* mood at baseline, T2 and T3 (Wilks' Lambda = .71, F (2, 112) = 21.18, p<.001). Two tailed independent samples t-tests reveal that there are significant differences between the high and low stress conditions for energetic mood at T1 (t (136) =7.14, p<.001), and T2 (t (136)= 5.28, p<.001), but not T3 (t(136)=.31, p=.76). This suggests that the stress manipulation successfully impacted upon tense mood.

Summary of manipulation check

Results suggest that the stress manipulation was successful and that the pattern of mood levels with time is different for the two stress conditions. For energetic mood the high stress condition peaked at T2 while for the non stress condition levels were highest at baseline and subsequently fell at T2 and T3. For tension, the high stress condition peaked at baseline while for the low stress condition levels peaked at T2.

Relationship between EI Cortisol and Mood

Two tailed spearman correlations between SUEIT cortisol and mood were calculated and are presented in table 6.5. Results reveal a significant negative correlation between EI emotions direct cognition and cortisol at baseline, a significant negative correlation between emotion management and tension at T3, and significant positive relationships between emotional control and energy at both baseline and T2. No significant relationship between trait EI subscales and cortisol.

Table 6.5 Relationships between EI cortisol and mood for the high stress condition

		CORTISOL (N=69)				MOOD (N=86)					
		Baseline (t1)	Change (t2-t1)	Recover (t2-t3)	total reaction (t2+T3)-T1	Base Energy	Base Tense	T2 Energy	T2 Tense	T3 Energy	T3 Tense
SUEIT	ERE	-.08	.07	-.08	.10	.18	.03	.02	.06	.08	-.15
	EC	-.11	.06	.14	-.05	.12	.01	**.20****	.03	.08	-.08

*** Significant at p<.05 level. ** Significant at p<.01 level**. Key: ERE= Emotional Recognition & Expression; EC= Emotional Control

Emotional intelligence explaining unique variance in cortisol and mood

Regressional analyses were conducted to examine the extent to which EI can explain unique variance in cortisol and mood, regardless of stress condition. Results are presented in table 6.5. Two tailed Pearson's correlations (see Table 6.5) were conducted to identify significant relationships between EI subscales cortisol and mood variables. Correlations reveal that neither Emotional recognition and expression nor Emotional control were significantly related to cortisol; however Emotional control was significantly related to energetic mood at T2. Therefore only Emotional control will be explored in regressional analyses as a predictor of mood, and cortisol will not be further explored. To establish which control variables should be included in regressional analyses correlations between potential control variables energetic mood T2 and Emotional control are displayed in table 6.5 (Correlations between control variables and all variables are displayed for use in later moderation analyses). Only control variables which correlate significantly with both emotional control and the Dependent variable will be included in regressional analyses.

Table 6.6 Identifying control variables: correlations between potential control variables, EI subscales, Cortisol reactions and Mood.

		STRESS	SUEIT		CORTISOL			MOOD					
			ERE	EC	Baseline (t1)	Reactivity (T2-T1)	total reaction (T2+T3)-T1	Base Energy	Base Tense	T2 Energy	T2 Tense	T3 Energy	T3 Tense
Controls	N	-.04	-.07	**-.38****	.08	-.03	.04	-.14	.11	-.08	.17	-.05	**.26****
	E	.12	**.32****	.02	-.12	.04	.03	.18	.13	.06	.04	.03	.03
	O	-.02	.13	.17	-.05	-.03	.02	.10	-.03	.08	-.15	-.03	-.06
	A	.10	**.32****	.05	-.03	.12	.14	.02	-.04	-.02	-.05	.03	-.10
	C	.13	.15	.05	-.07	.06	.04	.02	.05	-.03	-.12	-.02	.00
	Age	**.19***	.07	.10	-.22	.09	.04	.17	.08	**.28****	.11	**.23***	.10
	Gender	-.07	.01	**-.25****	-.24	-.05	-.08	**-.24***	.05	-.11	.11	-.13	-.03
	WAKE	-.02	-.13	.08	.19	.18	.16	**-.23***	.12	-.17	-.15	**-.25***	.17
	FOOD	**-.20***	**.19***	-.08	-.08	.01	-.05	.07	.06	-.10	.01	.07	.05
	ALCOHOL	.06	-.07	**.19***	.08	.16	.06	**.23***	-.12	.10	.01	.15	.04
	CAFFEINE	-.05	-.11	.02	-.11	.04	-.02	-.15	-.18	-.13	.13	.00	.15
	SMOKE	-.05	-.01	-.13	.03	-.12	-.05	-.03	.11	-.02	-.15	.09	.03

*** Significant at p< .05 level; ** Significant at p<.01 level**

Table 6.7 Multiple regression models with Emotional Control as a predictor of Mood T2

PREDICTED HEALTH VARIABLES	STEP 1 R^2	STEP 1 CONTROL VARIABLES	ß	STEP 2 R^2 CHANGE	STEP 2 EI SUBSCALES	ß	OVER-ALL F VALUE
Energetic Mood T2	-	None	-	.04*	Emotional control	.20*	4.53

*** Significant at p< .05 level; ** Significant at p<.01 level**

Regressional analysis in table 6.7 reveals that emotional control is a significant positive predictor of energetic mood T2. This indicates that participants with higher emotional control had greater energy at T2.

Moderation by EI of the stress health relationship.

EI was investigated as a moderator of life event stress by applying guidance of Baron and Kenny (1986) which states that if EI is a moderator of the relationship between stress and health, there should be (1) significant main effects but these are not required to evidence to the moderator hypothesis; and (2) there must be a significant interaction effect. To investigate moderation effects between EI subscales and life events stress, interaction terms will be entered in a third step of the multiple regression predicting health variables. Moderated multiple regression is considered the appropriate analysis for detecting the effects of moderator variables (Cohen & Cohen, 1983) and was therefore selected a priori to data being collected. Before moderated multiple regressions were carried out the independent variables were centred (as advised by Aiken & West, 1991) by calculating raw scores minus mean scores. Then interaction terms were calculated by multiplying centre scored life events stress and centre scored EI subscales.

In regressional analysis control variables are included where they demonstrate significant correlation with the dependent variable, plus Emotional control, Emotional recognition and expression, or stressful life events. These correlations are displayed in table 6. Results of moderational regressional analyses are displayed in table 6.8 These regressions reveal a significant interaction between Emotional control and stress condition when predicting baseline energy, therefore interactions are plotted in figure 6.1.

Table 6.8 Moderational analyses for Study 4 cortisol and mood variables.

PREDICTED VARIABLES	STEP 1 R^2 CHANGE	STEP 1 CONTROL VARIABLES	ß	STEP 2 R^2 CHANGE	STEP 2 EI SUBSCALES	ß	STEP3 R^2 CHANGE	STEP 3 INTER-ACTIONS	ß	OVER-ALL F
Baseline Cortisol (T1)	.	None	.	.01	ERE EC Stress condition	-.03 -.01 .09	.02	ERE x Stress EC x Stress	-.08 -.12	.65
Cortisol Change (T2-T1)	.	None	.	.07	ERE EC Stress condition	.03 -.02 .26*	01	ERE x Stress EC x Stress	.06 09	1.86
Total Cortisol reaction (T2+T3)-T1	.	None	.	.10*	ERE EC Stress condition	.08 -.07 .29**	.00	ERE x Stress EC x Stress	.01 -.02	2.28
Base T1 Energy	.03	Alcohol	.16	.02	ERE EC Stress condition	.08 .09 -.01	**.08***	ERE x Stress **EC x Stress**	.13 **.26****	**2.37***
Base T1 Tense	.	None	.	31**	ERE EC Stress condition	-.05 -.02 .56**	.00	ERE x Stress EC x Stress	-.04 .05	6.61**
T2 Energy	.	None	.	.16	ERE EC Stress condition	.01 .18* .35**	.04	ERE x Stress EC x Stress	.02 21*	5.44**
T2 Tense	.	None	.	.14	ERE EC Stress condition	.00 .01 .37**	.00	ERE x Stress EC x Stress	.04 .04	3.54**
T3 Energy		None		.06	ERE EC Stress condition	-.06 .07 .23*	.04	ERE x Stress EC x Stress	.18 .09	2.40*
T3 Tense		None		.02	ERE EC Stress condition	-.10 -.07 .07	.01	ERE x Stress EC x Stress	.06 -.06	.53

*** Significant at p< .05 level; ** Significant at p<.01 level**

6.2.3 Interpretation of significant interactions predicting Energetic baseline mood.

The significant interaction between Emotional control and stress predicting energetic mood T1 two were investigated in figure 6.1

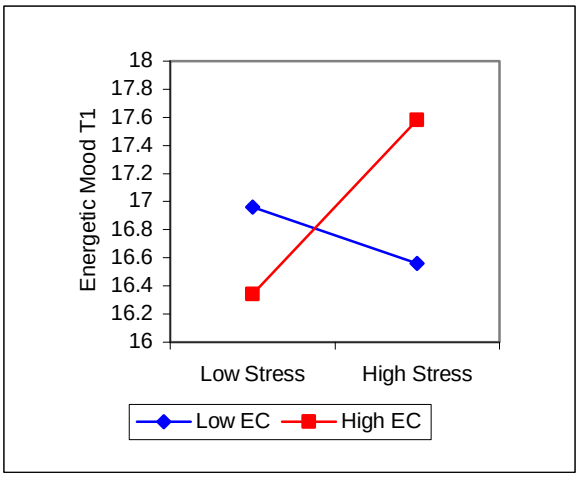

Figure 6.1 Interaction between Stress condition and *Emotional control* predicting Energetic Mood at baseline (T1)

Interaction plot (figure 6.1) reveals that under high stress conditions individuals with low Emotional control report less energetic mood at onset of a stressor.

6.2.4. Summary of analyses

Regressional analyses reveal that Emotional intelligence subscales Emotional control and Emotional Recognition and Expression cannot explain significant amounts of variance in cortisol reactions to stressful experiences. However, Emotional Control can explain significant amounts of variance in energetic mood following a stressor. Moderation analyses reveal that Emotional control moderates the relationship between stressor exposure and energetic mood.

6.3 Discussion

The current study sought to investigate the relationship between trait EI subscales ERE and EC and reactions to acute stressors while overcoming the methodological weaknesses in previous studies; weaknesses such as using EI measures which were inclusive of EI correlates such as happiness, social skills, and optimism (Salovey et al, 2002; Mikolajczak et al., 2007), failing to control for personality (Salovey et al, 2002), and using lab based studies which failed to provide information about how people responds to stressors in the real world. The aim of the study was to replicate previous findings that trait EI can explain unique variance in stress reactivity setting using both mood and cortisol reactivity as measures of stress response.

Regressional analyses reveal that neither ERE nor EC explain significant amounts of variance in cortisol levels. Contrary to predictions, regressional results failed to find evidence that trait EI significantly moderates the relationship between stressor exposure and either cortisol or mood levels. Thus, findings of the current study do not support the proposition that the relationship between trait EI and health is the result of EI reducing cortisol levels following an acute stress task. It is unexpected that the current study did not find trait EI to moderate the relationship between stressor exposure and cortisol response; however, results are supportive of the notion that using a narrower measure of trait EI, controlling for personality age and gender where appropriate, and testing the predictive power of trait EI in a real world setting, are important methodological controls if the relationship between trait EI and health is to be understood. Results of the current study are supported by past research, which has reported that emotional regulation is not a predictor of neuroendocrine functioning (Van Middendorp, Geenen, Sorbi, Van Doornen & Bijlsma, 2005). This suggests that individual facets of EI (emotion regulation is part the ability model and is assessed by trait EI measures) may not have the same predictive power as global trait EI scores. Thus, it is important to understand which components of trait EI have the greatest predictive power to aid theorising, understand underlying mechanisms and guide future research.

Using an assessed undergraduate presentation as a stressor was a strength of this study. Manipulation checks revealed that indeed the high stress condition provoked higher

cortisol reactions, greater tension before the task and increased energetic mood at time two and three. Using university assessments as a stressor reveals how students experience and react to stress in the real world, it suggests that trait emotional intelligence does not make a significant contribution to cortisol levels before and after oral coursework presentations.

Sample size in the current study is higher than previous published cortisol papers (Mikolajczak et al., 2007; Salovey et al., 2002). Thus, it cannot be concluded that the results of the current study are the result of low statistical power. Instead, it is more likely that non-significant results from the current study are the product of controlling for personality, using a measure of EI which was not over-inclusive, and increasing ecological validity. In conclusion, findings from the current study are indicative that trait emotional intelligence is not predictive of physiological reactions to stress, and is not likely to explain the previously reported relationship between EI and health.

Chapter 7: Conclusions, limitations and directions for future research

7.1 Overview of thesis

This thesis has investigated the relationship between trait EI and health, investigating the moderating role of EI in the relationship between stressor exposure and health, and exploring whether the relationship between EI and health is mediated by coping, unhealthy behaviours, or social support. Both objective and subjective measures of stress have been used, personality has been controlled, and health has been explored as a multidimensional construct. In this chapter, I will consider the implications of this work to theory and implications for future research.

7.2 Summary of research

7.2.1 EI explaining unique variance in health

Of the studies presented in this thesis, none present solid evidence that trait EI subscales can explain unique variance in measures of health, over and above the variance explained by control variables of gender, age and personality. This finding is incongruent with past research, with recent meta analysis finding a moderate effect size between EI and health (Martins, Ramalho & Morin, in press). If false positives were produced by past research, then they are likely to have been produced by methods and measures used, and failing to control for gender age and personality. Past research using measures of trait EI which were inclusive of content wider than the ability model has found a relationship between trait EI and health; (e.g. Dawda & Hart, 2000; Mikolajczak, Luminet & Menil, 2006). Although research using narrower measures of trait EI, such as the trait meta mood scale, has found that EI significantly predicted health, the authors failed to control for personality (E.g. Extremera & Fernadez-Berrocal, 2005; Goldman, Kraemer & Salovey, 1996). To interpret results of this thesis in this way is suggesting that there is no real relationship between EI and health.

Alternatively, the current thesis could present false negatives, as a result of poor power due to over estimating effect sizes, or using measures that lack predictive power. However, the current studies had samples sizes comparable with previous research (e.g.

Extremera & Fernadez-Berrocal, 2005; Goldman, Kraemer & Salovey, 1996). Furthermore effect sizes taken from meta analysis should provide a reliable basis for sample size calculations. This suggests that lack of significant findings within the current thesis is not the result of insufficient power.

A third explanation for the inability of ERE or EC to predict health might be that EI only has a positive influence on health under the influence of high stress. Support for this notion comes from the findings in studies 1 and 3 that EI subscales can moderate the relationship between stressor exposure and health. Additionally, it may be that certain types of emotional stressor such as grief may be hindered by emotional awareness, while other problem based stressors such as moving home or financial worries are helped by such skills. If EI subscales help protect health in some circumstances and some hinder it in others, overall results could produce a 'regression to the mean' effect, where having a profile high in ERE or EC does not overall benefit more than having a Low ERE or EC profile. Future research may therefore benefit from investigating whether types of stressor interact with emotional intelligence subscales to influence health. Of course the proposition that EI only explains health under high stress is something that fits with current findings but not the results of meta analysis (Martins, Ramalho & Morin, in press).

Whatever the interpretation, it is the conclusion of this thesis that EI measures which do not include content wider than the ability model (as proposed by Mayer & Salovey, 1997), are unable to predict health variables in populations with a normal distribution of stress scores. Whether tests should contain elements wider than the EI model is an issue distinct from predictive power.

7.2.2 Coping and social support as mediators of the relationship between EI and health

The current set of studies has not found evidence that the relationship between EI and health was mediated by either social support or coping. However, this is due to the lack of significant results for EI predicting health and therefore further mediation analyses not being undertaken. These studies have provided correlational evidence that trait EI is

significantly associated with both social support and coping which supports past research.

7.2.3 Unhealthy behaviours as a mediator of the relationship between EI and health

Study 2 examined whether the relationship between EI and health was mediated by unhealthy behaviours. Correlational analyses revealed that EI subscales ERE and EC were not significantly related to unhealthy behaviours. A recent systematic review of EI and addiction (Kun & Demetrovics, 2010) concluded that low EI was associated with more intensive smoking, alcohol use and illicit drug use, moreover reporting that subscales relating to 'emotion regulation' and 'decoding and differentiating emotions' were the most important factors. Findings of this review suggest that results of the current study are contrary to the general trend, and therefore that differences are likely to be related to measures used or low power here [although as previously discussed, effect sizes reported in meta analyses (Martins, Ramalho & Morin, in press) deem this latter explanation unlikely].

7.2.4. EI moderating the relationship between trait EI and self reported health

Studies 1 and 3 reveal that trait EI can moderate the relationship between stress and health (in study 1 moderated health variables were GP visit frequency and perceived health; while in study 3 moderated health variables were days healthy T2, days ill health reduced daily activities T2, and exercise T3). The direction of findings all support the notion that under high stress, health is best when ERE and EC are high. Although the current studies fail to find evidence that trait EI can explain significant amounts of variance in health, the moderational results suggest that under high stress EI may indeed be predictive of better health. Studies 1, 2 and 3 indicate that ERE and EC are significantly associated with social support (particularly in study 1 and 2). Therefore, when individuals with high ERE and EC experience stress, they may well have greater support to deal with demands, and therefore find stressors less difficult to deal with. This could mean that behavioural and physiological responses to stress are less likely to be activated, or consequently impact upon health. Study 1 also indicates that ERE and EC are significantly and negatively associated with disengaged coping, therefore those with low ERE and EC are more likely to initiate coping strategies whose aim is to avoid

the stressor and associated feelings. Such strategies may include unhealthy behaviours such as drinking alcohol and taking drugs. This suggestion is supported by the longitudinal finding from moderational analyses in study 3 that under high stress those with high ERE or EC exercise more.

It should be noted that moderation findings have not been consistently revealed (for example in study 2 no moderation effects were revealed) something which requires further investigation. A potential explanation for these inconsistencies is that for moderation analyses categories of high low stress were created by performing a median split. This false dichotomy may have failed to meaningfully separate those experiencing high stressor levels, compared to those with low stressor levels. Additionally, subjective stress scores were not considered, only frequency of reported events. This allowed separation of the stimulus and response from stressors, however in doing so the subjective nature of stress responses was not captured.

Interestingly, the significant moderation effects have been consistent in their direction: Under high stress, low EI has been associated with worse health. This directional finding does lend support to the notion that EI is protective of health from the harmful effects of stressful life events. Practical implications of this are that those with low EI and high stress may be most suitable targets for EI interventions. These people have the greater risk of ill health, and may benefit the most from intervention. Further, studying this subgroup may be fruitful in explaining why low emotional intelligence is problematic under high stress.

7.2.5 EI as a predictor of cortisol reactivity

Trait EI subscales did not predict significant amounts of unique variance in cortisol levels or mood. Neither did EI moderate the relationship between stressor exposure and cortisol, although trait EI was found to moderate the relationship between stress condition and mood at baseline. Results suggest that trait EI is not related to lower cortisol levels in daily life, and therefore fails to provide evidence that EI might impact positively on health by precipitating lower cortisol levels (Lindfors & Lundberg, 2002). However, it is possible that the current cortisol study's use of naturalistic setting had an impact upon results. Increasing ecologically valid means that for these participants (students giving assessed presentations as part of coursework requirements) there may

be a large number of other factors which were more important than trait EI in predicting stress responses. For example stress responses could be affected by the participants perceived academic ability, time spent preparing for the presentation, experience at giving presentations, or their understanding of the topic etc; to measure and control for such a large number of constructs was not feasible, and was considered too intrusive and too much of a time burden to be ethical. A further consideration is that participants in this naturalistic setting had greater control over their environment, and so participants with low EI profiles could have compensated for their lack of skills in emotion regulation and expression, finding other behavioural or cognitive ways to deal with their feelings of tension.

7.3 Emotional recognition and Expression, and Emotional control.

The studies presented in this thesis explored two specific areas of emotional intelligence; emotional recognition and expression (ERE) and emotional control (EC). The rationale for doing so was first, that these two subscales had a considerable body of research evidence supporting the notion that they were influential for health; and second that past research demonstrated that while emotional expression was good for health, emotional control was negatively associated with good health. The studies in this thesis have not found evidence that EC is negatively associated with health, instead finding that all significant relationships were positive in direction. This contradicts past research and suggests that emotional control as measured by trait EI scales, taps into a different construct to questionnaires designed specifically to measure emotional control. It is likely that emotional control measured as part of the EI construct is assessing *ability* or ease at managing emotions, while emotional control questionnaires measure a *desire* to control feelings. The lack of convergence in direction of findings between this thesis and past research suggests that emotional control and emotional control as a facet of emotional intelligence are qualitatively different constructs. Further, findings do not support the earlier suggestion (in section 2.3.1) that global EI totals may include subscales whose relationship with health are not all positive in direction, and that summed scores could therefore be less informative than individual subscales. However, it is still the position of this thesis that EI subscales should be explored instead of using global scores: Understanding which individual subscales are predictive of health will

aid theorising about how EI might influence health, and therefore shape interventions. This is something which global scores cannot do with precision.

7.4 Theoretical and practical implications of this research

7.4.1 Implications of Trait EI failing to explain significant variance in health.

This thesis finds that using trait EI measures with content limited to the ability model (as proposed by Mayer & Salovey, 1997), specifying two subscales Emotion recognition and expression (ERE) and Emotional control (EC), and controlling for personality age and gender where appropriate, trait EI is unable to explain unique variance in health variables.

A good theory is sufficiently specific to allow testable hypotheses to be driven, is parsimonious, falsifiable, can explain and predict behaviour and has application (Ogden, 2005). The current research has tested trait EI in the context of stress and health, and has used a parsimonious ability definition of EI. However, trait EI has not explained significant amounts of unique variance in health or cortisol reactivity. Therefore, the following points need to be considered: **First,** given previously reported meta analyses have found that trait EI does indeed explain variance in health, what type of trait EI here lacks predictive power? The content of trait EI measures varies widely (see appendix A) and therefore it could be argued that only measures with content narrowed to the ability EI model lack utility. Future studies therefore need to isolate the additional material to explore whether it is this content, rather than the 'true' trait EI (i.e. that which matches the original ability EI model), which has the predictive power revealed in past studies. **Second,** theoretically we need to understand how EI might protect health and focus future investigations on refining this understanding. In this way researchers can explore EI in a pragmatic manner, allowing utility to drive study design. As Ogden states, if theories are useful then they should be able to shape health interventions.

What has emerged from the results of this thesis is a list of further questions, suggestions for refinement, and propositions for future research. The null hypothesis has not been accepted and this thesis is not proposing that EI has no utility in the field

of stress and health. It is simply asserting that to be useful, a full picture needs to be drawn to understand where the latent relationships really stand. Future research should continue to investigate individual subscales rather than global EI scores to provide maximum theoretical understanding. Further, research should consider investigating the relationship between EI and health should specifically in participants with high exposure to stressors. Finally, more naturalistic research should be conducted, using different measures of stress reactivity, to understand how EI may influence stress reactions in the real world.

In operationalising EI, this research highlights the need to choose a measure of EI which maps well on to the ability EI domain. While the results of this collection of studies provides a complex set of information about the relationship between EI stress and health, using a measure of EI which was over or under conclusive would have made interpretation of results even more difficult. Current results reveal that a good measure of EI without the added predictive power or self esteem, optimism, or happiness can indeed moderate the relationship between stressor exposure and health. Having a solid workable definition of EI will make future research an easier proposition as clear hypotheses can be derived and tested.

7.4.2 Implications of Trait EI moderating the stress health relationship

That Emotional Control and Emotional recognition and expression have been found to moderate the relationship between stressor exposure and health demonstrates that trait EI subscales have utility and predictive power. Furthermore, Emotional Control relates to inhibiting ones own emotions, as this could not be assessed objectively the subjective measures of trait EI can be seen to provide information, which would not be captured by ability EI measures. Findings are contrary to claims that Trait EI has no incremental validity over personality, or little real world use (Roberts, Zeidner & Matthews, 2007). Moreover, findings support the work of Pennebaker (1997) who reported that emotion expression of past trauma was predictive of improved health.

Findings that Emotional Control and Emotional Recognition and Expression moderate the relationship between EI and health reveal that under stressful conditions that recognising, controlling and expressing of emotions are beneficial for health. However

emotional intelligence does not have the same predictive power over health as behaviours such as smoking drinking alcohol, and poor diet and therefore would not be a logical target for intervention at population level. Nevertheless, for individuals under stressful conditions, increasing skills in Emotional Control and Emotional Recognition and Expression might form a useful part of cognitive behavioural therapy (CBT) where negative emotions are reduced with the aim of reducing negative cognitions or unhealthy behaviours. Additionally findings support the work of charities such as The Samaritans who allow people to express feelings of distress or despair, such a service is likely to benefit the health of those who use it.

7.5 Limitations

The current studies have used a student sample, have been unequal in gender recruitment, and have used young healthy participants. While age and gender have been controlled for in each study, future research may investigate EI stress and health again using a wider sample from the general population. While there are issues with using a student sample, this population has allowed EI and cortisol to be investigated in a naturalistic setting, something which would be difficult to achieve with other sampling techniques. Additionally students provide a diverse spread of scores for stressful life events; students may experience a wide range of challenges in adjusting to university life, these challenges include but are not limited to financial, domestic, academic and social arenas.

Investigating cortisol reactivity in a naturalistic way is not without issues. While participants were asked to refrain from drinking alcohol, smoking, eating and drinking caffeine before the study, a number of them did not. This is to be expected as consuming these things will to an extent be part of preparing for an oral presentation. Participants did record all food drink and nicotine they had consumed and this allowed control variables to be added into the analyses. While many participants did not refrain from drinking eating and smoking, none-the-less manipulation checks revealed that participants giving highly stressful presentations did show physiological reactivity, with raised cortisol levels immediately after their presentations were over.

Studies 1 to 3 used self-report measures of health. Self report measures not intrusive or time consuming and are therefore appealing compared to objective assessments such as

heart rate and blood pressure; moreover self reported health has been found to be predictive of life expectancy and future health as well if not better than medical examinations (Helmer, Barberger-Gateau, Letenneur & Dartigues, 1999; Miilunpalo, Vuori, Oja, Pasanen & Urponen, 1997). However such measure are problematic in that participant's reports may be subject to reporting biases, memory and perceived demand characteristics (Ogden, 2007), further they may not provide the same results when compared with objective health measures (Johnston, Propper & Shields, 2009). It may therefore be fruitful for future research to replicate these studies using objective measures of health such as GP records.

7.6 Conclusions

This thesis finds in studies 1,2 and 3, that two components of Trait EI, [Emotional recognition and expression (ERE), and Emotional control (EC)] as measured with the SUEIT, are not able to explain unique variance in health scores over the variance explained by personality in samples with a normal distribution of stress. Additionally, in study 4 the current study failed to reveal EI as a significant predictor of cortisol reactivity or mood following an acute stress task. However, trait EI subscales have revealed evidence that they can significantly moderate the relationship between stressor exposure and health.

This thesis concludes that using trait EI measures with content limited to the ability model (as proposed by Mayer & Salovey, 1997), controlling for personality, age and gender, and using a population that has unspecified magnitude or frequency of stressor exposure, trait EI is unable to explain significant amounts of variance in health variables. Future research should therefore aim to provide evidence that more focussed measures of trait EI have predictive power and incremental validity. Alternatively, to explore where their predictive power lies, the individual subscales of trait EI measures with wider content should be investigated. Trait EI has been found to moderate the relationship between stressor exposure and health, and this should be furthered by exploring the relationship between EI and health in the context of different levels of stressor, to explore the possibility that EI is particularly beneficial to health under high stress. Understanding these nuances is important in understanding how EI interventions may be targeted to protect physical health from the effects of stressors. Stressful

environments are ubiquitous in work and education, therefore investigating how EI might protect from its negative effect health should be considered worthwhile.

Refinement of the methods and measures used in this thesis would provide useful data on whether EI can make a quantitative difference to health in the presence of acute or prolonged stressors. In summary, this thesis does not present convincing evidence that trait EI can protect health for people with all levels of stressor exposure. However, results of the current study do suggest that trait EI is a significant moderator of the relationship between stressor exposure and health. That trait EI has been found to protect health from the effects of stress, supports the claims of theorists by revealing that emotional intelligence really does influence everyday life, and that its interaction with exposure to stressors is as important as claimed for coping with or experiencing emotional stress reactions.

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Appendix A – Justification of choice of Trait EI measure

A literature review was conducted to identify suitable trait EI measures. Searches in popular literature and search engines such as Google reveal hundreds of measures of emotional intelligence, however only peer reviewed scholarly sources were considered the remit of this thesis. Data base searches in October 2005 used EBSCOHost (which includes data bases such as Academic Search Complete, E-journals, PsycARTICLES, and PsycINFO), and this revealed 7 predominant measures of trait Emotional intelligence: 1. The Emotional Intelligence Scale (SEIS; Schutte et al., 1998); 2. The Multidimensional Emotional Intelligence Assessment (MEIA; Tett, Fox, & Wang, 2005); 3. The Trait Emotional Intelligence Questionnaire (TEIQue; Petrides & Furnham, 2003); 4. The Emotional Quotient Inventory (EQ-I; Bar-On, 1997); 5. The Trait Meta Mood Scale (TMMS; Salovey, Mayer, Goldman, Turvey & Palfai, 1995); 6. The twenty item Toronto Alexithymia Scale-II (TAS-20; Bagby, Taylor & Parker, 1994); 7. Swinburne University Emotional Intelligence Test (SUEIT; Palmer & Stough, 2001).

For a measure of emotional intelligence to demonstrate quality it should; (i) provide adequate coverage of the EI domain; (ii) exhibit good reliability, (iii) be able to demonstrate utility by predicting important practical outcomes; and (iv) have similarity to other EI measures while being distinct from unrelated constructs (Mayer, 2001). In order to select the best available measure these criteria were applied to the 7 identified measures:

(i) Measures should assess the whole EI domain as defined by the ability model (Mayer & Salovey, 1997), not the trait model defined by Petrides (2001) to include personality. Petrides' trait model claims to encompass variance of two kinds: one portion drawn from higher order dimensions of established personality taxonomies (e.g., Big Five, Giant Three) and one portion of variance that lies outside these dimensions. Many researchers have described EI as being inclusive of trait and dispositions such as *happiness*, *self-esteem*, *optimism*, and *self-management*, rather than as ability based (Bar-On, 2004; Boyatzis & Sala, 2004; Tett, Fox, & Wang, 2005; Petrides & Furnham, 2001;). For example self esteem (included in the TEIQue; Petrides, 2001; Petrides & Furnham, 2003) does not directly measure emotion or intelligence or their intersection

(Matthews et al., 2004, p. 185, cited Mayer Salovey & Caruso, 2008). Further it seems illogical to decide to include optimism in a measure (i.e. the TEIQue, 2001) and then control for personality when using it (E.g. Petrides, Perez-Gonzalez, & Furnham, 2007; Mikolajczak, Luminet, Leroy & Roy, 2007). Additionally measures of EI containing correlates of EI such as stress management and coping (e.g. Bar-On, 1997) are problematic for this research programme, subsequent results may include 'false positives' by finding significant relationships between EI and other study variables that are an artefact of methods or assessment, rather than indicative of a real underlying relationship. Therefore this research aims to identify a self report (and therefore Trait not ability EI) Emotional Intelligence questionnaire which does not assess constructs wider than the ability model.

(ii). Measures should fully assess the whole EI domain; tests which only provide coverage of a portion of the full domain will be excluded. **(iii)**. Measures should have been used in research published in peer review journals and provide evidence of predictive power; **(iv).** Psychometric data should demonstrate that measures have good reliability.

Applying the first criterion, adequate coverage of the EI domain, reveals three measures to be too narrow in content (SEIS, TAS-20, and TMMS). The SEIS, although designed to cover the 1997 ability model (Mayer & Salovey), fails to do so as it has poor factor structure and does not support each of the four EI branches. The scale was originally designed and presented as a unifactorial measure; however confirmatory factor analysis does not support a single factor solution and several studies have suggested a four factor solutions instead (Saklofske et al., 2003; Petrides & Furnham, 2000). These four factor solutions have varied sufficiently to support criticism of the stability of the measures stability. Moreover, when the most commonly used four factor solution is applied (Petrides & Furnham, 2000) the factors produced (*Optimism/Mood Regulation, Appraisal of Emotions, Social Skills and Utilisation of Emotion*) do not map well onto the ability model, producing content which is wider than the EI domain (*social skills*), and failing to assess other core areas (e.g. emotional facilitation of thinking). Additionally the 4th factor *Utilisation of Emotion* solution is not always reliable enough for use requiring that it is omitted from analyses (e.g. Ciarrichi & Dean, 2002). Researches who have added items to the SEIS with the aim of increasing reliability of

this 4th factor have still identified only three factors (Austin, Saklofske, Huang & McKenny, 2004), thus again failing to capture the whole EI domain.

Also failing to cover the full EI domain were the TAS-20 and the TMMS. The TAS-20 is an alexithymia measuring three subscales (*difficulty in identifying feelings, difficulty describing feelings,* and *externally oriented thinking*). Never intended to be used as an EI measure the TAS-20 misses core aspects of EI ('emotion regulation' and 'emotional facilitation of thinking'). Finally, the TMMS has three subscales (attention to emotion, emotional clarity, and emotional repair), it fails to capture the full EI domain missing 'emotional facilitation of thinking'.

The second criterion used for selection of EI measure explored the extent to which measures were over inclusive, by capturing constructs which fall outside the EI domain. If an EI measure assesses aspects of other well established non EI-constructs (such as self esteem or happiness) then results of that test do not inform the research community about the properties of EI. Moreover, measures of trait EI have been found to overlap significantly with personality, and have therefore been called upon to demonstrate incremental validity by controlling for the big five. Therefore it is illogical for EI tests to purposefully assess correlates of EI such as personality, only for test users to have to control for them. Of the 7 identified measures of EI, three were over inclusive in content (SEIS; EQ-i, and the TEIQue). As discussed above, the most popular factorial solution of the SEIS (Petrides & Furnham, 2000) includes a subscale for '*social skills*'. The EQ-i includes five subscales which relate to non-EI constructs (*optimism*, *self-actualisation*, *happiness*, *independence*, and *social responsibility*). Meanwhile, the non-EI content of the TEIQue is primarily the compound scale of *Well-Being* which is made up of three subscales *Happiness*, *Optimism* and *Self-esteem*.

The third criterion used in selection of the EI measure was that the test should have been used in research published in peer review journals. At the time of measure selection all but one of the measures had been used in published research. The MEIA

Table A1 Summary of Trait EI measures: coverage of EI domain, focus of content and availability of psychometric data

Measure	Measure sufficiently broad to capture the full EI domain.	Measure sufficiently focused as not to include correlates or constructs out with the EI domain.	Measure used in published peer reviewed research, therefore data on reliability and validity available.
EQ-i Bar-on (1997)	✓	×	✓
MEIA Tett, Fox & Wang, (2005)	✓	✓	×
SREI Schutte et al., (1998)	×	×	✓
SUEIT Palmer & Stough, (2001)	✓	✓	✓
TAS-20 Bagby, Taylor & Parker, (1994)	×	✓	✓
TEIQue Petrides & Furnham, (2003)	✓	×	✓
TMMS Salovey, Mayer, Goldman, Turvey & Palfai (1995)	×	✓	✓

was published in July 2005 and other than the data provided by the scale authors, the scales had not used elsewhere. This meant that there was no evidence of the predictive power of the measure, and further that there was no data for use in comparison of either results or reliability.

The application of the above three criteria are summarised in Table A1. The criteria result in the selection of the SUEIT for use in the current program of research. Of the seven potential EI measures which could have been selected only the SUEIT met the first three criteria. The SUEIT was developed in response to the existing measures being either over inclusive or too narrow in focus. Aiming to measure the most definitive elements of Emotional Intelligence, Palmer and Stough (2001) conducted a large factor analytic study of the six predominant EI measures at the time. [1. MSCEIT; 2. EQ-I; 3. TMMS; 4. TAS-20; 5. Schutte SEIS; and 6. The Tett inventory (Tett, Wang, Thomas, Griebler, Linkovich, 1994)]. To identify the number and nature of components common to all of the inventories principle components analyses were applied to each measure in turn. The main factors assessed by each inventory were in this way identified and calculated then component scores of these main factors were used in an exploratory component analysis. The procedure revealed five factors which were labelled: 1. *Emotional recognition and expression* (in oneself) (*ERE*), the ability to identify one's own feelings and emotional states, and the ability to express those inner feeling to others; 2. *Emotions direct cognition* (*EDC*), the extent to which emotions and emotional knowledge are incorporated in decision making and/or problem solving; 3. *Understanding of emotions external (UE*), the ability to identify and understand the emotions of others; 4. *Emotional management (EM*), the ability to manage positive and negative emotions within both oneself and others; and 5. *Emotional control (EC*), how effectively emotional states experienced, such as anger, stress, anxiety and frustration are controlled. The five factors are assessed using 64 items where respondents select a response from a 1 to 5, indicating whether they never, seldom, sometimes, usually, or always think, feel, or act as specified in a given situation. The scale contains a mixture of positive and negatively worded items.

The SUEIT demonstrates good content validity as the measure's five factors represent good coverage of the EI domain mapping well on to the (1997) Mayer and Salovey model (see table A2). They also demonstrate good focus on the EI domain, and items do not refer to constructs other than EI. The SUEIT has demonstrated utility by

explaining unique variance in a number of published studies predicting outcomes such as life satisfaction (Gannon & Ranzijin, 2005), leadership (Downey, Papageorgiou & Stough, 2006), and critical and detached behaviour (Moss, Ritossa & Nga, 2006).

The SUEIT appears to have good reliability. For test re-test reliability over one month, correlations for subscales ranged between 0.81 and 0.94 (Palmer & Stough, 2001). Meanwhile for internal reliability Rajendran, Downey and Stough (2007) report cronbach alpha coefficients as follows; Total EI α= .91, Emotional Recognition and expression α=.78; Understanding of Emotions External α=..86; Emotions Direct Cognition α=.81; Emotional Management α=.81; Emotional Control α=.80. For the current study cronbach alpha coefficients were as follows: Emotional Recognition and expression α=.78; Understanding of Emotions External α=.79; Emotions Direct Cognition α=.66; Emotional Management α=.77; Emotional Control α=.74. Reliability analysis reveals that one of the SUEIT subscales yielded an internal reliability less than .70, and is therefore considered to have low reliability (Pallant, 2006). For this subscales removing items would increase reliability (for *Emotions direct cognition* to .72) However, it is desirable to compare the current study demographics and results to those from previous research, and as altering subscales would prevent this, the benefits of increased reliability would be negated by the loss of interpretation. The SUEIT's technical manual confirms the correlation of EI subscales with Neuroticism, extroversion and openness, ranges from r=.09 to r=.47, with total EI correlating significantly with neuroticism (r=-.41, p<.001), extroversion (r=.44, p<.001), and openness (r=.27, p<.001). The current study found that correlations between SUEIT subscales and personality factors ranged from r= .00 to r=.61, this confirms the need to control for personality when using the SUEIT.

The SUEIT maps well onto the Mayer and Salovey (1997) ability model (see table A2). Branch 1 relates to reflective regulation of emotions to promote emotional and intellectual growth. This includes the ability to stay open to feelings, the ability to reflectively engage or detach from emotion depending on it's judged informativeness, the ability to reflectively monitor emotions in relation to oneself and others, and the ability to manage emotions in oneself and others by moderating negative emotions. Branch 1 corresponds well to two SUEIT subscales: (1) Emotional management, which measures the ability to manage positive and negative emotions both within self and

others and (2), Emotional Control, which relates to the ability to effectively control strong emotions states such as anger, stress, anxiety and frustration.

Branch 2 relates to Understanding and analysing emotions, and employing emotional knowledge. This includes the ability to label emotions and recognise relations among the words and the emotions themselves, the ability to interpret the meanings that emotions convey, the ability to understand complex feelings including simultaneous feelings such as love and hate, and the ability to recognise likely transitions among emotions such as the transitions among emotions, such as anger to shame. Branch 2 maps well onto the SUEIT subscale Understanding Emotions of Others, which measures the ability to identify and understand the emotions of others, being conscious of and paying attention to the emotions of others.

Branch 3 of the ability EI model relates to emotional facilitation of thinking. This includes allowing emotions to prioritise thinking by drawing attention to important information, using vivid emotions to be generated to aid judgement, allowing emotional mood swings to change perspective and thus generating multiple points of view, and allowing emotional states to encourage different problem approaches. Branch 3 is reflected well in the content of the SUEIT subscales Emotions Direct Cognition, which measures the extent to which emotions and emotional knowledge are incorporated in decision making and problem solving.

Finally, branch 4 of the ability model relates to perception appraisal and expression of emotion. This relates to the ability to identify emotion in ones physical states feelings and thoughts, the ability to identify emotions in other people and art through language sound appearance and behaviour, the ability to express emotions accurately and to express related needs, and the ability to discriminate between honest and dishonest expressions of feeling. Branch 4 maps well onto the SUEIT subscale Emotional Recognition and Expression, which measures the ability to identify and express one's own feelings and emotional states.

In summary general evaluation of the SUEIT is favourable in comparison to the other potential measures this research could have used. The measure is relatively short and is free to use, therefore it is likely to be used by researchers more frequently as the body of evidence demonstrating its psychometric properties and predictive power expands.

As indicated in chapter one, the aims of this research were particularly to focus on understanding the impact of Regulation of Emotion (branch 1) and Emotional expression (branch 4). Therefore SUEIT subscales Emotional Control, and Emotional Recognition and Expression were selected for use in analyses

Table A2 Mapping SUIET on to the ability model of EI.

MAYER & SALOVEY (1997) MODEL		**SUEIT**	
Branches	Sub-branches	Factors	Explanation
1. Reflective regulation of emotions to promote emotional and intellectual growth	Being open to feelings.	EM & EC	Emotional management: The ability to manage positive and negative emotions within both oneself and others; Emotional control: How effectively emotional states experienced, such as anger, stress, anxiety and frustration are controlled.
	Ability to engage or detach from emotion.		
	Ability to monitor emotions		
	Ability to manage emotion in self and others		
2. Understanding and analysing emotions; employing emotional knowledge	Ability to label emotions and recognise relationships between emotions and emotional words	UE	Understanding of emotions external: The ability to identify and understand the emotions of others
	Ability to interpret the meanings that emotions convey		
	Ability to understand complex feelings or blends of feelings		
	Ability to recognise transitions among emotions		
3. Emotional facilitation of thinking	Using emotion to prioritise thinking	EDC	Emotions direct cognition: The extent to which emotions and emotional knowledge are incorporated in decision
	Emotions available and vivid		
	Ability to use mood swings to consider multiple points of view		
	Emotional stages encourage different approaches to problems solving		
4. Perception, Appraisal and expression of emotion	Ability to identify emotions in self	ERE	Emotional recognition and expression The ability to identify one's own feelings and emotional states, and the ability to express those inner feeling to others
	Ability to identify emotions in others		
	Ability to express emotions and related needs		
	Ability to appraise the difference between honest and dishonest feelings		

Appendix B – Convergent Validity of the SUEIT

As part of data collection for study one a small group of participants were recruited asked to complete the Swinburne University Emotional Intelligence Test (SUEIT), the Trait Emotional Intelligence Questionnaire – Short Form (TEIQue-SF; Petrides & Furnham, 2006); and the Schutte Self Report Inventory (SSRI; Schutte et al, 1998) to provide data on convergent validity.

EI Measures

Swinburne University Emotional Intelligence Test (SUEIT; Palmer & Stough, 2001)

The SUIET demonstrates good content validity as the measure's five factors represent good coverage of the EI domain mapping well on to the (1997) Mayer and Salovey model. They also demonstrate good focus on the EI domain, and items do not refer to constructs other than EI. The SUEIT has demonstrated utility by explaining unique variance in a number of published studies predicting outcomes such as life satisfaction (Gannon & Ranzijin, 2005), leadership (Downey, Papageorgiou & Stough, 2006), and critical and detached behaviour (Moss, Ritossa & Nga, 2006). The SUEIT has also been shown to have good internal reliability (Rajendran, Downey & Stough, 2007) and test re-test reliability (Palmer & Stough, 2001). For the current study cronbach alpha coefficients were as follows: Emotional Recognition and expression (α=.80); Understanding of Emotions External (α=.85); Emotions Direct Cognition (α=.69); Emotional Management (α=.70); Emotional Control (α=.71). For EDC removing item 12 would have increased reliability to α=.72. However it was decided that this was not desirable as it would prevent direct comparison of results with other published data.

The Trait Emotional Intelligence Questionnaire – Short Form (TEIQue-SF; Petrides & Furnham, 2006).

The TEIQue-SF consists of 30 items responded to on a 7 point scale. The questionnaire is designed to measure global trait emotional intelligence (trait EI) and is based on the full form of the TEIQue (Petrides & Furnham, 2003), which covers the trait EI sampling domain as defined by Petrides (2001) to include a wide range of traits and emotion related constructs has as optimism, happiness and self-esteem,. The TEIQue-SF provides a reliable global trait EI score that correlates with a wide range of criteria,

including coping styles, life satisfaction, personality disorders, perceived job control, and job satisfaction (Petrides et al., 2003). Reliability for the current study was (α=.88).

The Schutte Self Report Inventory (SSRI; Schutte et al, 1998)

The Schutte Self Report Inventory (Schutte et al., 1998) is 33-item measure of self-rated global emotional intelligence which uses a 5 point response scale. The scale was originally designed and presented as a unifactorial measure; however a four factor solution is commonly applied (Petrides & Furnham, 2000) producing subscales '*Optimism/Mood Regulation', 'Appraisal of Emotions', 'Social Skill's and 'Utilisation of Emotion'*. Sample items include "I am aware of my emotions as I experience them" and "I know why my emotions change." Reliabilities for the current study were '*Optimism/Mood Regulation'* (α=.79); *'Appraisal of Emotions'* (α=.74), *'Social Skills'* (α=.70); *'Utilisation of Emotion'* (α=.63); and scale Total (α=.88). For *'Utilisation of Emotion'* removal of any item would decrease increase reliability.

Comparative scores of SUEIT, TEIQue-SF, and SSRI

To provide data on the convergent validity of the SUEIT with other EI measures (and therefore to enable comparison with the results of other EI studies) participants were asked to complete the TEIQue-SF, and SSRI in addition to the SUEIT. Intercorrelations are displayed in table B1.

Intercorrelations between SUEIT total and score totals for TEIQue-SF and Schutte SSRI reveal highly significant positive relationships (r=.57 and r=.64); all SUEIT subscales have significant positive correlations with Schutte Total (r=.18 to r= .50) all but one SUEIT subscales (not 'emotions direct cognition') demonstrate highly significant positive correlations with the TEIQue-SF total (r= .39 to r=.60); SUEIT subscales reveal small to significant correlations (r=.14 to r=.55) with the three main Schutte subscales but not with the final Schutte factor Utilisation of Emotion which had small and most non significant correlations. In summary the SUEIT displays significant evidence of convergence with other measures of EI.

Table B1 correlations between SUEIT TEIQue-SF and SSRI scale totals

		SCALE TOTALS			SUBSCALES								
					SUEIT						SCHUTTE SSRI		
		SUEIT	Schutte SSRI	TEIQue-SF	ERE	UE	EDC	EM	EC	MR	AE	SS	UE
SUEIT		1	**.57****	**.64****	**.69****	**.76****	**.44****	**.65****	**.49****	**.40****	**.54****	**.55****	.13
Schutte SSRI			1	**.61****	**.47****	**.50****	**.32****	**.39****	**.18***	**.77****	**.77****	**.88****	**.48****
TEIQue-SF				1	**.41****	**.47****	.11	**.60****	**.39****	**.66****	**.43****	**.52****	.11
SUEIT subscales	ERE				1	**.48****	**.33****	**.67****	.10	**.20***	**.54****	**.47****	.14
	UE					1	**.23****	**.36****	.13	**.26****	**.55****	**.47****	.13
	EDC						1	.07	-.06	.15	**.25****	**.35****	**.25****
	EM							1	**.38****	**.47****	**.25****	**.34****	.03
	EC								1	**.26****	.14	.14	-.02
SCHUTTE subscales	MR									1	**.42****	**.57****	**.32****
	AE										1	**.61****	.17
	SS											1	**.34****
	UE												1

* **Significant at p< .05 level;** ** **Significant at p<.01 level** Key: SUEIT subscales: ERE= Emotional Recognition & Expression; UE= Understanding Emotion; EDC= Emotions Direct Cognition; EM= Emotional Management; EC= Emotional Control. SSRI subscales: MR= Mood Regulation/ Optimism; AE= Appraisal of Emotions, SS= Social Skills; UE= Utilisation of Emotion.

Appendix C- Factor analysis of Brief Cope questionnaire

Although initial factor analysis of the Brief cope items (Carver, 1997) yielded nine factors with Eigenvalues of more than 1.0, the original questionnaire was proposed as a fourteen factor scale. In the current study to confirm how the 28 coping items might be combined to create more parsimonious groups, a varimax rotation was conducted. This is in line with suggestion by Carver, Scheier and Weintraub (1989). In agreement with other studies which have also factor analysed the brief cope (e.g. Ng & Leung, 2006), the current study found a three factor solution.

This procedure began with a principle components analysis, where factor loadings were restricted to those > .3, and this found prior to rotation that eight factors with Eigenvalues of more than 1.0 could be extracted. These explained 68.14% of the variance. Three factors were retained on the basis of the scree plot, and a varimax rotation revealed these three factors were constructed as below. Each of the brief cope subscales has two items, and where there was ambiguity of distinction between superscales a parsimonious approach was taken where a subscale had one item loaded onto one factor and the second item on another factor the subscale was excluded. It should be added that Carver et al. (1989) originally suggested a second order factor analysis (in other words using the totalled subscales as the raw data), however this produced factors which failed to make sense theoretically.

Factor analysis presented in table 7 below, confirms three groups of coping strategy (with the original brief cope subscale names); *Disengaged coping* (Substance use; Denial, Behavioural disengagement, Self blame, and Distraction); *Engaged coping* (Planning, Positive reframing, Active coping, Acceptance); and *Social coping* (Emotional social Support; Instrumental social support). Previous studies had found subscales made up differently. For example Ng & Leung (2006) also found a three factor solution.

Table C1 Brief Cope Factors

FACTORS (BRIEF COPE ITEM NUMBERS; AND SUBSCALE)	FACTOR LOADINGS		
	Factor 1	Factor 2	Factor 3
1. Disengaged coping			
Eigenvalue: 4.41			
Variance explained: 15.73%			
8 Refusing to believe it happened	.704		
4 Using alcohol/ drugs to feel better	.701		
11 Using alcohol/ drugs to get through	.693		
16 Given up coping	.671		
3 Saying "this isn't real"	.668		
6 Given up dealing with it	.577		
13 Been criticising myself	.512		
26 Blaming myself	.467		
22 Comfort in religion or spirituality *	.449	.429	
9 Saying things to let feelings go **	**.431**		**.423**
1 Using work or activity as distraction	.410		
27 Praying or meditating *	**.388**	.305	
19 Distraction using TV, movies, sleep	.373		
28 Making fun of the situation ***	**.303**		
2. Engaged coping			
Eigenvalue: 4.20			
Variance explained:15.01%			
14 Coming up with a strategy		.758	
25 Thinking about steps to take		.737	
17 Looking for good in what happened		.677	
2 Doing something about situation		.632	
20 Accepting the reality		.618	
7 Taking action to make it better		.572	
12 Seeing it in a new positive light		.571	
24 Learning to live with it		.484	
21 Expressing negative feelings**		**.405**	**.369**
18 Making jokes about it***	**.321**	**.354**	
3. Social support			
Eigenvalue: 3.40			
Variance explained:12.14%			
5 Getting emotional support			.832
10 Getting help and advice			.832
15 Getting comfort and understanding			.805
23 Getting advice about what to do			.750

items 22 and 27 were omitted as both these religion subscales loaded onto both factors one and two, suggesting ambiguity in meaning. ** items 9 and 21 were omitted as venting subscales loaded between factors *** items 18 and 28 were omitted as these humour subscales loaded between factors

Appendix D – A-priori calculations for power and sample size

For regressional analyses a-priory power calculations were undertaken to calculate the required sample size. In the EI literature effect sizes for EI and health indicate that a low to moderate effect size should be expected (Cohen (1988; 1992) suggests effect sizes of .20 are considered small, .50 moderate and .80 large). For example meta analysis by Schutte Malouff, Thorsteinsson Bhullar and Rooke (2007) revealed an effect of r=.22. Therefore calculations for power and sample size were conducted for low and low-moderate effect sizes (see table D1). This is estimate of effect size is supported by a recent meta analysis (Martins, Ramalho & Morin, in press) which reports a moderate effect size ($\bar{r}$= .27) for trait emotional intelligence predicting physical health. This meta analysis used a larger pool of articles, including international journals and articles published subsequent to the study by Schutte et al., (2007). Therefore in calculations to assess required sample size moderate and moderate small effect sizes were considered Sample sizes were computed using an online statistics calculator http://www.danielsoper.com/statcalc/calc16.aspx

For regressions of EI predicting health the maximum number of predictors in step 1 is anticipated to be 3, and in step 2 to be 2.

Table D1. A- Priori calculations of required sample size

Number of Predictors step 1	Number of Predictors Step 2	Sample size required for .80 power		
		Low effect size .15	Low-Moderate Effect size .22 (as per Schutte et al., 2007)	Low-Moderate Effect size .27 (as per Martins et al., in press)
0	1	54	37	31
0	2	67	47	39
1	1	55	38	32
1	2	68	48	40
2	1	56	39	33
2	2	69	49	41
3	1	57	40	34
3	2	70	50	42