

EXPLORING HOW STRESS MINDSET, IRRATIONAL BELIEFS, AND STRESS APPRAISALS RELATE
TO PSYCHOLOGICAL WELLBEING AND PERFORMANCE UNDER PRESSURE

By

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A thesis submitted to University of Birmingham

for the degree of

DOCTOR OF PHILOSOPHY

School of Sport, Exercise, and Rehabilitation Sciences

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University of Birmingham

December 2022

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Abstract

The overarching aim of the present thesis was to explore how stress mindset, irrational beliefs, and stress appraisals related to psychological wellbeing and performance under pressure. To achieve this aim Chapter 2 first investigated how trait dispositions (i.e., stress mindset and irrational beliefs), stress appraisals, and psychological wellbeing were related. Path analysis was employed to examine the direct and indirect effects of these relationships using cross-sectional data from over 400 athletes from a variety of sports across a range of competitive levels. Chapter 3 then assessed whether the relationship between stress mindset and stress appraisal tendencies identified in Chapter 2 was mediated by proactive coping. By using a mixture of athletes and non-athletes, a secondary aim of Chapter 3 was to investigate whether there were any differences in stress mindset between these samples.

Following on from the identified associations in the first two chapters, an experimental design was employed in Chapter 4 that aimed to examine whether an individual's stress mindset could be altered using a stress mindset and imagery intervention. Additionally, the study investigated whether any changes in stress mindset were accompanied by higher levels of self-confidence, a greater challenge appraisal, lower threat appraisal, more facilitative anxiety, and better performance of a competitive golf putting task.

This thesis makes a novel contribution to the area of psychological wellbeing and performing under pressure by offering cross-sectional and experimental data that extends the evidence highlighting the importance of stress mindset and stress appraisals relating to psychological wellbeing. In Chapter 2, this thesis also contains the first-known study that has

measured stress mindset of athletes and compared this to non-athletes. Alongside the findings in Chapter 3, these results highlight the role that stress mindset may have in influencing stress appraisals and psychological wellbeing, and the mechanisms as to how this may happen. Furthermore, the conceptualisation of stress mindset under the umbrella of REBT offers a novel perspective as to how negative beliefs about stress could be challenged.

Dedication

This thesis is dedicated my family. Without your support during my postgraduate education, completing this doctorate would not have been possible. Thank you.

Specifically, I would like to dedicate this thesis to my daughters. I hope that this inspires you on your own journeys in education.

I would also like to dedicate this thesis to all those who have encountered particularly difficult times in their lives. I hope the findings of this thesis offer some support to you.

Acknowledgements

I would like to begin by thanking Sarah as my primary supervisor. I would have been lost without her knowledge, advice, and guidance throughout this PhD. This was particularly the case when it comes to stats and path analysis! Thank you for all the really detailed feedback that was so useful when trying to improve the drafts of my work. Thank you also to Jet for her input at the beginning of the degree. Thank you to those that gave me the opportunity to teach in higher education. The experience was invaluable. I would also like to thank the undergraduate students who helped me to collect the data in Chapters 3 and 4, and those who participated in the studies within this thesis.

When it comes to acknowledging my family, I must begin by thanking my grandparents. Without the support from them, I might not have even started my undergraduate degree in 2002. Nobody in my family had ever been to university before, and without their help, I may not have made that first step into higher education.

Completing this PhD would not have been possible without the support of my parents. I will always be grateful for the emotional support from Dad and Lisa, and Mum and Gary, as well as the more practical help by looking after the girls when I needed to work on my PhD. Progress through this PhD has not been plain sailing, and you all helped to pick me up at some of the difficult moments along the way.

I would also like to thank my wife, Nicola. I can appreciate that it has not always been easy to live with someone who is going through the ups and downs of completing a PhD, so thank you for your encouragement and patience throughout this process. Also, I must acknowledge the role that my daughters Chloe and Emily have played by providing me

with welcome distractions from studying. Hopefully I have made you all proud by completing this PhD.

Rewinding back to 2016, I began my postgraduate studies at Staffordshire University. It is not hyperbole to say that this MSc changed my life, particularly the theory around Rational Emotive Behaviour Therapy. The interesting content lit a fire within me and has undoubtedly provided a foundation for which to build my future career on. So, thank you to Matt Slater and Andrew Wood for providing the inspirational content during this MSc. Also, special recognition should also go to Martin Turner for the same reasons, but also for helping me to develop as a writer and researcher in our recent publication.

Completing a PhD whilst at times holding down three different jobs has not been easy or left me much free time to spend with friends, but I would like to acknowledge Grace, Laura, and Neil for their support in my time at Birmingham. Outside university, I have been grateful for the friendship provided through my football community and would like to single out Manny as an inspirational individual. Thank you for involving me in your fundraising and for giving me something worthwhile to focus on as an alternative to studying. Also, thank you to Dave for selecting me as a co-host on his Always Wolves podcast. Being involved with both the fundraising and the podcast has enabled me to meet many wonderful individuals and develop as a person.

Finally, I would like to acknowledge my colleagues from my time at Loughborough University. Your knowledge and experience during this year was invaluable and has certainly helped me to develop as an academic. Special mention here to Jamie Barker for the opportunities that he gave me in teaching on his module and writing a book chapter.

Contents Listing

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Publications Produced During the PhD

Publications which are part of this PhD

1. Mansell, P. C. (2021). Stress mindset in athletes: Investigating the relationships between beliefs, challenge and threat with psychological wellbeing. *Psychology of Sport and Exercise*, 57, 102020.
2. Mansell, P. C. (2022). The mediating role of proactive coping in the relationships between stress mindsets, challenge appraisal tendencies, and psychological wellbeing. *International Journal of Sport and Exercise Psychology*. (Submitted to Journal: Under Review)

Publications which are not part of this thesis

Journal Article

Mansell, P. C., & Turner, M. J. (2022). Testing the REBT-I model in athletes: Investigating the role of self-confidence between irrational beliefs and psychological distress. *Psychology of Sport and Exercise*, 63, 102284.

Online Article

Mansell, P. C. (2021). "Athletes use stress to boost their wellbeing - here's how you can too". <https://theconversation.com/athletes-use-stress-to-boost-their-wellbeing-heres-how-you-can-too-176065>

Book Chapter

Wilkinson, A. J., & Mansell, P. C. (2023). Developing a challenge-state environment for optimal pressurized golf performance. In D. Hill, J. Barker, and K. Steptoe (Eds), *Golf Performance under Pressure*. Routledge.

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CHAPTER 1

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GENERAL INTRODUCTION

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271 **Defining Stress**

272 Although the term ‘stress’ is used broadly as part of everyday language, attempts to
273 define stress accurately have proved to be challenging and somewhat confusing (Cohen et
274 al., 2016). Early definitions of stress have been more neutral in tone, such as Selye’s (1976,
275 p.137) conceptualization of stress as, “the non-specific response of the body to any demand
276 made upon it”. Definitions of stress have since evolved to become oriented towards stress
277 being considered more negatively with deleterious consequences for psychological
278 wellbeing, such as Lazarus and Folkman’s (1984, p.21) definition of stress being, “the
279 relationship between the person and the environment that is appraised by the person as
280 taxing or exceeding his or her resources and endangering his or her well-being” (Lazarus &
281 Folkman, 1984, p.21). More recently, definitions of stress have included the notion of worry
282 about forthcoming stressful situations, such as “the experience of anticipating or
283 encountering adversity in one’s goal-related efforts” (Carver & Connor-Smith, 2010, p.683).
284 Accordingly, such negatively valenced definitions of stress has meant that stress is often
285 equated with distress (e.g., Jenkins et al., 2021). For example, 85% of respondents in one
286 study expressed the view that stress has a negative impact on health, family life, and work
287 (McGonigal, 2016). Conceptualisations of stress through this negative lens fail to
288 encapsulate the idea of eustress, or “good stress” posited by Selye (1956). Eustress has been
289 defined in many ways, but from a psychological viewpoint, it can be considered as “primarily
290 a result of positive perception of the stressors” (Le Fevre et al., 2006, p.551). However, it is
291 argued that definitions of eustress are vague, and it has been suggested that eustress
292 should simply be labelled as “stress” to demonstrate neutrality (Bienertova-Vasku et al.,
293 2020). It might be that adopting Selye’s (1974) more neutral conceptualisation of stress may
294 enable individuals to view stress in a more balanced way, although this definition does not

295 include the appraisal aspect when confronted with a stressful situation. For the purpose of
296 this thesis, using Crum et al.'s (2020, p.121) definition of stress will be employed: 'the
297 anticipation or experience of encountering demands (e.g., danger/conflict, uncertainty, or
298 pressure) in one's goal-related contexts'. This includes the appraisal component in the form
299 of acknowledging demands and provides a greater degree of neutrality.

300 **Stress Responses**

301 Irrespective of how it is defined, stress is unavoidable for everyone. The experience
302 of stress often begins with a process that is initiated by stressors (Spielberger, 2021), which
303 may be defined as "any event, situation or environmental condition that is subjectively
304 perceived as having a negative impact on the individual" (Halbreich, 2021, p. 146). When
305 confronted with physical stressors (e.g., pain) or psychological stressors (e.g., perceptions of
306 threat), the body's fight or flight systems are activated (Dhabhar & McEwan, 2001), and
307 despite Halbreich's negatively valenced definition of stressors, individuals experience
308 psychological and biological responses that are designed to facilitate coping with the
309 situation (Dhabhar, 2014). For example, as part of the biological response to stressors, the
310 hypothalamus-pituitary-adrenal (HPA) axis is activated to release glucocorticoids and the
311 sympathetic-adrenal-medullary (SAM) axis induces the release of hormones such as
312 norepinephrine and noradrenaline as part of the sympathetic nervous system (Godoy et al.,
313 2018). An increase in breathing rate and heart rate delivers more oxygen to the brain and
314 muscles in preparation for coping, or even thriving in the situation (McGonigal, 2016).
315 During short-term stress, the brain will receive a 12% greater supply of energy (Hitze et al.,
316 2012), thus aiding concentration and decision making. As a result, more energy is mobilised
317 in anticipation of responding to the stressor (Godoy et al., 2018). The hormone cortisol is

318 secreted, which acts as an anti-inflammatory and can enhance memory (Stein & Bartone,
319 2020), whilst the production of oxytocin is increased, enabling blood vessels to stay relaxed
320 when under stress (McGonigal, 2016). Additionally, the anabolic hormone
321 dehydroepiandrosterone (DHEA) is released and plays a protective and regenerative role on
322 the body (Crum et al., 2013). Stress responses also include an immunosuppressive response
323 such as increasing the delivery of leukocytes into the blood to respond to any potential
324 wounds or infection that may arise from a stressor (Dhabhar, 2014), and emotional
325 responses which initially emanate from the amygdala before being controlled by the
326 prefrontal cortex (Storoni, 2017). When presented with such facts, it becomes apparent that
327 these psychological and physiological responses are designed to assist individuals rather
328 than debilitate them.

329 **Can Stress Enhance Performance?**

330 The psychological and physiological responses to stress may contribute towards
331 'clutch performance', whereby performance increases as a result of situations of stress
332 (Otten, 2009). Specifically, in sport settings, a glance at the list of Olympic Games World
333 Records (World Athletics, 2022) suggest that it is these high-pressure events rather than less
334 -meaningful events that bring out the best of athletes as they utilise stress responses to
335 facilitate performance. In support, studies have demonstrated that they can perform *better*
336 because of the stress (e.g., Jones & Hardy, 1989; Takemura et al., 1999). For example,
337 baseball pitching statistics taken from over one hundred years were found to be significantly
338 better in the post-season (where there is more at stake) compared with the regular season
339 (Otten & Barrett, 2013). Performance increments are also possible across numerous
340 domains (Godoy et al., 2018), such as trainee surgeons performing better when under

341 acutely stressful situations (LeBlanc et al., 2008). That said, better performance may not
342 always be the case for everyone when confronted with stressful situations and the type of
343 stress that an individual experiences may be a factor in influencing stress-related outcomes.

344 **The Distinction Between Short-Term and Long-Term Stress**

345 To explain when stress may lead to negative consequences, it is important to
346 consider the different ways in which stressors can be experienced. Mucke et al. (2018)
347 suggest that experiencing transient acute stress (i.e., the experience of short-term stress
348 which may last for minutes or hours) may have beneficial effects on an individual's
349 development. However, exposure to stress that is intense, chronic (i.e., stress may be
350 present more continuously for weeks or months) and exceeds an individual's ability to cope
351 will increase their allostatic load and result in significant health risks (Dhabhar & McEwen,
352 1997). This repeated and prolonged exposure to stress means the HPA and SAM axes are
353 continually activated with negative repercussions for both psychological and physiological
354 health (Cohen et al., 2007) - like an accelerator pedal in a car that is kept pushed down for
355 too long without use of the brake (Smith, 2022). For example, prolonged increased cortisol
356 secretion is thought to be one physiological response to chronic stress that can cause
357 maladaptive health outcomes (Crum et al., 2013). However, it is perhaps overly simplistic to
358 view acute stress as something that can be good and chronic stress as something that is
359 always bad. Stress can affect individuals in different ways (Aldwin, 2009) and no two
360 individuals will view the same stressor identically (Cohen et al., 2016). Indeed, individuals
361 may experience maladaptive responses to acute stress (LeBlanc, 2009).

362

363

364 **The Negative Outcomes of Chronic Stress**

365 Psychologically, the experience of chronic stress is also said to increase the risk of
366 experiencing symptoms of anxiety and depression, which may in turn influence related
367 physiological and psychological processes. Physiological outcomes of experiencing chronic
368 stress can include atherosclerosis and obesity (McEwan, 2006), whilst negative behavioural
369 outcomes may also be evident, such as engaging in unhealthy behaviours to act as a relief
370 from stress (Diaz et al., 2018) or by withdrawing from physical activity (Moljord et al., 2014).
371 Over-exposure to stress may also result in decrements in productivity and cognitive and
372 physical performance. To illustrate, employees across a range of sectors who experienced
373 high stress reported reduced productivity (Halkos & Bousinakis, 2010). Specifically in the
374 workplace, two-thirds of employees have reported feeling stressed or anxious about work in
375 a 12-month period, with this number increasing to 75% for those under 35 (ACAS, 2019). In
376 athletes, the experience of a high degree of stress may result in symptoms of burnout,
377 which in turn leads to mental fatigue, loss of energy, and resultingly, reduced performance
378 (Raedeke, 1997). Taken together, the evidence demonstrates the potential for stress to
379 have deleterious consequences on psychological and physiological health, performance, and
380 behaviour. Equally, it is important to note that not all experiences of stress result in these
381 negative outcomes and that the experience of acute rather than chronic stress may benefit
382 individuals.

383 **Altering Our Experiences of Stress**

384 Given the ubiquity of stress and the lack of control over potential stressors, it is
385 important to consider the ways in which individuals respond to stressful situations, and to
386 understand that responses to stressors *are* controllable. This may begin with the

387 conceptualisation of how individuals think about stress and how they perceive their
388 responses to stress. The neutrally valenced definition by Selye (1974) has been adapted by
389 Crum et al. (2020, p.121), to describe stress responses as “the body’s nonspecific responses
390 (e.g., physiological, behavioural, and emotional) to the experience of stress”, and aligning
391 views of stress with these impartial conceptualisations may help to reduce the demonisation
392 of stress (Rudland et al., 2020). Not all stress is bad, and when regarded from an
393 evolutionary perspective, stress and its associated responses are considered as being an
394 essential mechanism in coping with stressors (Dhabhar, 2014; Godoy et al., 2018). Like a
395 smoke alarm erroneously being activated, not every internal alarm in the form of stress
396 responses signifies real danger (Smith, 2022). When individuals are aware of the adaptive
397 properties of stress responses, they may begin to conceptualise stress in a different way,
398 thus facilitating a plethora of stress-related outcomes such as greater psychological
399 wellbeing (Crum et al., 2013).

400 **Stress and Mental Health**

401 Stress is not classified as a mental health condition, but it can influence an
402 individual’s mental health. Mental health, or psychological wellbeing, refers to how we are
403 feeling emotionally and can change daily on a spectrum from good to poor mental health,
404 affecting daily life in the process (Mental Health Foundation, 2022). Mental health problems
405 are a growing concern in the UK and worldwide (Vos et al., 2015), with a reported 1 in 6
406 experiencing a common mental health problem in a given week in the UK (McManus et al.,
407 2016). Whilst individuals can experience good mental health, at the other end of the
408 spectrum are mental health disorders. This may involve conditions that cause clinically
409 significant distress or impairment to an individual (Reardon et al., 2019) and one factor that

410 may expedite these conditions is the negative experience of stress (Bor, 2014). As an
411 individual experiences stress negatively, this may result in regular losses of temper,
412 reductions in sleep quality, and withdrawal from work and social situations. In turn, this may
413 serve to fuel poor mental health. Indeed, a recent study by the Mental Health Foundation
414 (2020) demonstrated that more than half of adults who reported feeling stressed also
415 reported feeling depressed or anxious. Overall, given the growing incidences of poor mental
416 health and with evidence suggesting that stress may exacerbate mental health problems,
417 knowledge about how this mechanism may operate could be crucial in enhancing
418 individuals' psychological wellbeing.

419 **Depression**

420 Mental health conditions cover a wide spectrum of disorders ranging from mild
421 conditions (e.g., mild phobias) to more intense and deleterious conditions (e.g.,
422 schizophrenia) (NHS, 2022). Anxiety and depression are two mental health conditions that
423 contribute to psychological distress (Mirowsky & Ross, 2002), and are commonly
424 experienced in the UK and worldwide. Worryingly, depression is predicted to be the leading
425 cause of illness globally by 2030 (Hoying et al., 2020). A variety of depressive symptoms may
426 be experienced by individuals so that a clinical diagnosis of depression may appear different
427 from one individual to the next. Although not an exhaustive list, common symptoms of
428 depression include repetitive negative thinking (Everaert & Joormann, 2020), low mood,
429 reduced capacity for enjoyment, inability to concentrate, reductions in energy (WHO, 2019),
430 and worse general health (Hoying et al., 2020). Individuals may also experience a sense of
431 hopelessness about the future (Bandura, 1997), worthlessness, and reduced self-confidence
432 (WHO, 2019). It is argued by some academics and practitioners that the onset of depressive

433 symptoms is instigated by chemical imbalances in the brain, however, recent opinion has
434 shifted to consider psychological processes instead as a major source (Davies, 2021). As
435 such, the experience of stress is thought to be one of the causes of depressive symptoms in
436 the general population (Hoying et al., 2020) and in athletes (Poucher et al., 2021),
437 particularly when this experience is chronic (Bor, 2014).

438 **Anxiety**

439 As with depressive symptoms, anxiety can be experienced on a spectrum from mild
440 anxiety to severe anxiety and is closely associated with experiencing stress (Cohen et al.,
441 2007). Anxiety is said to consist of the subjective and conscious experience of feelings of
442 nerves, tension, apprehension, and worry which results in an increased heightened
443 activation of the autonomic nervous system (Spielberger, 2021) and may be subdivided into
444 cognitive anxiety and somatic anxiety. Cognitive anxiety is the mental manifestation of
445 anxiety, such as negative thoughts and worry, whilst somatic anxiety represents the physical
446 experience of anxiety that may include physiological signs of tension (Martens et al., 1990).
447 When exposed to stressful situations, both types of anxiety are often elevated (Williams et
448 al., 2017) and as a result, variances in performance may be evident (Seipp, 1991; Masters,
449 1992). This may depend on an individual's trait anxiety - some individuals may be more
450 prone to experiencing anxiety than others and are therefore more vulnerable to stress
451 (Takemura et al., 1999; Spielberger, 2021). Resultingly, they tend to experience a greater
452 intensity of state anxiety in stressful situations and will likely perceive these situations as
453 threatening (Park et al., 2018).

454

455

456 **Vitality**

457 It is important to remember that mental health does not only consist of negative
458 aspects but encompasses positive aspects too. For example, the eustress element of stress
459 is associated with positive mental health in the form of positive emotions (Lazarus, 1993).
460 Indeed, the inclusion of positive emotions in studies may create additional knowledge as to
461 how individuals generate and sustain psychological wellbeing (Folkman, 2008). One example
462 of psychological wellbeing that is related to stress is vitality, which may be defined as
463 positive subjective feelings of being alive and having energy (Ryan & Frederick, 1997).
464 Vitality is associated with perceiving situations as challenges and not as obstacles
465 (Greenglass & Fiksenbaum, 2009), positive physical and mental health, and lower depressive
466 symptoms (Ryan & Frederick, 1997). It is possible for vitality to be depleted as a result of
467 prolonged exposure to stress although it may be regenerated with the assistance of positive
468 antecedents (Lavrusheva, 2020), such as sleep. In athletes, this is important as experiencing
469 high vitality is said to result in a greater sense of energy that can help to fuel performance in
470 everyday life and in athletic endeavours (Fruchart & Rulence-Pâques, 2020; Lavrusheva,
471 2020). As such, it is important to continue investigations into how antecedents such as
472 stress (Rozanski & Kubzansky, 2005) may contribute towards the development of
473 psychological wellbeing and performance.

474 In sum, two of the most prevalent mental health conditions associated with stress
475 are anxiety and depression, whilst vitality is an aspect of psychological wellbeing that may
476 be influenced by stress. As it is not possible to avoid stress, it is important to understand
477 how stress influences mental health conditions such as anxiety and depression, and whether
478 it is possible to harness stressful situations to contribute to greater mental health. Due to

479 the known associations between vitality, anxiety, depressive symptoms, and stress,
480 developing further knowledge as to how they influence psychological wellbeing and
481 performance could be important for non-athletes and athletes alike.

482 **Athlete-Specific Stressors**

483 It is widely recognised that instances of poor mental health in athletes is common
484 (e.g., Reardon et al., 2019). Despite experiencing the health benefits of taking part in sport
485 (e.g., Cooney et al., 2013), athletes also need to contend with a plethora of sport-specific
486 stressors that may combine to erode mental health (Schaal et al., 2011). In addition to
487 performance-related events that create challenges and sometimes end in disappointment
488 (Michel-Kröhler & Turner, 2022), athletes must also navigate additional stressors, such as
489 injury, de-selection, and fatigue (Rice et al., 2016). Athletes competing at any level must set
490 aside time for frequent training sessions and balance this against the other commitments
491 they have, such as spending time with their families. For athletes competing at higher levels,
492 the risk of experiencing psychological distress may increase compared to amateur
493 performers (Fletcher et al., 2012) with pressure to perform intensified by expectations from
494 themselves, their coaches, and potentially the media. Indeed, taking competitive level into
495 account, the Interactive Model of Adaptation to Stress (Gomes, 2014) posits that other
496 personal antecedents such as age and gender may also influence athletes' experience of
497 stress and subsequent emotions. Perhaps the most demanding stressor of all for athletes
498 competing at any level, is the added pressure of competition – a stressor which has been
499 noted to affect physical and technical performance when the pressure to perform increases
500 beyond their ability to cope (Mortiz et al., 2000; Nicholls et al., 2010). Hence, athletes may
501 become anxious about forthcoming competitions, worry about making mistakes (Gomes et

502 al., 2022), and experience fear of failure which contributes to an increase in stress
503 (Gustafsson et al., 2017). This anticipatory stress leading up to competitions (van Paridon et
504 al., 2017) may accumulate during a season, and such long-term exposure to stress may
505 subsequently lead to poor mental health (Smith, Hill, Mallinson-Howard, & Gustafsson,
506 2020).

507 **Athlete Mental Health**

508 Two mental health conditions that athletes are at risk of experiencing are anxiety
509 (Küttel et al., 2021) and depressive symptoms (Nixdorf et al., 2016). Studies report varied
510 results regarding the prevalence of mental health conditions in athletes, but to illustrate,
511 one study reported that 36.5% of high performing female athletes presented with mild to
512 severe depressive symptoms (Brand et al., 2013), whilst another study suggested that this
513 figure was 26.7% for high performing males (Ghaedi et al., 2014). Additionally, gender
514 differences also seem to exist with Kuttel et al. (2020) reporting that female athletes were
515 significantly more likely to exhibit higher anxiety and depressive symptoms than male
516 athletes. This finding appears to mirror differences in the general population, as females are
517 more likely to experience greater psychological distress than males (e.g., Junge &
518 Feddermann-Demont, 2016), possibly due to differences in endocrinological responses to
519 acute stress (Kirschbaum et al., 1992) or hormonal differences (O’Kelly and Gilson, 2019).
520 Additionally, the type of sport that athletes participate in may influence mental health as
521 athletes taking part in individual sports have been found to report greater depressive
522 symptoms than those taking part in team sports (Nixdorf et al., 2016). Overall, the evidence
523 suggests that athletes are susceptible to psychological distress such as anxiety and
524 depressive symptoms (e.g., Rice at al., 2016) and a major contributing factor to this is stress

525 (Crane & Temple, 2015). So, if athletes still experience comparative levels of poor mental
526 health to the general population despite the mental health benefits that regular exercise
527 provides (e.g., Williams et al., 2016), it is of importance for researchers to continue to
528 develop knowledge and interventions to support athlete mental health (Doron & Martinent,
529 2017).

530 **Irrational Beliefs and REBT**

531 From the literature presented, it is clear that stress can have both positive and
532 negative consequences on the psychological wellbeing of any individual. With the
533 prevalence of psychological distress continuing to grow, it is important to understand ways
534 in which the development of psychological distress may occur or may be prevented from
535 occurring. A framework in which beliefs and attitudes are influential in determining
536 psychological distress is suggested within Rational Emotive Behaviour Therapy (REBT; Ellis &
537 Dryden, 2007). Irrational beliefs (i.e., inflexible, illogical, and extreme beliefs; Turner et al.,
538 2019a) are a core component of REBT and may cause distress through extreme emotions
539 that are self-defeating and may subsequently block the pursuit of goal attainment (Mesagno
540 et al., 2020). In contrast, rational beliefs are flexible, logical, and non-extreme beliefs which
541 are adaptive and underpin psychological wellbeing (Szentagotai & Jones, 2010).

542 Four core irrational beliefs are put forward by REBT that relate to performance
543 (Michel-Kröhler & Turner, 2022), namely primary irrational beliefs of demandingness that
544 refer to rigid assertions of demands that certain conditions must/must not exist
545 (DiGiuseppe, 1996) (e.g., "I want to, therefore I must..."), and three secondary irrational
546 beliefs of awfulizing, frustration intolerance, and self/other/life depreciation. Awfulizing
547 refers to beliefs that overestimate the consequences of events and fail to recognise that

548 worse things could happen (David et al., 2010) (e.g., “it would be absolutely terrible if I lost).
549 Frustration intolerance beliefs refer to cognitions that should an individual’s desires not be
550 met, it would be unbearable (e.g., “I can’t stand it”), and self/other/life depreciation beliefs
551 consist of cognitions that overgeneralise about themselves, others, or the world (Dryden,
552 2021) (e.g., “losing makes me a complete failure”). The rational counterparts include
553 preference, anti-awfulizing, unconditional self/life/other acceptance, and frustration
554 tolerance (David et al., 2004). They are considered to reflect desires rather than demands
555 (DiLorenzo et al., 2007) and are said to assist an individual in managing stressful situations
556 (David et al., 2005). Within the REBT-I model, it is proposed that demandingness acts as a
557 foundation and leads to the secondary irrational beliefs, which in turn underpin
558 psychological distress (Ellis, 1994a; DiLorenzo et al., 2007; Mansell & Turner, 2022). The
559 combined effect of primary and secondary irrational beliefs is deleterious for psychological
560 wellbeing (Ellis & Dryden, 2007), with the proximity of secondary irrational beliefs to
561 emotions said to influence psychological wellbeing in particular (DiLorenzo et al., 2007). For
562 example, an athlete might believe that they absolutely must win their next competition
563 (demandingness), and if they did not, they would be a complete failure (depreciation), it
564 would be worse than bad (awfulizing), or they would not be able to tolerate losing
565 (frustration intolerance).

566 There is a wealth of evidence to support the negative impact of irrational beliefs on
567 psychological distress, particularly in the form of a meta-analysis by Visla et al. (2016) that
568 demonstrated significant relationships between irrational beliefs with anxiety and
569 depressive symptoms. In athletes, irrational beliefs have consistently been found to relate
570 to psychological distress (e.g., Turner et al., 2019b; 2022), with females tending to report
571 higher irrational beliefs than males and younger athletes exhibiting higher irrational beliefs

572 than older athletes (Turner & Allen, 2018; Michel-Kröhler & Turner, 2022). In relation to
573 stress, individuals who hold irrational beliefs may be more likely to disqualify the positives of
574 upcoming stressful situations, and by assigning negative values to stress (Dryden, 2010),
575 may discount previous positive experiences of stressful situations (Bor, 2014). The root of
576 such beliefs may emanate from or be enhanced by additional stressors that athletes face,
577 such as regular competition (Michel-Kröhler & Turner, 2022), and may be responsible for
578 specific problems such as burnout (Turner & Moore, 2016). For example, athletes who
579 possess high demandingness beliefs (e.g., *"I have to be the best"*) may consider only being
580 successful as acceptable, and such rigid perfectionist beliefs are dysfunctional and threaten
581 wellbeing (Michel-Kröhler & Turner, 2022). Irrational beliefs may also detrimentally
582 influence performance by negatively relating to self-confidence (Mansell & Turner, 2022)
583 decreasing the likelihood of approaching competition in an adaptive way (Chadha et al.,
584 2019), which may explain why golfers who used rational self-talk were able to perform
585 better than those who used irrational self-talk (Turner et al., 2018). In support, when
586 irrational beliefs are reduced in athletes via REBT, this leads to decreased performance
587 anxiety (Turner & Barker, 2013), increased self-efficacy (Chrysidis et al., 2020), and greater
588 performance (Wood et al., 2020).

589 Each type of irrational beliefs may uniquely influence psychological distress
590 (DiLorenzo et al., 2007). For example, frustration intolerance has been found to be
591 independently associated with adverse psychological functioning (Park et al., 2018). But it is
592 depreciation that appears to be particularly pernicious to psychological wellbeing (e.g., Allen
593 et al., 2017), with numerous studies (e.g., Cunningham & Turner, 2016; Michel-Kröhler &
594 Turner, 2022; Turner et al., 2019a) reporting that this relationship was evident in athletes.
595 Depreciation beliefs are extreme and fatalistic (Turner et al., 2022), and the nature of these

596 beliefs means that failures and setbacks are ascribed to oneself. In turn, this results in
597 damaging and dysfunctional thoughts that increase the risk of anxiety and depressive
598 symptoms (Turner et al., 2016). As knowledge about the individual contributions to
599 psychological wellbeing that different irrational beliefs may make is still fairly novel, it is
600 important that research continues in this area so that practitioners are more able to target
601 specific irrational beliefs when intervening to enhance psychological wellbeing. This may
602 also be the case with irrational beliefs about stress – an area yet to be explored. Irrational
603 beliefs are rigid, inflexible, and illogical, and this may align those who possess negatively
604 valenced and entrenched beliefs about stress as ‘wholly bad’. For example, irrational beliefs
605 about stress may include frustration intolerance about adversity (e.g., “*I can’t stand feeling*
606 *stressed*”) rather than holding the rational equivalent of frustration tolerance (Dryden,
607 2010). As such, a novel method of adopting the REBT framework to examine negative beliefs
608 about stress may shine a light on how negative stress beliefs (e.g., mindsets) relate to
609 mental health and performance, and how they may be changed through adopting more
610 rational conceptualisations about stress.

611 **Mindset and Stress Mindset**

612 Mindsets are mental representations about a person’s self and surroundings (Dweck,
613 2017) and act as a mental filter for how individuals view a particular topic (Wang et al.,
614 2022). Mindsets are a central part of an individual’s personality (Dweck, 2017) and either
615 implicitly or explicitly shape their cognitions and responses towards a given area. Much
616 research in the domain of mindsets has centred around growth and fixed mindsets in
617 education, with studies demonstrating that individuals who possess a growth mindset are
618 more likely to respond positively to a setback (e.g., Dweck & Leggitt, 1988). This may be

619 because when an individual possesses a growth mindset, they believe that their intelligence
620 is malleable and that they can change this through applying themselves and seeking
621 feedback to improve (Dweck, 2017). Research concerning mindsets and psychological
622 wellbeing is still in its infancy although evidence has demonstrated that mindset can be a
623 predictor of psychological wellbeing (e.g., Zion et al., 2021). In support, individuals who
624 possess a growth mindset towards anxiety remain motivated to improve when confronted
625 with challenges and setbacks, and experience lower levels of depressive symptoms
626 (Schroder et al., 2017).

627 The adaptive outcomes of growth mindset-focused research coupled with growing
628 concerns about the impact of stress have brought into focus individuals' mindset towards
629 stress. Known as stress mindset, individuals' meta-beliefs about stress (Jamieson et al.,
630 2018) encompass how they perceive stress to influence performance and productivity,
631 health and vitality, and learning and growth, which may subsequently influence stress-
632 related outcomes (Crum et al., 2013). Indeed, when considering how beliefs are said to
633 influence behavioural and emotional consequences within the REBT framework (Ellis,
634 1994a), it is possible to draw comparisons with stress mindset theory. Beliefs about stress
635 are often dichotomous in that high stress is bad and low stress is desirable (Dixon et al.,
636 2017), however most individuals will possess beliefs that fall somewhere along a spectrum –
637 beliefs which may exist in the presence or absence of a stressor (Herman et al., 2020). Such
638 beliefs are formed through socialisation, formal learning processes, and through an
639 individual's own and vicarious experiences (Kilby & Sherman, 2018). For example, stress
640 mindsets may be shaped by negative portrayals in the media or by public health messages
641 suggesting that stress is something to avoid (Crum et al., 2013). In athletes, beliefs may be
642 influenced by significant others involved with an athlete, such as a coach, parents, and the

643 media (King et al., 2022) and accordingly, such 'lay beliefs' about a topic are not necessarily
644 based on facts (Zedelius et al., 2017). Regardless, an individual's stress mindset can direct
645 their attention to the confirmation of thoughts, feelings, and behaviours that align with that
646 mindset (Wang et al., 2022). A theory that explains this is confirmation bias (Nickerson,
647 1998) whereby individuals look for and interpret evidence that relates to their belief
648 systems, and this means that subsequent stress-related thoughts, feelings, and behaviours
649 may emanate from an individual's stress mindset.

650 At either end of a continuum, individuals may hold a 'stress-is-enhancing' mindset
651 whereby they believe that stress has facilitative consequences on areas such as health,
652 productivity, wellbeing, and performance, whilst a 'stress-is-debilitating' mindset is evident
653 when an individual believes that stress has negative consequences (Crum et al., 2013).
654 There is growing evidence that a 'stress-is-enhancing' mindset is associated with a plethora
655 of adaptive stress-related outcomes, such as greater levels of psychological and physical
656 health (Keech et al., 2018), inclination to receive feedback (Crum et al., 2013), coping
657 behaviours (Casper et al., 2017), and support to a spouse (Nguyen et al., 2020).
658 Furthermore, the possession of a 'stress-is-enhancing' mindset is also said to be related to
659 reduced levels of depressive symptoms (Crum et al., 2013; Huebschmann & Sheets, 2020)
660 and job stress (Kim et al., 2020). Despite the volume of evidence that points to the positive
661 stress-related outcomes associated with a 'stress-is-enhancing' mindset, evidence that this
662 leads to greater performance is still scarce. Studies have demonstrated associations
663 between the two, such as work productivity (e.g., Crum et al., 2013) and performance in
664 Navy SEAL training (Smith et al., 2020), but it is thought that a 'stress-is-enhancing' mindset
665 may influence performance more indirectly, such as through stress appraisals (Wang et al.,
666 2022).

667 Contrastingly, a ‘stress-is-debilitating’ mindset is not beneficial when faced with
668 stressful situations, and findings of previous research suggest that the possession of these
669 beliefs about stress may also relate to negative stress-related outcomes more generally. For
670 example, those who possess a ‘stress-is-debilitating’ mindset are more likely to exhibit
671 avoidance coping strategies (Crum et al., 2017), and these self-limiting beliefs mean that
672 these individuals will likely pass up on opportunities to develop through experiencing
673 stressful situations. Worse cognitive flexibility (Crum et al., 2017), greater irritability-anger
674 (Horiuchi et al., 2018), burnout (Klussman et al., 2020), and negative affect when confronted
675 with stressors (Laferton et al., 2020) have all been found to be associated with a ‘stress-is-
676 debilitating’ mindset. This may be because individuals who possess such beliefs are more
677 likely to direct their attention inward towards the body’s responses to stress (Laferton et al.,
678 2018) and interpret these responses negatively (Nieuwenhuys & Oudejans, 2017). To
679 illustrate, a racing heart rate may be interpreted as a sign of panic or of being in danger,
680 rather than the body preparing itself to cope with a stressful situation. A ‘stress-is-
681 debilitating’ mindset may therefore be considered as a self-fulfilling prophecy (Kilby et al.,
682 2020) which can set off a chain reaction of other maladaptive thoughts, emotions, and
683 behaviours.

684 An individual’s stress mindset is also associated with a range of physiological stress-
685 related outcomes. Those who possess a ‘stress-is-enhancing’ mindset recover quicker from
686 stressful situations and have wider blood vessels compared with those who possess a ‘stress
687 -is-debilitative’ mindset (McGonigal, 2016). This allows a greater amount of blood flow to
688 the brain and working muscles which in turn can facilitate more adaptive responses during
689 stressful situations (Hangen et al., 2019). Electroencephalogram (EEG) results have also
690 demonstrated more adaptive responses to stress for those who possess a ‘stress-is-

691 enhancing' mindset (Park & Hahm, 2019). Eliciting a 'stress-is-enhancing' mindset can also
692 increase the production of DHEAs, a neurosteroid which counteracts the negative effects of
693 cortisol (Hogue, 2019). Parallels may be drawn here with physical training in that when
694 individuals put their body under stress it is able to adapt and grow (Seery, 2011), and that
695 considering psychological stress in the same way could be an adaptive way for individuals to
696 think when confronted with a stressful situation. Evidence that describes the physiological
697 responses associated with a 'stress-is-debilitating' mindset demonstrates much more
698 negative outcomes. Negative stress beliefs have been found to be associated with
699 significantly worse physical health (Keller et al., 2012), with another study demonstrating
700 that such beliefs predict greater heart disease over an 18- year period (Nabi et al., 2013).
701 Furthermore, when attention is drawn to the negative physical responses to stress, the pain
702 matrix in the brain becomes activated (Richter et al., 2010). Taken together, it appears that
703 the psychological and physiological responses to stress-related outcomes are influenced by
704 an individual's stress mindset.

705 **How Might a 'Stress-Is-Enhancing' Mindset Lead to Adaptive Outcomes?**

706 As the volume of evidence to support the possession of a 'stress-is-enhancing'
707 mindset for adaptive stress-related outcomes has begun to grow, explanations as to why
708 this may be the case have followed. One suggestion to explain these relationships is through
709 REBT. Negative beliefs about stress may underpin an $A \rightarrow C$ way of thinking whereby an
710 adverse event (A) leads directly to behavioural and emotional consequences (C), for
711 example, thinking that adversity (or stress) alone causes certain emotions and behaviours
712 (Turner, 2016). As such, the individual may believe that they have no control over their
713 responses if they perceive stress to be a wholly negative concept. In addition, if individuals

714 engage with their negative beliefs about stress (B), even an $A \rightarrow B \rightarrow C$ way of thinking can
715 still lead to maladaptive stress-related outcomes based on irrational beliefs about stress.
716 Indeed a 'stress-is-debilitating' mindset may be irrational because it is not pragmatic or
717 useful (Mesagno et al., 2020). It is also extreme, unrealistic and rigid as it only focuses on
718 the negative aspects of stress and ignores eustress. In contrast, those who possess more
719 facilitative views about stress can acknowledge that stress *can be* enhancing which is
720 reflective of flexible, non-extreme, and logical rational beliefs (Turner, 2016). These types of
721 beliefs encourage a greater sense of control and may mean that an individual can adopt a
722 more adaptive $A \rightarrow B \rightarrow C$ way of thinking. Accordingly, when confronted with an adverse
723 event (A), the individual is more likely to cognitively reappraise that situation by engaging
724 with their flexible beliefs about stress (B), and in turn this may result in more favourable
725 behavioural and emotional consequences (C). Indeed, when confronted with a stressful
726 situation, exerting a sense of control is integral to promoting adaptive approaches to
727 stressful situations (Trotman et al., 2018), and an individual's stress mindset may be at the
728 root of perceptions of control. Aligned with REBT, this indicates that individuals should be
729 encouraged to change the way they think in order to change the way they feel (Oschner &
730 Gross, 2004), and adopting more rational beliefs about stress could be one such method.

731 The potential for stress mindset to support adaptive stress-related outcomes is
732 further enhanced by an important advantage that it holds compared to other stress
733 regulation approaches. Although there are several methods that have demonstrated that
734 stress may be reduced (e.g., mindfulness; Lim et al., 2020), it is not always possible to avoid
735 stressful situations and attempting to reduce stress may be futile (Crum et al., 2017).
736 Indeed, it could be argued that we should not want to avoid stressful situations as this
737 means that individuals will miss out on opportunities to perform well and to grow (Jamieson

738 et al., 2018). Traditional ways of dealing with stress seem to involve endeavouring to reduce
739 or remove stress, which further enhances stress's negative reputation (Crum et al., 2013),
740 whilst preventative or reductive stress management techniques are thought to be
741 sometimes inefficient and inappropriate (Fletcher & Arnold, 2021). As posited by REBT (e.g.,
742 Ellis & Dryden, 2007), individuals can choose their beliefs, and holding negative beliefs about
743 stress may lead to the suppression of stress, which in turn can result in catastrophizing
744 thoughts and distressing emotions (Măirean, 2015). The alternative is to consider the
745 upsides of stress, which may break the cycles of repetitive negative thinking and habitual
746 thoughts in relation to stress and subsequently lead to enhanced psychological wellbeing.
747 This may perpetuate more long-term facilitative views of stress and be particularly useful
748 when it is not possible to change a stressor.

749 **Stress Appraisals**

750 Whilst stress mindset is concerned with general beliefs about stress, appraisals of
751 specific stressful situations will also be made by individuals. Referred to as stress appraisals,
752 research has recently built upon traditional and generic approaches to stress appraisal (e.g.,
753 Lazarus & Folkman, 1984) by focusing on how stress appraisals may influence performance
754 and psychological wellbeing in athletes specifically. Acting as a foundation for athlete-based
755 theories about stress appraisal, the Transactional Model of Stress (Lazarus & Folkman, 1984)
756 proposes that when an individual is confronted with a stressful situation, they evaluate the
757 potential for that situation to result in gain or loss. This is known as primary appraisal, whilst
758 the assessment of resources used to cope with the perceived situation is known as
759 secondary appraisal (Lazarus & Folkman, 1984). If an individual perceives that they possess
760 the resources (e.g., familiarity, knowledge, and ability) to cope with the demands (e.g.,

761 uncertainty, potential danger, and expected effort) of the task, a challenge state is likely
762 elicited. In contrast, if they perceive that they do not possess the resources to cope with the
763 situation, it is likely that that they will appraise the situation as a threat (Dixon et al., 2017),
764 which is synonymous with the anticipation of failure (Tomaka & Magoc, 2021). To illustrate
765 secondary appraisal using the analogy of weighing scales, when the demands of a situation
766 outweigh an individual's perceived resources to cope, the scales are tipped towards a threat
767 state, whilst the scales will be tipped in the favour of a challenge state if perceived resources
768 outweigh the demands. With regards to performing under pressure, athletes who appraise
769 stressful situations as a challenge see such situations as an opportunity for gain (Cumming
770 et al., 2017b), experience more positive emotions, and perceive negative emotions (e.g.,
771 anxiety) as facilitative for performance (Turner et al., 2012), whereas threatened athletes
772 view these emotions as debilitating and experience more negative emotions overall (Doron
773 & Martinent, 2017).

774 Secondary appraisal is also captured within the Biopsychosocial (BPS) Model of
775 Challenge and Threat (Blascovich & Tomaka, 1996) which described that when individuals
776 engage with motivated performance situations, appraisals of the demands of the task and
777 their personal resources interact. The BPS posits that demand and resource appraisals may
778 be conscious or subconscious (Blascovich & Mendes, 2000) and may be influenced by an
779 individual's confidence (Blascovich et al., 2004). Resultingly, a challenge or threat state
780 characterised by particular psychological and physiological responses follow. For example,
781 physiological responses indicative of a challenge state are thought to include adaptive
782 changes such as the vasodilation of the major blood vessels (Seery, 2011) and an increase in
783 cardiac output which provide a more efficient delivery of oxygen and energy to the muscles
784 and brain (Jones et al., 2009). A threat state, whilst still including an increase in cardiac

785 output, is thought to be accompanied by maladaptive changes such as vasoconstriction
786 caused by the release of cortisol from the HPA axis, which combine to restrict the flow of
787 blood to where it is required (Seery et al., 2011). In support of the BPS, Moore et al. (2012)
788 found that golfers who exhibited challenge demand/resource evaluations and
789 cardiovascular responses performed better on a golf putting task than those in a threat
790 group.

791 Despite evidence supporting the BPS's predictions of challenge states being
792 facilitative for performance, the BPS was not developed specifically with athletes in mind – a
793 consideration that was addressed by the Theory of Challenge and Threat States in Athletes
794 (TCSTA; Jones et al., 2009). Integrating and offering an extension to the BPS, Jones et al.
795 (2009) outlined three key antecedents to experiencing a challenge or threat state: namely
796 self-efficacy, perceived control, and type of motivational goals. Again, combining the
797 psychological and physiological responses to stressful situations, the TCTSA also spelled out
798 the deleterious effect on performance that a threat state may cause. Specifically, it was
799 suggested that ineffective self-regulation, decision-making, cognitive function, and
800 decreased anaerobic power could all contribute to worse athletic performance. Another
801 important facet of the TCTSA is that athletes may experience anxiety but perceive these
802 symptoms to be facilitative, and in such instances, this may still lead to challenge states
803 (Jones et al., 2009). This appears to align with stress mindset theory in that both theories
804 seek not to bury or suppress stress responses, but instead encourage reconsideration of
805 how the responses may be used to facilitate performance. However, the TCTSA does not
806 fully encompass the potential for trait beliefs to influence stress appraisals and thus
807 overlooks the potential influence of stress mindset on challenge and threat appraisals.

808 A more recent addition to the stress reappraisal literature is the advancement of the
809 TCTSA in the form of the Theory of Challenge and Threat States in Athletes – Revised (TCTSA
810 -R; Meijen et al., 2020). In contrast to the single-continuum approach implied by the TCSTA,
811 the TCTSA-R integrates recent research by acknowledging that athletes can make both
812 challenge and threat appraisals simultaneously and that stress appraisals are dynamic
813 (Uphill et al., 2019). Additionally, the TCTSA-R recognises the contribution of secondary
814 appraisals as part of this dynamic process, and this may be seen an important opportunity
815 for coping strategies to be employed to aid reappraisal. Other important hallmarks of the
816 TCTSA-R are the inclusion of social support and trait beliefs as mediators of challenge and
817 threat states. For example, irrational beliefs have been cited as one trait disposition that
818 could influence challenge and threat states (Chadha et al., 2019), and research in non-
819 athletic domains has suggested associations between a more ‘stress-is-enhancing’ mindset
820 and challenge appraisals (Kilby & Sherman, 2016; Wang et al., 2022). In contrast to the
821 TCTSA, the TCTSA-R also highlights the importance of trait challenge appraisal tendencies in
822 influencing challenge appraisals in specific situations, a finding that was demonstrated in an
823 athlete-based study (Cumming et al., 2017b). Indeed, the inclusion of dispositions such as
824 stress appraisal tendencies is important given that other studies have also demonstrated a
825 positive relationship between challenge appraisal tendencies and state challenge appraisals
826 (Skinner & Brewer, 2002). However, there is little research that has investigated the
827 relationships between dispositions such as stress mindset and stress appraisals in athletes
828 specifically, and as such, further investigations in this area may support athletes to
829 experience adaptive stress-related outcomes.

830

831 **The Outcomes Associated with Stress Appraisals**

832 Despite conceptual differences between the BPS, TCTSA, and TCTSA-R, there is
833 agreement that experiencing challenge appraisals is conducive to performance whilst a
834 threat state is not. This is supported by a recent review that suggested that challenge states
835 have resulted in enhanced performance in 74% of studies across different contexts
836 compared to threat states (Hase et al., 2019) – a finding echoed in a growing number of
837 studies in a sporting domain (e.g., Turner et al., 2013; Brimmell et al., 2018). The
838 relationship between challenge appraisals and performance may be explained by a variety
839 of reasons, such as a greater mobilisation of energy through an enhanced cardiovascular
840 profile (Turner et al., 2014), greater motor skill performance (Vine et al., 2013), or by an
841 increased focus on task-relevant information (Moore et al., 2012). Meanwhile, a threat state
842 is generally thought to detrimentally influence performance (Behnke & Kaczmarek, 2018) by
843 increasing the likelihood of poor decision making (Turner et al., 2012) and reinvestment
844 (Moore et al., 2013), and may also lead to worse movement kinematics (Moore et al., 2012).
845 As stress mindset is said to be related to challenge appraisals (Kilby & Sherman, 2016), it
846 would be of interest to explore whether enhancing stress mindset also leads to enhanced
847 challenge appraisals, and in turn, greater performance under pressure.

848 As well as enhanced performance, studies also report positive associations between
849 challenge and psychological wellbeing. Indeed, emotions not only contribute to challenge
850 and threat states, but are experienced as a result of a challenge or threat state and are said
851 to feed back into subsequent appraisals by operating in a virtuous circle (Sammy et al.,
852 2020). For instance, challenge has been found to be related to more positive perceptions of
853 anxiety symptoms (e.g., Turner et al., 2012), positive emotions (Skinner & Brewer, 2002;

854 2004), and greater resilience (Seery, 2011), whilst also being associated with lower anxiety
855 (Moore et al., 2012) and depressive symptoms (Mak et al., 2004). Contrastingly, threat is
856 said to be associated with psychological illbeing (Nicholls et al., 2016), such as higher
857 depressive symptoms (Mak et al., 2004; Mansell, 2021), negative emotions (Doron &
858 Martinent, 2017), and irrational beliefs (Chadha et al., 2019). Overall, evidence points to
859 challenge appraisal tendencies being positively related to better mental health and it is
860 possible to suggest that when individuals tend to perceive that they possess the resources
861 to cope with demands of stressful situations, that these perceptions would be associated
862 with greater vitality and fewer symptoms of anxiety and depression.

863 **The Potential Relationship Between Stress Mindset and Stress Appraisals**

864 Similar to stress mindset and aligned with REBT, stress appraisals take the view that
865 it is not stress or adversity alone which dictates stress responses, but how we appraise
866 stress (Gomes et al., 2022). Considering the potential for stress mindset to predict stress
867 appraisals, it is logical to assume that those who possess debilitating views about stress
868 (even subconsciously) will likely perceive inflated demands and reduced resource appraisals
869 when confronted with stressful situations and thus experience threat rather than challenge.
870 Although research has begun to establish positive associations between a 'stress-is-
871 enhancing' mindset and challenge appraisals (Kilby & Sherman, 2016), a scoping review has
872 suggested that the relationships between beliefs about stress and stress-related outcomes
873 may be indirect (Kilby et al., 2020). Whilst the suggestion by Kilby et al. (2020) raises the
874 possibility of an indirect relationship, it also highlights the need for studies to confirm this
875 and investigate potential mediators between stress mindset and stress appraisals.

876 So, if an individual possesses a 'stress-is-enhancing' mindset, how does this set of
877 beliefs encourage the likelihood of increased challenge appraisals? When individuals
878 endorse statements such as "*Experiencing stress facilitates my learning and growth*" (SMM-
879 G; Crum et al., 2013), it appears logical that this would lead to increases in approach-type
880 cognitions and behaviours, and as posited by the TCTSA (Jones et al., 2009), this is an
881 antecedent of challenge appraisals. That said, in athletes specifically there is very little
882 research that has examined the relationships between stress mindset and stress appraisals
883 and moreover, not all research which has examined stress beliefs and stress appraisals has
884 been conclusive. As such, there appears to be a gap that needs to be addressed regarding
885 how stress mindset and stress appraisals may relate, especially in athletes.

886 Kickstarted by facilitative beliefs about the nature of stress in general, perhaps these
887 approach-type cognitions and behaviours increase individuals' coping expectancy by using
888 methods of coping to prepare for and deal with stressors (Skinner & Brewer, 2002). Coping
889 can be defined as "realistic and flexible thoughts and acts that solve problems and thereby
890 reduce stress" (Lazarus & Folkman, 1984, p.118) and is something that individuals can do
891 before stress occurs or in response to a stressor to help them thrive in stressful situations
892 (Greenglass & Fiksenbaum, 2009). The flexible thoughts and acts of coping suggested by
893 Lazarus and Folkman (1984) aligns with stress mindset theory in acknowledging that stress
894 *can be* enhancing (Keech et al., 2021) and that not all stress equates to distress (Jenkins et
895 al., 2021). Indeed, when examining the definition of coping, it raises the suggestion that
896 stress mindset may instigate specific coping strategies, which in turn could enhance
897 challenge appraisals.

898

899 **Coping**

900 Coping is categorised in several ways, such as avoidance coping or emotion-focused
901 coping (Nicholls, 2020). The coping style that individuals select may be influenced by their
902 trait beliefs (Guo et al., 2019) and one set of trait beliefs that is said to influence an
903 individual's coping style is stress mindset. Notably, stress mindset has been found to be
904 related to proactive coping. To elaborate, stress mindset has been demonstrated to relate
905 to psychological wellbeing indirectly through proactive coping (Horiuchi et al., 2018; Keech
906 et al., 2018; Jenkins et al., 2021). Like stress mindset, proactive coping is concerned with
907 skills that support preparations for dealing with stressors in general, such as accumulating
908 and developing personal resources including problem-solving (Aspinwall & Taylor, 1997).
909 Moreover, the general approach of both stress mindset and proactive coping may be
910 particularly salient when it is not possible to change the intensity or type of stressor and
911 thus may offer a sense of control when preparing to face stressors (Gomes et al., 2022).
912 Resultingly, proactive coping is said to positively influence stress-related outcomes such as
913 psychological wellbeing (Keech et al., 2018; Serrano et al., 2021) and performance (Stern et
914 al., 2013). In athletes specifically, proactive coping may result in a greater extent of problem
915 -solving and goal-setting skills being employed (Devonport et al., 2013), which can
916 contribute to enhanced psychological wellbeing and performance.

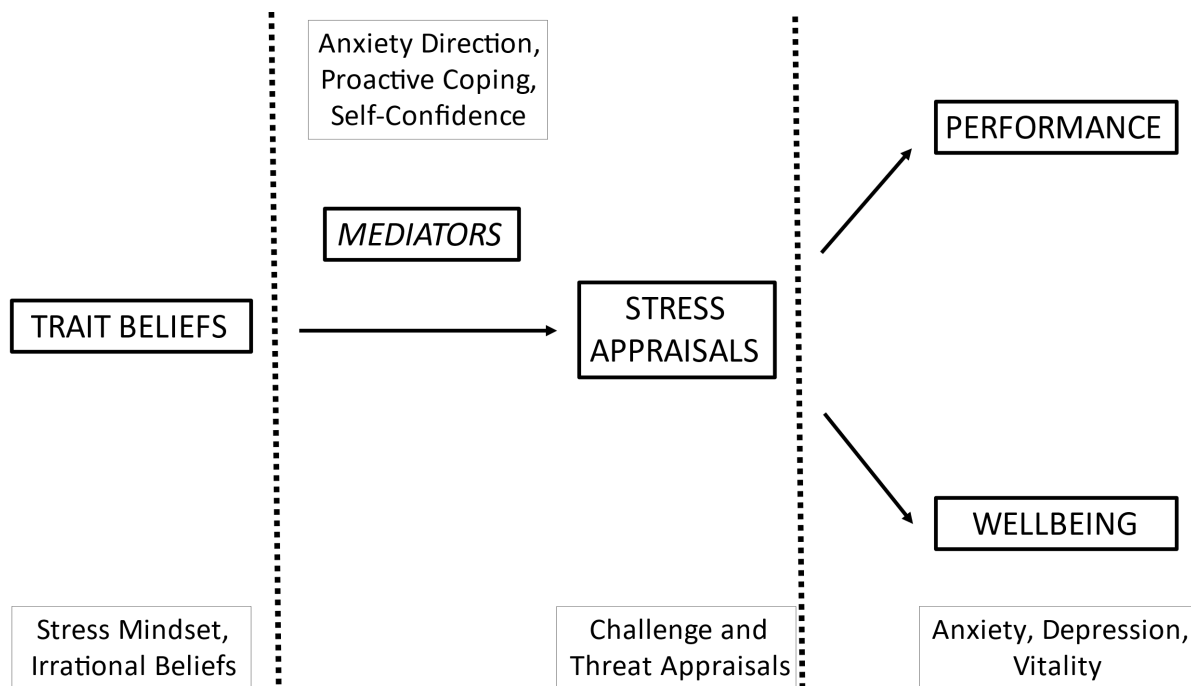
917 Although debate remains whether proactive coping should be measured as a
918 disposition or a situational state (Drummond & Brough, 2017), it could be argued that stress
919 mindset may fuel proactive coping strategies and enhance approach behaviours when faced
920 with stressful situations (Greenglass & Fiksenbaum, 2009) by allowing individuals to respond
921 based on a set of values about stress that are approach focused. Stress mindset is not a

922 coping strategy in itself, but the values purported within this theory can encourage
923 facilitative coping styles (Crum et al., 2013). In turn, the characteristics of proactive coping
924 suggest that an individual who adopts these types of coping strategies will likely appraise
925 stressful situations as a challenge rather than as a threat (Greenglass & Fiksenbaum, 2009;
926 Raper & Brough, 2020). However, the relationships between stress mindset, proactive
927 coping, and challenge appraisals have yet to be explored together, and the question remains
928 as to whether beliefs about stress influence stress appraisals directly or indirectly.

929 Below, Figure 1.1 summarises how trait beliefs, stress appraisals, performance and
930 wellbeing may relate. The diagram is based upon the findings of previous studies and
931 theories including the TCTSA-R (Meijen et al., 2020) and REBT (Ellis & Dryden, 2007). Both
932 theories endorse the notion that trait beliefs influence subsequent cognitions, and that
933 beliefs and cognitions may combine to underpin psychological wellbeing and performance.
934 Indeed, as an advancement on the seminal TCTSA (Jones et al., 2009), greater credence was
935 given to the role of trait beliefs in influencing challenge and threat appraisals. As two stable
936 and enduring beliefs, this may include stress mindset and irrational beliefs. Figure 1.1 also
937 suggests that the relationship between trait beliefs and stress appraisals are mediated by
938 several potential constructs. Considering the relationship between stress mindset and stress
939 appraisal tendencies, proactive coping may act as a mediator as it involves strategies that
940 can be employed prior to the experience of stressors. Indeed, strategies that reflect
941 proactive coping such as problem solving may be fuelled by the approach-focus that a
942 'stress-is-enhancing' mindset could instigate. Similarly, possessing adaptive trait beliefs (e.g.,
943 about stress or rational beliefs) may support the formulation of facilitative interpretations of
944 anxiety and greater self-confidence which in-turn can influence stress appraisals,
945 psychological wellbeing and performance (Jones et al., 2009).

946 **Figure 1.1**

947 *Proposed Theoretical Framework of Beliefs, Stress Appraisals, Wellbeing and Performance*



948

949 **Altering Stress Mindset and Reappraising Stress**

950 As evidence has recently begun to accumulate regarding the adaptive stress-related
951 outcomes associated with a 'stress-is-enhancing' mindset, (Crum et al., 2013), attention has
952 shifted as to how such beliefs can be cultivated. Indeed, several studies have demonstrated
953 that it is possible to change individuals' stress mindset so they possess more facilitative
954 views of stress (e.g., Crum et al., 2013; Keech et al., 2021). Often, individuals who possess a
955 'stress-is-debilitating' mindset may not be aware of the facilitative psychological and
956 physiological responses to stress and it is this type of individual who may particularly benefit
957 from stress mindset interventions (Jamieson et al., 2021; Keech et al., 2021). Demonstrating
958 the potential chain reaction effect of stress mindset, the deployment of stress mindset
959 interventions has resulted not only in increments in stress mindset, but is also often
960 accompanied by adaptive changes in stress-related outcomes (e.g., Jamieson et al., 2016).

961 The use of such interventions is important because as a set of trait and stable beliefs about
962 stress, a 'stress-is-enhancing' mindset does not develop on its own, and to achieve more
963 facilitative views of stress, it is important that 'stress-is-enhancing' mindsets are deliberately
964 taught and promoted (Kim et al., 2020). An advantage of stress mindset interventions is the
965 speed in which changes may occur. Through short interventions such as three-minute videos
966 (Crum et al., 2013) and a 15-minute presentation (Hogue, 2019), studies have concluded
967 that stress mindset interventions can be efficient, easy to administer, and impactful
968 (Herman et al., 2020). It is thought that despite the brief duration of stress mindset
969 interventions, it is possible to achieve long-lasting effects on stress-related outcomes
970 (Yeager et al., 2016), although additional longitudinal evidence is required to support this.

971 By embedding stress mindset theory into interventions, individuals can reappraise
972 their beliefs about stress (Jamieson et al., 2018). Stress reappraisal does not aim to
973 encourage individuals to 'think positively' about stress, but rather adopt more flexible
974 thinking about stress and stress responses (Jamieson et al., 2018), and in turn, this cognitive
975 approach can lead to better performance (Brooks, 2014; Jamieson et al., 2016). There are a
976 variety of methods that may be employed to deliver reappraisal, such as educating
977 individuals about the facilitative impacts of stress (e.g., Hangen et al., 2019) or by using
978 instructions (e.g., "*get excited*"; Brooks, 2014). Explanations as to why stress mindset and
979 reappraisal interventions have elucidated adaptive stress-related outcomes have been
980 posited by researchers. Firstly, rather than portraying an unrealistic view of stress as a
981 wholly positive concept, presenting that stress *can be* enhancing means that individuals are
982 more likely to accept this as an alternative to viewing stress as wholly bad. A binary view of
983 stress as 'only bad' or 'only good' is not accurate, and instead adopting a more balanced
984 viewpoint of stress is possible as individuals can process positive and negative emotions

985 simultaneously (Man et al., 2017). Secondly, a stress mindset intervention could be effective
986 as it supports individuals to normalize emotional distress, accept that unpleasant emotions
987 are natural when under pressure, and recognise the possibilities of benefitting from such
988 situations (Jordet, 2010). However, one novel explanation as to why stress mindset and
989 reappraisal interventions can alter stress mindset is through alignment with the REBT
990 framework. To elaborate, by employing the element of controllability purported by REBT,
991 individuals can learn that their responses to stress do not have to be controlled by an
992 adverse event in itself and how they respond to stress is malleable (McEwan & Schmalz,
993 2010). Indeed, the $A \rightarrow B \rightarrow C$ framework posited by REBT suggests that when individuals'
994 behavioural and emotional consequences (C) are not governed by an adverse situation
995 alone (A) but instead by their beliefs about the situation (B), it leads to more adaptive stress
996 -related outcomes (Dryden, 2021). There are no known studies that have yet to position
997 stress mindset within the REBT framework but doing so may help to strengthen the
998 likelihood of altering stress mindset through appropriate interventions.

999 Another explanation as to why embedding stress mindset theory into stress
1000 reappraisal interventions may be effective in enhancing stress-related outcomes is by acting
1001 as a shortcut to stress inoculation. Being repeatedly exposed to performance-based stressful
1002 situations has been demonstrated to result in more adaptive cardiovascular profiles (Kelsey
1003 et al., 1999), suggesting that athletes can get used to performing under pressure. This may
1004 act as a resource to facilitate performance under pressure as part of preparation for
1005 stressful situations (LeBlanc, 2009). However, the application of a stress mindset and stress
1006 reappraisal intervention may mean that rather than having to experience stress to get used
1007 to coping with stressors, the stress-related benefits associated with stress inoculation may
1008 be experienced more quickly and efficiently. However, caution should be urged with this

1009 assertion. Despite other recent indications that stress mindset interventions can positively
1010 alter stress mindset, all individuals are different and will respond to interventions in various
1011 ways (Hangen et al., 2019). Consequently, this means developing a range of stress mindset
1012 interventions will allow practitioners to call upon a greater variety of methods to suit the
1013 needs of different individuals and contexts.

1014 **Imagery**

1015 As well as the use of education about stress to successfully facilitate stress
1016 reappraisal (Hangen et al., 2019), imagery is another method with demonstrable
1017 effectiveness (e.g., Williams et al., 2017). Imagery is recognised as a psychological process
1018 through which an individual uses all available senses to experience an event without
1019 experiencing the real thing (White & Hardy, 1998). A medium that has demonstrated wide-
1020 ranging benefits, imagery has also been associated with positive effects on psychological
1021 wellbeing (Skodzik et al., 2017), the regulation of emotions (Cumming et al., 2017a), and
1022 challenge states (Williams & Cumming, 2012). Importantly, imagery has been suggested to
1023 be an effective method to enhance stress mindset (Keech et al., 2021). Although there is
1024 little other evidence to support the finding by Keech et al. (2021), the use of imagery to
1025 enhance stress mindset may have been due to their shared characteristic of attempting to
1026 change experiences of stress (Jamieson et al., 2018).

1027 Imagery's ability to encourage stress reappraisal may be explained by Lang's (1979)
1028 Bioinformational theory of imagery, which proposes all images consist of stimulus, response
1029 and meaning propositions. Stimulus propositions relate to the scenario involved in the
1030 imagery (e.g., a job interview), response propositions are concerned with the emotional and
1031 psychological responses an individual experiences because of the stimulus, and meaning

1032 propositions explain how the response to the stimuli is perceived by the individual (Williams
1033 et al., 2013). Such responses may be deemed as facilitative or debilitating (Cumming et al.,
1034 2017a), and the goal of imagery can be to alter individuals' responses to become more
1035 facilitative by encouraging reappraisal of response propositions to the stimuli associated
1036 with stressful situations (Holmes et al., 2007). This may promote a greater sense of control
1037 and facilitate performance under pressure (Williams et al., 2021) and appears to align with
1038 the content purported in stress mindset theory in that it is possible to view stress more
1039 favourably.

1040 **Implementing Imagery**

1041 Imagery is often conducted in applied settings by using imagery scripts. Working with
1042 a practitioner, athletes can construct content to elicit more adaptive meaning propositions
1043 that align with the $A \rightarrow B \rightarrow C$ framework posited by REBT (Ellis, 1994b). Utilised via either
1044 written or audio methods, this flexible approach to creating and using imagery scripts
1045 means that athletes can tailor content to their own specific situations. Indeed, studies have
1046 demonstrated that using imagery scripts based on Lang's Bioinformational theory can be a
1047 fruitful method of enhancing facilitative interpretations of anxiety (Cumming et al., 2007)
1048 and challenge appraisals (Williams et al., 2010).

1049 A second imagery technique likely to be effective in altering meaning propositions
1050 and beliefs about stress is Layered Stimulus Response Training (LSRT; Cumming et al.,
1051 2017a). This technique is said to increase the vividness of imaging (Williams et al., 2013) by
1052 beginning with simple images before reflecting on the content of the images and then
1053 adding to this content in a layering approach (Cumming et al., 2017a). Increasing of imagery
1054 ability is important given the known role of imagery ability as a moderator of imagery's

1055 success (Cumming & Williams, 2012). However, the layered approach to LSRT may also be
1056 effective in adding to the image more positive feelings or outcomes associated with stress
1057 gradually (e.g., imaging a stressful situation while also being focussed and performing well in
1058 the situation). Consequently, the LSRT process may also be capable of altering the response
1059 propositions of the image, that is the belief one has about stress.

1060 Overall, evidence suggests that imagery is an effective form of reappraisal and can
1061 deliver positive outcomes such as enhanced stress appraisals (Williams & Cumming, 2012)
1062 and more facilitative interpretations of anxiety symptoms (Williams et al., 2017; Quinton et
1063 al., 2019). However, despite the known effectiveness of imagery in facilitating adaptive
1064 stress related outcomes, there is a paucity of research which confirms imagery's ability to
1065 compliment stress mindset interventions, and whether imagery scripts or LSRT are suitable
1066 methods to enhance stress mindset and other stress-related outcomes. Accordingly,
1067 developing combined stress mindset and imagery interventions warrant further exploration
1068 as a method of enhancing stress-related outcomes such as psychological wellbeing and
1069 performance.

1070 **Summary**

1071 Stress is unavoidable as part of daily life and is inextricably linked to individuals'
1072 psychological wellbeing and their ability to perform well across a multitude of domains. The
1073 role of dispositional traits in the relationships between stress mindset, psychological
1074 wellbeing, and performance may be important, although additional research is required to
1075 establish how this might be the case (Moore et al., 2014). One such trait disposition is stress
1076 mindset, and research in this area has shown promise in that beliefs about stress may
1077 influence stress-related outcomes and that it may be altered through interventions (e.g.,

1078 Crum et al., 2013). Considering stress mindset and stress responses in a novel way through
1079 an REBT lens may provide insight as to how stress beliefs can have downstream influences
1080 on stress-related outcomes. Accordingly, the formulation of models that test the
1081 relationships between stress mindset, stress appraisals and psychological wellbeing may
1082 enhance knowledge of how they influence each other (e.g., Keech et al., 2020; Kilby &
1083 Sherman, 2016).

1084 As well as conducting investigations as to how stress mindset may influence other
1085 stress-related outcomes, further research into these relationships that focus on athletes
1086 specifically is of particular importance given the specific range of additional stressors that
1087 athletes experience (e.g., Reardon et al., 2019). Developing knowledge in this area can then
1088 be used as a theoretical basis for interventions to support the psychological wellbeing of
1089 individuals and their performance when confronted with stressful situations.

1090 **Aims**

1091 The aim of the present thesis was to explore how stress-related factors such as stress
1092 mindset, irrational beliefs, and stress appraisals may relate to psychological wellbeing and
1093 performance under pressure, and each chapter within the thesis aimed to address a specific
1094 research question within this domain. The overarching aim of the thesis was achieved by
1095 first investigating how trait dispositions (i.e., stress mindset and irrational beliefs), stress
1096 appraisals, and psychological wellbeing are related. Chapter 2 investigated the extent to
1097 which athletes' stress mindset and other irrational beliefs were associated with their
1098 depressive symptoms and vitality, and whether these relationships were indirectly
1099 associated through challenge and threat appraisal tendencies. Path analysis was employed
1100 to examine the direct and indirect effects of these relationships using cross-sectional data

1101 from over 400 athletes from a variety of sports across a range of levels of competition. A
1102 secondary aim was to investigate whether there were gender and age differences in stress
1103 mindset, irrational beliefs, challenge and threat appraisals, depressive symptoms, and
1104 vitality. An REBT framework (Ellis, 1994a) was used to posit that stress mindset may be
1105 conceptualised as a type of irrational belief about stress, and to explain how such trait
1106 dispositions related to stress appraisal tendencies and psychological wellbeing. Chapter 3
1107 then assessed whether the relationship between stress mindset and stress appraisal
1108 tendencies identified in Chapter 2 was moderated by proactive coping. A secondary aim of
1109 Chapter 3 was to investigate whether there were any differences in stress mindset between
1110 athletes and non-athletes.

1111 Following on from the identified associations in the first half of the thesis, an
1112 experimental design was employed in the remaining chapters. Chapter 4 aimed to examine
1113 whether an individual's stress mindset could be altered using a stress mindset and imagery
1114 intervention. Additionally, the study investigated whether any changes in stress mindset
1115 were accompanied by higher levels of self-confidence, a greater challenge appraisal, lower
1116 threat appraisal, more facilitative anxiety, and better performance of a competitive golf
1117 putting task. Novice golfers were randomly assigned to a control group, a stress mindset
1118 only group, or a stress mindset and imagery group, and completed the putting task after
1119 watching a 3-minute video either highlighting the adaptive properties of stress responses
1120 and providing the message that stress *can be* enhancing (stress mindset group) or watching
1121 the same video and also listening to a 3-minute imagery script designed to promote more
1122 facilitative interpretations of responses to the competitive putting task (stress mindset and
1123 imagery group).

1124

CHAPTER 2

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1131 **STRESS MINDSET IN ATHLETES: INVESTIGATING THE RELATIONSHIPS BETWEEN BELIEFS,**

1132 **CHALLENGE AND THREAT WITH PSYCHOLOGICAL WELLBEING**

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1141 Stress has been defined as “the relationship between the person and the
1142 environment that is appraised by the person as taxing or exceeding his or her resources and
1143 endangering his or her well-being” (Lazarus and Folkman, 1984, p.21). Stressors are also
1144 commonplace for athletes due to a variety of factors such as injury, deselection and
1145 competitive failures (Turner et al., 2017). Athletes experiencing greater or more long-term
1146 stress may display depressive symptoms which can result in a clinical diagnosis of
1147 depression (Rice et al., 2016). This process is said to occur as chronic stress can cause long-
1148 term changes in an individual’s emotions, physiology and behaviours which can influence
1149 susceptibility to depressive symptoms (Cohen et al., 2007), such as low mood, persistent
1150 fatigue, disturbed sleep and low self-esteem (WHO, 2019). Additionally, subjective vitality
1151 (i.e., feeling alive and full of energy; Ryan & Fredrick, 1997) can be depleted due to chronic
1152 stress (Rozanski & Kubzansky, 2005). Vitality has been highlighted by some studies as a
1153 predictor of psychological wellbeing (Lavrusheva, 2020) and has been noted for its negative
1154 relationship with depressive symptoms (Ryan & Fredrick, 1997). However, subjective vitality
1155 is considered to be a renewable form of affect and may be revived with the assistance of
1156 positive antecedents (Lavrusheva, 2020). In a sporting context, there has been little prior
1157 research that has examined the relationship between stress and vitality, however, it can be
1158 proposed that a similar relationship will exist in that greater stress is likely to be associated
1159 with lower vitality. The nature of competition in sport means that the outcomes of athletic
1160 endeavours are uncertain. The uncertainty in sport means that it is not possible to avoid
1161 stress (Jamieson et al., 2016) and athletes will always encounter stressful situations as part
1162 of their pursuits, particularly in motivated performance situations as they assess the
1163 demands of the situations and their perceived resources to meet those demands (Meijen et
1164 al., 2020). Therefore, it is important that research seeks to investigate factors that relate to

1165 stress and athletes' psychological wellbeing, such as depressive symptoms and vitality.

1166 Research suggests that it is not simply experiencing stress that has a detrimental
1167 effect on our psychological wellbeing, but rather how stressful situations are viewed and
1168 appraised is likely to be of equal importance (Lazarus & Folkman, 1984). Rational Emotive
1169 Behaviour Therapy (REBT; Ellis & Dryden, 2007) offers support for this notion by theorizing
1170 that beliefs play a key role in determining the responses that an athlete experiences in a
1171 stressful situation, thus influencing cognitive appraisals about an event. As the environment
1172 of sport frequently places athletes under conditions of stress, it would appear logical to
1173 examine how appraising stress is associated with depression and vitality. Two types of stress
1174 appraisal are challenge and threat, which are responses to performance situations of
1175 personal significance suggested in the Theory of Challenge and Threat States in Athletes
1176 (TCTSA; Jones et al., 2009); and the revised version of the TCTSA (TCTSA-R; Meijen et al.,
1177 2020). When an athlete perceives that the competition is relevant to the athlete's goals and
1178 that the conditions are favourable for success, they will appraise the scenario as a challenge
1179 (Meijen et al., 2020), such as a sprinter believing that they can win an important race.
1180 Conversely, an athlete who considers the competition to be relevant but deems the
1181 conditions to be unfavourable for success will appraise the scenario as a threat (Meijen et
1182 al., 2020). For example, when a tennis player believes that they are not capable of beating
1183 an opponent in a forthcoming tournament. Perceptions of resources being able to meet the
1184 demands of a situation are thought to be determined by levels of self-efficacy, perceived
1185 control, and approach or avoidance goal focus, whilst predispositions such as trait appraisals
1186 (Skinner & Brewer, 2002) and irrational beliefs (David et al., 2002) are also considered to
1187 influence state challenge and threat. Specifically, 'high challenge' is experienced when
1188 individuals feel efficacious, in control, and focus on approach goals (Meijen et al., 2020).

1189 Athletes who appraise a stress-evoking situation as a challenge in turn experience more
1190 adaptive responses such as positive emotions and if negative emotions are experienced,
1191 these are perceived as being facilitative for performance (Meijen et al., 2020). Those who
1192 appraise the same situation as a threat experience negative emotions (Doron & Martinent,
1193 2017; Meijen et al., 2020) or emotions which are more debilitating to performance (Williams
1194 et al., 2017). Building on previous research by Jones et al., (2009), researchers have recently
1195 suggested that it is possible to be experiencing both challenge and threat simultaneously
1196 (Uphill et al., 2019) and that challenge and threat may instead be described using a 2 x 2
1197 theory of high challenge, low challenge, high threat and low threat (Meijen et al., 2020). In
1198 attempting to explain the mechanism behind this relationship, individuals who appraise
1199 stressful situations as a challenge see an opportunity for growth and mastery, which can in
1200 turn positively influence levels of psychological wellbeing (Adie et al., 2008). Both a stress-is-
1201 debilitating mindset and irrational beliefs share the distinction of being (Jones et al., 2009),
1202 the TCTSA-R (Meijen et al., 2020) aligns with REBT in suggesting that an athletes' beliefs may
1203 also play a role in determining cognitive appraisals. With that in mind, it is important to
1204 identify dispositions likely to be associated with athletes' general challenge and threat
1205 appraisal tendencies due to the relationship these could have on general psychological
1206 wellbeing.

1207 Beliefs, or the views that we adopt for oneself (Dweck, 2017), are said to be a key
1208 factor in influencing the psychology of an individual towards a stressful event. One such type
1209 of belief likely to be associated with appraisals of stressful events is stress mindset. Rather
1210 than focusing on the amount or intensity of stress (Crum et al., 2017), stress mindset refers
1211 to the extent to which an individual holds the trait belief that stress has enhancing or
1212 debilitating consequences on stress-related outcomes (Crum et al., 2013). For instance, an

1213 individual may believe that stress has positive or negative benefits in areas such as health,
1214 productivity, wellbeing and performance (Crum et al., 2013). Such beliefs about stress are
1215 considered to be part of higher-level belief systems and are general in nature compared to
1216 more situation-specific appraisals (Jamieson et al., 2018). While stress has traditionally been
1217 viewed negatively, more recent research supports the notion that stress can be perceived
1218 positively and used constructively (e.g., Crum et al., 2013; Jamieson et al., 2016) and differs
1219 from resilience and hardiness approaches to stress as they reaffirm the notion that stress
1220 needs to be managed or reduced rather than used in a facilitatory capacity (Crum et al.,
1221 2013). Indeed, a 'stress-is -enhancing' mindset, where an individual embraces stressful
1222 situations and sees them as an opportunity to learn (Park et al., 2018), is thought to have
1223 beneficial effects on health and wellbeing (Crum et al., 2013). For instance, Skinner and
1224 Brewer (2002) reported that positive appraisals of stressful events are associated with
1225 positive emotions, whereas individuals who hold rigid beliefs that stressful situations are
1226 negative occurrences typically experience lower levels of vitality compared to those who
1227 interpret stressful situations as facilitative (Park et al., 2018).

1228 In non-athlete populations a 'stress-is-enhancing' mindset has been found to
1229 increase levels of positive emotions (Crum et al., 2017) and proactive coping behaviours
1230 (Keech et al., 2018). Additionally, a stress-is-enhancing mindset has been shown to
1231 positively relate with challenge in employees anticipating high-workload situations (Casper
1232 et al., 2017) and a mathematics competition (Hangen et al., 2019). Perhaps this increase in
1233 positive emotions under stressful circumstances is due to a 'stress-is-enhancing' mindset
1234 giving an individual more belief that they can succeed in such situations as they have more
1235 positive expectations of coping with the stressor (Jones, 1995). In turn, as self-efficacy is
1236 known as a key antecedent of challenge (Skinner & Brewer; 2002; Turner & Barker, 2013),

1237 an individual may be more likely to adopt a challenge approach to a stress situation if they
1238 hold a 'stress-is-enhancing' mindset.

1239 Research has also found links between depressive symptoms and stress mindset
1240 (Crum et al., 2013). Specifically, a 'stress-is-enhancing' mindset has been associated with
1241 lower levels of depressive symptoms and higher levels of wellbeing (Crum et al., 2013; Jiang
1242 et al., 2019). In contrast, students who held 'stress-is-debilitating' mindsets were
1243 significantly more likely to have increased levels of depressive symptoms than those who
1244 held 'stress-is-enhancing' mindsets (Huebschmann & Sheets, 2020). In terms of athlete
1245 populations, there is little known research that examines the relationships between stress
1246 mindset and psychological wellbeing. Recent work by Smith et al. (2020) in US Navy SEALs
1247 shows some promise that stress mindset can be an important factor in stressful athletic
1248 situations by demonstrating that a 'stress-is-enhancing' mindset can influence levels of
1249 performance and persistence, possibly by improved physiological responses to stressors,
1250 such as by improved cortisol reactivity profiles (Crum et al., 2013). This finding suggests that
1251 stress mindsets in athletes may play an important role in psychological wellbeing.

1252 Irrational beliefs are another factor which have been found to influence affect in
1253 athletes by interacting with challenge and threat when considered through a Lazarusian
1254 perspective (Chadha et al., 2019). Irrational beliefs are rigid, extreme and inflexible beliefs
1255 comprised of a primary irrational belief (demandingness) and three secondary beliefs (self-
1256 depreciation, low frustration tolerance, and awfulizing; Turner et al., 2017). Demandingness
1257 is characterised by absolute expressions, such as 'must win' and 'have to', self-depreciation
1258 refers to negative evaluations applied to oneself, low frustration tolerance is concerned with
1259 a belief of an inability to tolerate the conditions of adversity (Bennett & Turner, 2018), and

1260 awfulizing includes beliefs that consider unpleasant events to be the worst that they could
1261 be (Dryden & Neenan, 1995). From a REBT viewpoint, individuals hold the view that
1262 adversity (e.g., failure in a sporting competition) is inevitable. When faced with such
1263 situations, individuals with irrational beliefs will experience unhealthy negative emotions
1264 (e.g., depression) and behaviours that are unhelpful (e.g., avoidance) in the pursuit of
1265 athletic success (Visla et al., 2016). In contrast, according to binary constructs of emotional
1266 distress (Ellis, 1962), low levels of irrational beliefs are said to be associated with low levels
1267 of dysfunctional negative feelings and high levels of functional negative feelings when faced
1268 with a stressful situation (David et al., 2005). Indeed, rational beliefs are more logical, non-
1269 extreme and flexible and are considered to promote positive levels of psychological
1270 wellbeing (Turner, 2016). REBT is based on the ABC(DE) framework (Ellis & Dryden, 2007),
1271 where practitioners assist individuals by helping them to recognise that the adversity they
1272 face (A) does not cause emotional and behavioural responses alone (C), instead, it is their
1273 beliefs (B) about the situation (A) that helps determine their response (C). With this in mind,
1274 it is possible to suggest that stress mindset and REBT are theoretically closely aligned and
1275 that a 'stress-is-debilitating' mindset may be an irrational belief in itself about stress. Both a
1276 'stress-is-debilitating' mindset and other irrational beliefs share the distinction of being
1277 meta-emotional disturbances, that is emotional disturbance about emotional disturbances
1278 (Dryden & Branch, 2008), and individuals who possess 'stress-is-debilitating' mindsets may
1279 reflect irrational beliefs in that their beliefs about stress are fixed, illogical and extreme.
1280 REBT posits that it is an individual's beliefs about what happens to them that causes stress
1281 and not stress alone (Dryden & Branch, 2008). Therefore, in the case of individuals who
1282 possess 'stress-is-debilitating' mindsets and other irrational beliefs, an REBT theoretical
1283 approach seeks to promote cognitions that are B to C in nature to reduce emotional

1284 disturbances and encourage positive cognitive reappraisal. To summarise, both stress
1285 mindset and irrational beliefs theories are linked closely to REBT in that in both areas, an
1286 individual's dysfunctional responses (C) are formulated as a result of rigid and extreme
1287 beliefs (B) held about adversity (A).

1288 There is growing recent evidence to suggest how the complex interactions of irrational
1289 beliefs and challenge and threat may influence affective states (Chadha et al., 2019), which
1290 in turn may influence athletic performance and wellbeing. It is thought that primary
1291 appraisals about the demands of the task and secondary appraisals of an individual's
1292 perceived possession of resources to cope with said demands may link irrational beliefs to
1293 appraisals (Evans et al., 2018). In support, irrational beliefs have been shown to be positively
1294 associated with threat in specific sporting contexts (Dixon et al., 2017; Evans et al., 2018;
1295 Chadha et al., 2019) and negatively with challenge (Chadha et al., 2019), perhaps due to
1296 having negative expectations about future events. In turn, research has shown that athletes
1297 who experience higher threat are also more likely to interpret stress responses as
1298 debilitating towards performance (Chadha et al., 2019). Importantly for practitioners, recent
1299 research has demonstrated that athletes who experienced a reduction in irrational beliefs
1300 also experienced an increase in self-efficacy (Chrysidis et al., 2020; Wood et al., 2017) -
1301 situational specific self-confidence - which may assist athletes in developing challenge
1302 appraisals. Literature from both sport and outside of sport also demonstrates that irrational
1303 beliefs are associated with depressive symptoms (Flett et al., 2008; Turner et al., 2017; Visla
1304 et al., 2016) and can influence stress appraisals (i.e., challenge and threat) to alter emotions
1305 and anxiety (Chadha et al., 2019). In athletes, irrational beliefs have been found to relate to
1306 depressive symptoms through dysfunctional perceptions in the form of maladaptive
1307 schemas that are activated in relevant situations (Turner et al., 2019a). Therefore, challenge

1308 and threat appraisals are proposed to be two more cognitions that indirectly associate
1309 irrational beliefs with depressive symptoms and vitality.

1310 **Aims and Hypothesis**

1311 Despite the likely importance of athlete stress mindset and other irrational beliefs on
1312 depressive symptoms and vitality, there is no known research that examines how these
1313 variables are associated in an athlete population, and whether challenge and threat
1314 appraisals have an effect on these relationships. Therefore, the aims of the present study
1315 were to investigate the extent to which athletes' stress mindset and other irrational beliefs
1316 were associated with their depressive symptoms and vitality, and whether these
1317 relationships were influenced through challenge and threat tendencies. As displayed in
1318 Figure 2.1, it was hypothesised that stress mindset would be positively associated with a
1319 challenge appraisal tendency and negatively associated with a threat appraisal tendency.
1320 Irrational beliefs were hypothesised to have the reverse associations with the same
1321 variables. Challenge and threat appraisal tendencies were predicted to relate to depressive
1322 symptoms positively and negatively respectively and were predicted to relate to vitality
1323 negatively and positively respectively. Furthermore, indirect associations between stress
1324 mindset (negatively to depressive symptoms and positively to vitality) and other irrational
1325 beliefs (positively to depressive symptoms and negatively to vitality) were proposed to
1326 operate through challenge and threat appraisal tendencies. It was also hypothesized that
1327 the relationship between vitality and depressive symptoms would be bi-directional and that
1328 these associations would be negative.

1329 Additionally, previous research has identified gender and age differences in beliefs,
1330 appraisals and psychological wellbeing (e.g., Mak et al., 2004). Therefore, the present study

1331 also examined any gender and age differences in stress mindset, irrational beliefs, challenge,
1332 threat, depressive symptoms and vitality. It was proposed that males would possess greater
1333 levels of stress mindset, challenge appraisal, and vitality than females, with females
1334 possessing higher irrational beliefs, threat and depressive symptoms than males. It is also
1335 hypothesised that age would have a negative relationship with, irrational beliefs, threat
1336 appraisal, depressive symptoms and vitality, and a positive relationship with stress mindset
1337 and challenge appraisal.

1338 **Method**

1339 **Participants**

1340 Four hundred and fifteen athletes ($n = 227$ females, $n = 183$ males, $n = 5$ other, *Mage*
1341 $= 33.86$ years, $SD = 17.73$) participated in the study. Following ethical approval from the
1342 author's university ethics committee, participants were recruited locally through
1343 advertisements on campus and throughout the UK by sending emails to sports clubs. The
1344 study was also promoted via social media channels such as Facebook and Twitter. Recruited
1345 athletes represented fifty different team and individual sports including running ($n = 84$),
1346 football ($n = 48$) and roller derby ($n = 26$). The competitive level of the athletes included
1347 recreational ($n = 169$), local club/university ($n = 164$), regional ($n = 36$), semi-professional (n
1348 $= 15$), national ($n = 17$), and international ($n = 14$), and athletes had taken part in their main
1349 sport for an average of 13.14 years ($SD = 11.54$). Exclusion criteria included not currently
1350 experiencing any injuries preventing them from taking part in their sport in the last two
1351 weeks, and having no medically diagnosed mental health conditions. Inclusion criteria were
1352 that athletes were at least eighteen years of age and took part in a sport.

1353 **Measures**

1354 ***Stress Mindset***

1355 Stress mindset was assessed using the 8-item unidimensional Stress Mindset
1356 Measure - General (SMM-G; Crum et al., 2013). Four statements emphasise more of a stress
1357 -is-enhancing mindset (e.g., *“Experiencing stress enhances my performance and*
1358 *productivity”*), and four statements represent a stress-is-debilitative mindset (e.g., *“The*
1359 *effects of stress are negative and should be avoided”*). Participants rated how strongly they
1360 agreed with each of the eight statements on a 4-point Likert scale ranging from 0 (*strongly*
1361 *disagree*) to 4 (*strongly agree*). Negatively worded items are reverse scored and then all 8
1362 items are averaged together on one subscale so that the higher the value, the more on a
1363 continuum an individual is considered to possess a stress-is-enhancing mindset. The SMM
1364 was reported to produce valid and reliable stress mindset scores (Crum et al., 2017). The
1365 Cronbach alpha coefficient in the present study was .87, indicating high levels of internal
1366 reliability.

1367 ***Irrational Beliefs***

1368 The irrational performance beliefs inventory (iPBI; Turner et al., 2016) was used to
1369 assess irrational beliefs. The 28-item scale assessed four subscales including Demandingness
1370 (DEM; e.g., *“I have to be viewed favourably by people that matter to me”*), Low Frustration
1371 Tolerance (LFT; e.g., *“I can’t stand not reaching my goals”*), Awfulizing (AWF; e.g., *“It is*
1372 *appalling if others do not give me chances”*) and Self-depreciation (DEP; e.g., *“If I face*
1373 *setbacks, it goes to show how stupid I am”*). Participants rate the extent to which they
1374 agree/disagree with each statement on a 7-point Likert scale ranging from 1 (*strongly*
1375 *disagree*) to 7 (*totally agree*). Questions have been previously developed for a sports setting
1376 (e.g., *“It would be awful if my position in the team was not secure”*; Turner & Allen, 2018).
1377 The scale was also deemed suitable for this study due to its previously reported validity and
1378 reliability (Turner & Allen, 2018). Cronbach alpha coefficients in this study indicated high

1379 levels of reliability and were recorded for each subscale: DEM, $\alpha = .78$; LFT, $\alpha = .87$, AWF,
1380 $\alpha = .83$ and DEP, $\alpha = .91$.

1381 **Challenge and Threat**

1382 The Challenge and Threat in Sport Scale (CAT-Sport Scale; Rossato et al., 2018) was
1383 used to assess athletes' experiences of challenge and threat in anticipation of competition.
1384 The CAT-Sport Scale is a 12-item questionnaire with 5 items assessing challenge (e.g., "A
1385 *challenging situation motivates me to increase my efforts*") and 7 items assessing a threat
1386 (e.g., "I feel like competing in my sport is a threat"; Rossato et al., 2018). Participants
1387 indicate the extent to which agree or disagree with each statement by responding on a 7-
1388 point Likert scale ranging from 1 (*totally disagree*) to 7 (*totally agree*). Mean scores are
1389 generated for challenge and threat subscales. The Cronbach alpha coefficient in the present
1390 study was .84 for challenge and .94 for threat, indicating high levels of internal reliability
1391 (Rosatto et al., 2018). The scale has also been recently used in other similar studies (Chadha
1392 et al., 2019).

1393 **Depressive Symptoms**

1394 The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) was designed to
1395 assess the mental health of an individual, with 9 items taken from the original 36 to assess
1396 symptoms of depression. Participants are asked to consider how frequently they have been
1397 bothered by things over the last two weeks. Nine items include things like "*Little interest or*
1398 *pleasure in doing things*" and "*Feeling down, depressed or hopeless*". Responses are made
1399 on a 4-point Likert scale ranging from 0 (*not at all*) to 3 (*nearly every day*). Scores are then
1400 summed with higher scores therefore indicating higher levels of depressive symptoms. The
1401 PHQ-9 has been found to be a valid and reputable measure of depression severity (Kroenke
1402 et al., 2001) and has been used recently in other studies that measure the association

1403 between depressive symptoms and irrational beliefs (e.g. Turner et al., 2019). The Cronbach
1404 alpha coefficient in the present study was .88, indicating high levels of internal reliability.

1405 **Vitality**

1406 Participants' feelings of positive affect and personal energy were measured using the
1407 Subjective Vitality Scale (SVS; Ryan & Frederick, 1997). Seven items are included in total
1408 (e.g., "*I look forward to each new day*") in which participants indicate the degree to which
1409 each statement is true for them in general in their life. Responses are made on a 7-point
1410 Likert scale, ranging from 1 (*not at all true*) to 7 (*very true*). One item ("*I don't feel very*
1411 *energetic*") was reverse-coded and all items are then summed so that a higher score
1412 indicates a greater subject vitality. The Cronbach alpha coefficient in the present study was
1413 .91, indicating high levels of internal reliability. The SVS has also previously been found to
1414 demonstrate high internal reliability ($\alpha = 0.93$; Rouse et al., 2015; Fenton et al., 2018) and
1415 has been used other recent relevant studies (Davis & Turner, 2020).

1416 **Procedures**

1417 Data collection took place for five months from April 2019 – August 2019. Potential
1418 participants were provided with an information sheet about the study (see Appendix 1),
1419 including inclusion/exclusion criteria, details of key ethical considerations such as data
1420 confidentiality and their freedom to withdraw at any time. After providing informed consent
1421 (see Appendix 2), participants completed an online questionnaire pack containing the SMM,
1422 iPBI, CAT-Sport, PHQ-9 and SVS. Overall, the questionnaire pack took about 20 minutes to
1423 complete and participants were thanked for taking part in the study upon completion.

1424 **Data Analyses**

1425 Data were screened and cleaned in SPSS (IBM, version 26). Three participants did not
1426 complete the questionnaire pack and were removed from the data. The remaining data

1427 contained less than 5% of missing responses. Little's MCAR Test demonstrated that this data
1428 was missing at random ($p > .05$), so the expectation maximisation method was employed to
1429 complete the data set (Tabachnick & Fidell, 2013). Next, data were checked for outliers and
1430 normality. The process of checking for outliers revealed no univariate or multivariate
1431 outliers when using Mahalanobis distance at $p < .001$ (Tabachnick & Fidell, 2013). The final
1432 sample consisted of 415 participants (female $n = 227$, male $n = 183$, other $n = 5$).

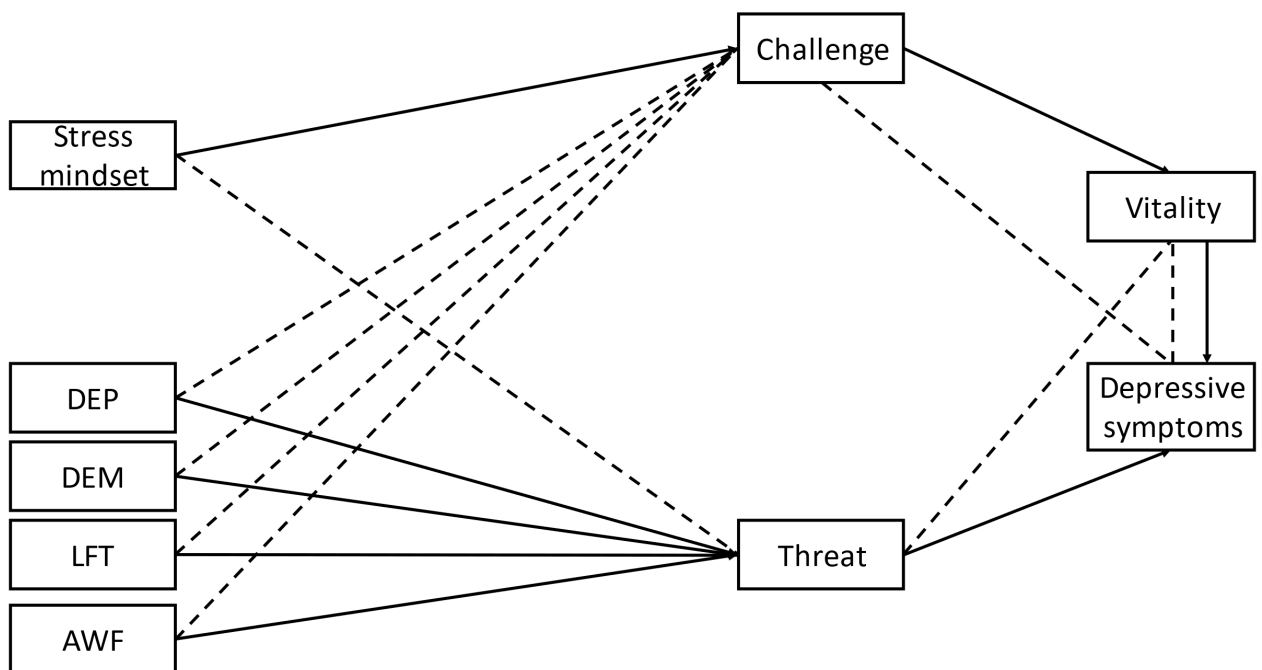
1433 To check that the questionnaire data was valid and reliable, confirmatory factor
1434 analysis (CFA) using AMOS (version 26) was conducted on all questionnaires to assess fit
1435 indices for all the questionnaires (see Table 2.1). Cronbach alpha co-efficients were
1436 conducted on all questionnaire subscales along with chi-square (χ^2 ; Jöreskog & Sörbom,
1437 1993) and degrees of freedom, comparative fit index (CFI), Tucker Lewis fit index (TLI), root
1438 mean square error of approximation (RMSEA), and standardized root mean square residual
1439 (SRMR).

1440 Descriptive statistics were calculated, and one-way ANOVAs were conducted to see
1441 whether there were any gender differences in the different variables of interest (i.e., stress
1442 mindset, irrational beliefs (demandingness, self-depreciation, low frustration tolerance and
1443 awfulizing), challenge and threat, depressive symptoms, and vitality) due to gender
1444 differences in previous research (e.g., Mak et al., 2004). Next, Pearson's correlations were
1445 conducted to test for associations between these different variables of interest. In the case
1446 of correlational analysis between age and the variables of interest, R^2 values were also
1447 calculated to reduce bias towards p values (Zhu, 2012). The findings were also used to
1448 determine that gender and age should be controlled for when testing the hypothesised
1449 model. Based on literature highlighting more elite athletes are better able to employ

1450 psychological skills to guard against the debilitating effects of stressful situations compared
 1451 to lower-level athletes or non-athletes (e.g., Hagan Jr et al., 2017; Neil et al., 2006),
 1452 competitive level was controlled for in the hypothesised model. For visual simplicity, gender,
 1453 age and competitive level are not displayed in Figure 2.1.

1454 **Figure 2.1**

1455 *Hypothesised Model*



1456
 1457 *Note.* Dashed lines represent negative associations and unbroken lines represent positive
 1458 associations.

1459

1460 The hypothesised model was tested using path analysis in AMOS (version 26) to
 1461 determine how stress mindset and other irrational beliefs were associated with depressive
 1462 symptoms and vitality through challenge and threat. The goodness of fit in the model and
 1463 the CFA were examined using the chi square likelihood statistic ratio (χ^2 ; Jöreskog & Sörbom,
 1464 1993). Additionally, the CFI and the TLI were used as measures of incremental fit, with
 1465 values of ≥ 0.95 and ≥ 0.90 demonstrating an excellent model fit (Hu & Bentler, 1999).

1466 Furthermore, the RMSEA and SRMR were chosen as indices of absolute model fit, where
1467 criteria of ≤ 0.05 and ≤ 0.08 reflected excellent and adequate model fit respectively (Hu &
1468 Bentler, 1999; Byrne, 2010). Similar measures of model fit were also used in other
1469 comparable studies (Chadha et al., 2019; Williams & Cumming, 2011). Based on
1470 recommendations by Byrne (2010) in cases of poor model fit, modification indices were
1471 examined and meaningful covariances with larger regression weights were considered and
1472 included into subsequent iterations of the proposed model. Standardized regressions were
1473 reported for all direct and indirect effects. Indirect effects were examined using 95% bias-
1474 corrected confidence intervals generated from bootstrapping of 1000 samples.

1475 Results

1476 Validity and Reliability of Measures in the Present Study

1477 Results for all CFAs are reported in Table 2.1 and indicate a largely adequate fit to
1478 the data. When compared to the present study, the SMM-G (Karampas et al., 2020), iPBI
1479 (Turner & Allen, 2018) and the CAT-Sport (Rossato et al., 2018) have been found to have
1480 very similar fit indices to the present study.

1481 Descriptive Statistics and Gender Differences

1482 Participant characteristics depicting gender differences are reported in Table 2.1. A
1483 one-way ANOVA revealed that males recorded significantly higher vitality than females $F(1,$
1484 $408) = 5.67, p = <.020, \eta^2 = .01$. Separate one-way ANOVAs also revealed that there were no
1485 significant gender differences in stress mindset or depressive symptoms. Additionally,
1486 multivariate analysis was employed to assess further gender differences. A one-way
1487 MANOVA revealed a significant difference at the multivariate level, Pillai's trace = .02, $F(2,$

1488 407) = 4.62, $p = .010$, $\eta^2 = .02$. Results of the follow-up univariate ANOVA analysis revealed
1489 significant mean differences in challenge ($p = .007$) when comparing male scores ($M = 4.88$,
1490 $SD = 0.67$) with female scores ($M = 4.68$, $SD = 0.77$). Significant mean differences were also
1491 found in threat ($p = .022$) when comparing male scores with female scores (see Table 2.1 for
1492 mean scores). A one-way MANOVA revealed irrational beliefs differed between males and
1493 females, Pillai's trace = .03, $F(4, 405) = 3.36$, $p = .01$, $\eta^2 = .03$. Results of the follow-up
1494 univariate analysis revealed significant mean differences in self-depreciation ($p = .005$),
1495 demandingness ($p = .003$), low frustration tolerance ($p = .026$), and awfulizing ($p < .001$),
1496 with women reporting higher mean scores than men on all four subscales.

1497 **Associations with Age**

1498 Correlation analysis of the relationships between the key variables and age are
1499 displayed in Table 2.2. Similar to research by Turner and Moore (2016), age was shown to
1500 have a significant negative relationship with, self-depreciation, demandingness, low
1501 frustration tolerance and awfulizing. Age was also shown to have a significant negative
1502 relationship with stress mindset, threat and depressive symptoms. In contrast, age was
1503 significantly positively correlated with vitality. There was no significant correlation between
1504 age and challenge.

1505

1506 **Table 2.1**

1507 *Confirmatory Factor Analysis Fit Indices for the Questionnaires Employed the in the Study*

1508

	χ^2	CFI	GFI	SRMR	RMSEA (90% CI)	Composite Reliability	Average Variance Extracted
SMM-G	129.17	.918	.927	.047	.115 (.096-.134)	2.143	0.857
iPBI	1218.29	.851	.820	.072	.078 (.074-.083)	-15.73	1.597
CAT-Sport	261.67	.950	.898	.075	.098 (.086-.109)	0.993	1.001
PHQ-9	127.42	.936	.935	.028	.095 (.079-.112)	2.485	0.835
SVS	120.95	.944	.921	.084	.136 (.114-.159)	-.961	1.280

1509

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1515 **Table 2.2**

1516 *Participant Characteristics and Gender Differences*

	Mean/Total (SD)	Range	Males Mean (SD)	Females Mean (SD)
Stress mindset	2.04 (0.70)	0.13 - 3.75	2.11 (0.69)	1.99 (0.70)
DEP	15.26 (5.71)	7 - 34	14.38 (5.36) **	14.96 (5.98)
DEM	25.25 (4.22)	9 - 35	24.56 (4.72) **	25.80 (3.68)
LFT	24.04 (5.12)	8 - 35	23.41 (5.67)*	24.55 (4.58)
AWF	22.70 (4.68)	7 - 35	21.84 (5.04) **	23.39 (4.26)
Challenge	4.77 (0.74)	11 - 30	4.88 (0.67)*	4.68 (0.77)
Threat	3.12 (1.23)	7 - 40	2.95 (1.21)*	3.23 (1.24)
Depression	5.13 (4.99)	0 - 24	4.78 (4.90)	5.42 (5.06)
Vitality	4.80 (1.12)	1 - 7	4.94 (1.08)*	4.68 (1.14)

1517

1518 *Note.* ^aDegrees of freedom = 408, DEP = Self-depreciation, DEM = Demandingness, LFT = Low Frustration Tolerance and AWF = Awfulizing. * = difference is significant at the 0.05 level (sig. 2
 1519 tailed), ** = difference is significant at the 0.005 level (sig. 2). Participants who identified their gender as 'other' were not included in this analysis due to the number of people in this group
 1520 not being comparable to the numbers in the other groups to conduct the relevant analyses of variance.

Table 2.3*Age Correlations with Key Variables*

	Pearson Correlation	R ²
Stress mindset	-.108*	-.012
DEP	-.281***	-.079
DEM	-.123*	-.015
LFT	-.406***	-.016
AWF	-.236***	-.056
Challenge	-.026	-.001
Threat	-.312***	-.100
Depressive symptoms	-.260***	-.067
Vitality	.114*	.013

Note. DEP = Self-depreciation, DEM = Demandingness, LFT = Low Frustration Tolerance and AWF = Awfulizing. * = $p < .05$, ** = $p < .01$, *** = $p < .001$

Model

Path analysis revealed that the initial model did not demonstrate an acceptable fit to the data $\chi^2(19) = 144.52, p < .05, GFI = .95, TLI = .74, RMSEA = .13$ (CI = .11 to .15) SRMR = .12. Modification indices recommended three additional paths from self-depreciation to stress mindset, depressive symptoms, and vitality. These pathways were considered to make sense conceptually and reflect notions from the literature so were subsequently added to the hypothesised model. In recent studies involving athletes, interventions which decreased self-depreciation also increased levels of self-efficacy (Chrysidis et al., 2020) whilst self-depreciation has also been reported to have a positive relationship with

depressive symptoms (Turner et al., 2019).

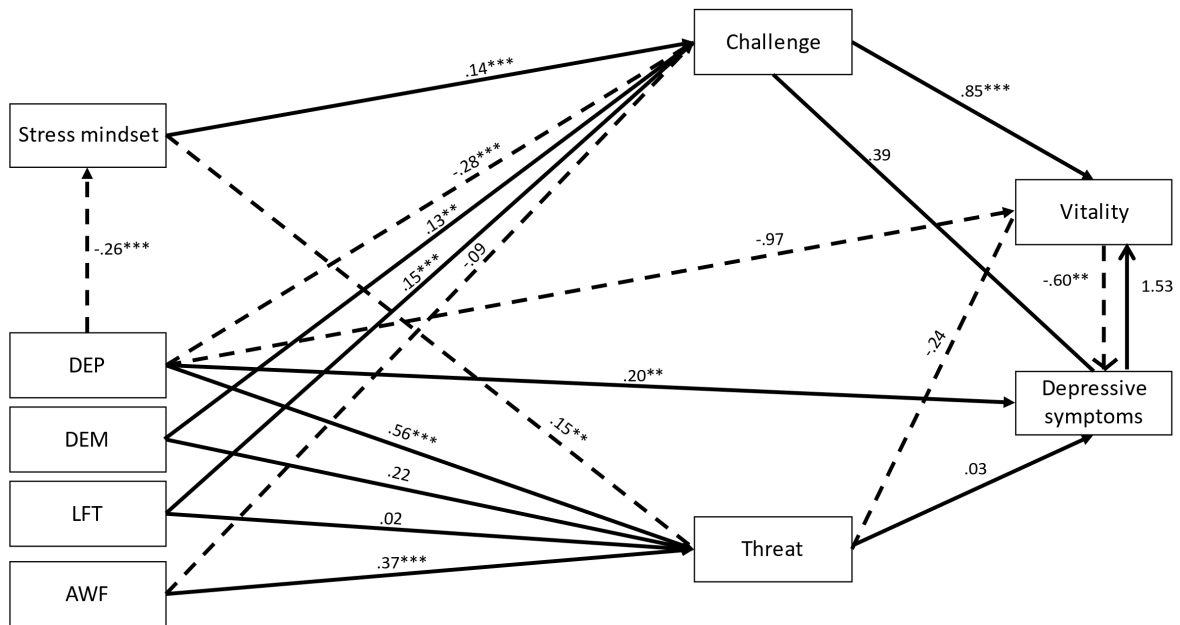
Following these iterations, the revised model demonstrated an excellent fit to the data $\chi^2(16) = 38.83, p = .001, GFI = .98, TLI = .94, RMSEA = .06$ (CI = .04 to .08), SRMR = .04. The standardized path coefficients for each individual path are displayed in Figure 2.2, demonstrating patterns largely consistent with study hypotheses. Squared multiple correlation (R^2) scores offered additional support for the strength of fit of the data to the proposed model. Stress mindset was found to account for 21% variance in challenge ($p < .001$) and 10% variance in threat ($p = .010$). Self-depreciation was found to account for 26% total variance in stress mindset ($p < .001$), 44% of total variance in challenge ($p < .001$), 38% variance in threat ($p < .001$) and 23% variance in depressive symptoms ($p < .001$). The other irrational belief subscales were also found to influence levels of key variables. Demandingness was responsible for 15% variance in challenge ($p = .015$), low frustration tolerance was responsible for 21% variance in challenge ($p < .001$) and awfulizing was responsible for 20% variance in threat ($p = .001$). Finally, challenge was responsible for 40% variance in vitality ($p < .001$). Non-significant paths were found between demandingness and threat, low frustration tolerance and threat, awfulizing and challenge, challenge and depressive symptoms, threat with both depressive symptoms and vitality, and depressive symptoms to vitality.

Results of the indirect effects demonstrated that stress mindset was found to have a significant indirect effect on depressive symptoms ($\beta = .12, p = .017, 95\% CI = -.06$ to $-.01$) through challenge, threat and vitality, and on vitality ($\beta = .12, p = .001, 95\% CI = .07$ to $.19$) through challenge, threat and depressive symptoms. Self-depreciation was found to have a significant indirect effect on challenge ($\beta = -.04, p = .001, 95\% CI = -.07$ to $-.20$) and threat

($\beta = .04, p = .015, 95\% \text{ CI} = .09 \text{ to } .80$) through stress mindset. Self-depreciation also had a significant indirect effect on depressive symptoms through stress mindset, challenge, threat and vitality ($\beta = .29, p = .027, 95\% \text{ CI} = .06 \text{ to } .63$). Low frustration tolerance had a significant indirect effect on vitality through challenge, threat and depressive symptoms ($\beta = .11, p = .007, 95\% \text{ CI} = .04 \text{ to } .19$). Awfulizing was found to have a significant indirect effect on depressive symptoms through challenge, threat and vitality ($\beta = .04, p = .002, 95\% \text{ CI} = .02 \text{ to } .10$), and on vitality ($\beta = -.11, p = .019, 95\% \text{ CI} = -.23 \text{ to } -.03$) through challenge, threat and depressive symptoms. No other irrational beliefs were found to have a significant indirect effect on the other variables in the model.

Figure 2.2

Path Analysis Testing the Revised Model for the Effect of Beliefs on Depressive Symptoms and Vitality.



Note: Full lines denote positive relationships and dashed lines denote negative relationships. Numbers refer to standardized beta values. DEP = Self-depreciation, DEM = Demandingness, LFT = Low Frustration Tolerance and AWF = Awfulizing. * = $p < .05$, ** = $p < .01$, *** = $p < .001$

1585 In summary of the model, the data demonstrates that self-depreciation is the type of
1586 irrational belief that has the greatest association with appraisals and depressive symptoms
1587 both directly and indirectly through stress mindset and vitality. Awfulizing was also found to
1588 associate with depressive symptoms indirectly, through challenge, threat and vitality.
1589 Additionally, stress mindset demonstrated variances in challenge and threat directly and
1590 had significant indirect effects on depressive symptoms through challenge, threat and
1591 vitality and on vitality through challenge, threat and depressive symptoms. Overall, the
1592 results showed that both beliefs and appraisals related to depressive symptoms and vitality
1593 to different extents.

1594 Discussion

1595 The aims of the present study were to assess the extent that stress mindset and
1596 other irrational beliefs related to psychological wellbeing through the direct and indirect
1597 effects of stress appraisals in athletes. Athletes' stress mindset was found to have a
1598 significant positive relationship with challenge and a significant negative relationship with
1599 threat. This supports previous studies in general population samples demonstrating stress
1600 mindset relates to challenge (e.g., Kilby & Sherman, 2016). As hypothesized, stress mindset
1601 was indirectly associated with greater vitality and the present study is the first to show that
1602 this relationship occurs specifically through challenge, threat and depressive symptoms.

1603 The link between challenge and psychological wellbeing is well-established in the
1604 literature (e.g., Mak et al., 2004; Adie et al., 2008), and one explanation for the relationships
1605 demonstrated in the present study is that a stress-is-enhancing mindset can increase
1606 perceived coping resources (Keech et al., 2018), which can subsequently enhance levels of
1607 challenge and psychological wellbeing. Considering stress mindset as a trait-level belief

1608 about the extent to which stress can be facilitative or debilitating (Crum et al., 2013), the
1609 finding that stress mindset is positively related to challenge is also supported by the TCTSA-
1610 R (Meijen et al., 2020), where predispositions were highlighted as being a key factor in
1611 influencing appraisals. The present study adds to this literature by demonstrating that if an
1612 athlete has a 'stress-is-enhancing' mindset, they are more likely to report higher challenge
1613 and psychological wellbeing.

1614 Supporting the hypothesis, the negative relationship between stress mindset and
1615 threat was significant in athletes. In non-athlete samples, previous research has produced
1616 mixed results in relation to stress mindset and threat, and it has been proposed that if
1617 employees hold a 'stress-is-debilitating' mindset, they might appraise specific stressful
1618 situations as a threat and make fewer approach-coping efforts (Casper et al., 2017).
1619 However, more recent research found that stress-is-debilitating instructions did not elicit a
1620 greater degree of threat in a laboratory-based competition compared to a control group
1621 (Hangen et al., 2019). Future research should ascertain whether the relationship between
1622 stress mindset and threat is evident at both trait-level and immediately prior to a stressful
1623 event, such as a sporting competition. In addition, subsequent research should examine the
1624 role stress mindset plays in sporting performance and whether this differs between
1625 recreational and professional athletes or those who take part in individual sports compared
1626 to team sports. Future research in this area may also test the value of stress mindset in
1627 differing conditions of stressor intensity.

1628 Partly as hypothesized and consistent with REBT theory (Evans et al., 2018), some
1629 irrational beliefs were positively associated with threat, with subscales except
1630 demandingness and low frustration tolerance relating. This supports recent work by Meijen

1631 et al., (2020), who stated as part of the TCTSA-R that predispositions such as irrational
1632 beliefs are one of the main drivers of subsequent appraisals. Previous studies have
1633 demonstrated that greater irrational beliefs are associated with a greater tendency to
1634 appraise stress as a threat (Chadha et al., 2019; Dixon et al., 2017; Evans et al., 2018).
1635 Thoughts that include absolute expressions such as negative expressions about oneself (self-
1636 depreciation) and considering unpleasant events to be the worst that they can be
1637 (awfulizing) may all contribute to an athlete not believing that they have the resources to
1638 cope with the demands of a task, subsequently leading to a threat appraisal (Skinner &
1639 Brewer, 2002). In support of Chadha et al., (2019), fewer negative associations were
1640 revealed between irrational beliefs and challenge. This relationship could be explained as
1641 there was no imminent stressful situation such as a sporting competition (Chadha et al.,
1642 2019). Furthermore, the binary theory of emotional distress (Ellis, 1962) may explain why
1643 the relationships between irrational beliefs were stronger with threat than challenge.
1644 Challenge and threat have also been considered to be a binary concept, which draws
1645 parallels with suggestions based on REBT theory, whereby an individual may hold either
1646 rigid or flexible beliefs (Dryden, 2021). Therefore, measuring both irrational beliefs and
1647 rational beliefs, such as unconditional acceptance attitudes (Dryden, 2021), may be useful in
1648 further demonstrating relationships between irrational beliefs, challenge and threat in
1649 future research.

1650 Contrary to the hypothesis, demandingness and low frustration tolerance were
1651 significantly associated with greater challenge appraisal. Although there is a plethora of
1652 research with supports the detrimental effects of irrational beliefs on psychological
1653 wellbeing (e.g., Visla et al., 2016), there are also some studies that have concluded that
1654 irrational beliefs may enhance athletic performance (e.g., Wood et al., 2017). It has been

1655 proposed that irrational beliefs can be useful in achieving short term goals (Mesagno et al.,
1656 2020), although there is no known research that has confirmed positive relationships
1657 between demandingness and low frustration tolerance with challenge specifically. The
1658 reasons behind this relationship in the present study are unclear and future research may
1659 wish to further explore the relationships between demandingness, low frustration tolerance
1660 and challenge in athletes. Taken together, these findings suggest that challenge and threat
1661 may not be opposite ends of a continuum (Uphill et al., 2019), and that there may be
1662 nuances in the relationships between the individual irrational beliefs with challenge and
1663 threat.

1664 One finding which was not expected and contradicted the originally hypothesized
1665 model was the prominence of self-depreciation in directly predicting additional variables in
1666 the model, as the analysis identified additional associations of self-depreciation also
1667 predicting stress mindset and depressive symptoms. Self-depreciation irrational beliefs have
1668 been reported to be an important factor in determining affect in students (Allen et al.,
1669 2017), a key area to target in psychological interventions with athletes (Cunningham &
1670 Turner, 2016), and have also been found to positively relate to athlete's psychological
1671 illbeing in previous studies (e.g., Turner et al., 2017). However, in the present study, the
1672 strength of self-depreciation's relationships with challenge and threat was also considerably
1673 greater than the other three types of irrational beliefs, exhibited by higher beta scores of at
1674 least a medium effect size in each relationship. This was despite the mean scores for self-
1675 depreciation being lower than the other three types of irrational beliefs. The lower self-
1676 depreciation mean scores may be explained by how self-depreciation differs to awfulizing
1677 and low frustration tolerance in that thoughts such as "*I am a complete failure*" are final and
1678 refer to the self, whilst the other irrational beliefs tend to evaluate outside events, such as

1679 *"It's awful if others do not approve of me"*. The link between self-depreciation and threat is
1680 likely to be explained by the self-downing nature of such beliefs, which may also be
1681 reflected in some of the items in the threat subscale of the CAT-Sport questionnaire (e.g., *"I*
1682 *get concerned that others will find fault with me"*). Self-depreciating irrational beliefs hold
1683 negative evaluations of oneself as a central tenet, for example, equating a defeat with being
1684 a loser as a person (Wood & Turner, 2020). As setbacks may be attributed internally in the
1685 form of self-blame, this may lead to additional threat appraisals being made due to
1686 individuals experiencing greater degrees of worry about an event or how they are perceived
1687 by others. Furthermore, self-depreciating beliefs are said to be unhealthy and dysfunctional
1688 leading to depressive symptoms (Bennett & Turner, 2018) which likely explains the direct
1689 association in the present study between self-depreciation and depressive symptoms. This
1690 relationship is supported by REBT theory (Dryden, 2021) and previous studies (e.g.,
1691 Buschmann et al., 2018), and is particularly salient in athletic populations as they will be
1692 certain to encounter adversity in their careers, thus risking the development of depressive
1693 symptoms if the athlete holds self-depreciating beliefs (Cunningham & Turner, 2016). The
1694 present study emphasizes the importance of self-depreciation's associations with beliefs,
1695 appraisals of stress, and psychological wellbeing in athletes. Practitioners could assess self-
1696 depreciation in athletes and employ interventions where required to promote more rational
1697 beliefs through strategies targeting unconditional acceptance (Wood & Turner, 2020) by
1698 accepting that if they do fail in their sporting endeavors, they are not therefore a failure
1699 (Turner et al., 2017).

1700 Not entirely as hypothesized, an interesting finding was that the positive stress
1701 appraisal (i.e., challenge) predicted the wellbeing outcome (i.e., vitality) whereas there were
1702 no significant relationships between challenge and depressive symptoms and threat with

1703 either depressive symptoms or vitality. This is partially supported by previous research
1704 which found no association with challenge and depressive symptoms but is also in contrast
1705 to previous findings of a positive association between threat and depressive symptoms
1706 (Lazarus & Folkman, 1984; Mak et al., 2004). Previous research also demonstrates that
1707 challenge is related to wellbeing (Adie et al., 2008) and positive emotions (Doron &
1708 Martinent, 2017), although the present study adds to that literature by highlighting that
1709 challenge is also associated with greater vitality specifically. Athletes who have higher levels
1710 of vitality consider themselves to have better levels of wellbeing (Fruchart & Rulence-
1711 Pâques, 2020), which in turn may provide athletes with feelings of an increased energised
1712 state to assist performance (Lavrusheva, 2020). However, it also should be noted that
1713 depressive symptoms and vitality may fluctuate thus meaning that situational factors may
1714 influence the responses by participants. Importantly, these results add weight to the notion
1715 that challenge and threat are not necessarily at opposite ends of a continuum (Uphill et al.,
1716 2019) and they highlight the importance of considering both stress appraisals when
1717 examining athlete wellbeing and illbeing as challenge and threat may associate differently
1718 with affective states (Chadha et al., 2019). Indeed, although challenge and threat may be
1719 related, they can occur simultaneously and should be considered as separate constructs
1720 (Lazarus & Folkman, 1984).

1721 In partial support of the hypothesis, vitality was found to be significantly negatively
1722 related to depressive symptoms, but depressive symptoms were not found to significantly
1723 relate to vitality. Although the present study is cross-sectional in design, the strength of the
1724 negative correlation between vitality and depressive symptoms may indicate the
1725 importance of vitality in reducing psychological illbeing. With this in mind, it may be that
1726 practitioners could consider focusing on ways to enhance subjective vitality in athletes, such

1727 as by promoting a 'stress-is-enhancing' mindset and rational beliefs, and in turn this may
1728 result in a decrease in depressive symptoms. Future research may consider assessing the
1729 same relationships with a clinical population, such as by including individuals who have
1730 received a clinical diagnosis of depression, or by using interventions which target
1731 improvements in trait beliefs to assess changes in depression and vitality over a prolonged
1732 period of time.

1733 As hypothesised, males reported significantly higher vitality compared to females.
1734 Females had higher irrational beliefs than males. Also supporting the hypothesis and the
1735 literature (Lee et al., 2018) males reported significantly higher challenge and lower threat
1736 than females. Contrary to the hypothesis, there were no significant differences in stress
1737 mindset or depressive symptoms, which is in contrast to the findings of Park et al., (2018)
1738 and Mak et al., (2004) respectively. However, the findings of the present study offer support
1739 for research by Nixdorf et al., (2013), who found no significant gender differences in
1740 depressive symptoms. Supporting the hypothesis, age was found to have a significant
1741 negative relationship with threat and depressive symptoms. Additionally, age had a
1742 significant negative relationship with irrational beliefs. This is supported by previous findings
1743 in the literature and may be explained by older athletes typically possessing more
1744 experience than younger athletes (e.g., Turner & Allen, 2018). In contrast to the hypothesis
1745 was the finding of a significant positive relationship between age and vitality and the
1746 significant negative relationship between age and stress mindset. There was no significant
1747 relationship between age and challenge.

1748 As used in previous related research (e.g., Chadha et al., 2019) the use of path
1749 analysis is a strength of the present study as it accounts for multiple associations

1750 simultaneously and examines direct and indirect effects to generate a greater
1751 understanding as to how stress mindset and other irrational beliefs relate to stress
1752 appraisals and psychological wellbeing. It allows for a clear conceptualization of the theory
1753 through the format of a visual model (Byrne, 2010), although future research may wish to
1754 consider using Structural Equation Modeling with latent variables to explore a full model.
1755 Furthermore, a strength of the study is that it combines two variations of beliefs in stress
1756 mindset and other irrational beliefs into an integrated model for the first time. In a practical
1757 setting, findings of the present study suggest that promoting a 'stress-is-enhancing' mindset
1758 through techniques such as videos and training (e.g., Crum et al., 2013) will positively impact
1759 on positive psychological traits such as challenge and vitality and may influence negative
1760 psychological traits such as threat and depressive symptoms. Indeed, stress mindset has
1761 been shown to be a malleable belief that can be enhanced through brief interventions in a
1762 cost-efficient manner (e.g., Crum et al., 2013; 2017), whilst there is growing evidence to
1763 show the efficacy of REBT as an effective method to reduce irrational beliefs in athletes
1764 (e.g., Cunningham & Turner, 2016). As both stress mindset and other irrational beliefs are
1765 united by aspects of REBT theory, implementing an REBT-based intervention may promote a
1766 'stress-is-enhancing' mindset and rational beliefs simultaneously by challenging
1767 counterproductive beliefs (Turner, 2016) and encouraging more realistic thoughts that are in
1768 proportion to stressful events (Froggatt, 2005).

1769 Practitioners may wish to consider reappraisal of stress responses when working
1770 with athletes, emphasizing that they do not have to be defined by their initial appraisal of a
1771 stressful situation as it is possible to reappraise a situation from being a threat to a
1772 challenge (Meijen et al., 2020). A limitation of the study is that the data is cross-sectional
1773 and does not imply causation. Therefore, future research should look to alter irrational

1774 beliefs (Davis & Turner, 2020) in addition to stress mindset to ascertain whether this
1775 influences stress appraisals and subsequent psychological wellbeing in the way the model
1776 may imply. Additionally, future research should also investigate the effect of stress mindset
1777 on sport performance and whether increasing a 'stress-is-enhancing' mindset leads to
1778 improvements in sporting performance levels. Future research may also wish to consider
1779 how stress mindset and other irrational beliefs relate to challenge and threat immediately
1780 prior to a stressful event, which may mean that physiological data could also be collected.

1781 In conclusion, the present study aimed to investigate whether athletes' stress
1782 mindset and other irrational beliefs were associated with their depressive symptoms and
1783 vitality, through stress appraisals. Using path analysis, data generally supported the model
1784 predicting depressive symptoms and vitality. In summary, results demonstrated that the
1785 relationships between stress mindset, irrational beliefs and psychological wellbeing are
1786 influenced by direct and indirect effects of challenge and threat. Put simply, an individual's
1787 beliefs relate to the likelihood of whether a challenge or threat appraisal is made, which will
1788 subsequently relate to levels of psychological wellbeing. Stress mindset was related
1789 positively to challenge and negatively to threat, while irrational beliefs tended to be more
1790 strongly associated with threat. Challenge was associated with vitality, but this was the only
1791 direct significant relationship between appraisals and psychological wellbeing. However, self
1792 -depreciation appears to be a key irrational belief that directly predicts stress mindset,
1793 challenge, threat and depressive symptoms.

1794 Results highlight the importance of stress mindset and other irrational beliefs in
1795 athletes' psychological wellbeing. Moreover, results also continue to offer support for the
1796 relationships between irrational beliefs, challenge and threat that are put forward in the

1797 theoretical concepts of the TCTSA-R (Meijen et al., 2020) and path analysis by Chadha et al.,
1798 (2019).

CHAPTER 3

**THE MEDIATING ROLE OF PROACTIVE COPING IN THE RELATIONSHIPS BETWEEN STRESS
MINDSET, CHALLENGE APPRAISAL TENDENCIES, AND PSYCHOLOGICAL WELLBEING**

Psychological distress, including conditions such as depression, are one of the main causes of disease worldwide (Vos et al., 2015). In the UK, psychological distress is reported to be a greater disease burden than both cancer and heart conditions (Mental Health Foundation, 2015) with one in four adults said to experience poor mental health during their lifetime (NHS, 2022). Depressive symptoms are a major contributor to psychological distress, with 21% of adults experiencing some form of depression at one time (ONS, 2022).

One factor which is proposed to increase the risk of psychological distress is stress. Stress is experienced when the perceived demands of the environment to outweigh the ability to cope (Cohen et al., 2007). Stressors can be in the form of events, situations, or environmental conditions where a potential negative impact is perceived by an individual (Halbreich, 2021). When stress is chronic and excessive, this increases an individual's allostatic load and contributes significantly to psychological distress (Mücke et al., 2018), such as increased depressive symptoms (Cohen et al., 2007). Indicators of psychological wellbeing such as vitality (i.e., feeling alive and full of energy; Fruchart & Rulence-Pâques, 2020) are associated with lower levels of depressive symptoms (Ryan & Frederick, 1997). In athletes specifically, vitality is seen as a contributor to eudaimonic wellbeing, and alongside high performance, this is support thriving in their sporting pursuits (Brown et al., 2021). However, stress also relates to lower levels of vitality (Rozanski & Kubzansky, 2005). Consequently, stress is typically considered to be a deleterious construct. In support, one study found that 85% of participants reported stress to have a negative impact on health and productivity (McGonigal, 2016). Rather than automatically equating stress with distress (Rudland et al., 2020), it is possible to view stress and its consequences positively (Dixon et al., 2017), which may result in downstream psychological benefits (Laferton et al., 2019). This is particularly important as it is not possible to avoid stress entirely.

Rather than trying to eliminate stress, recent work has shifted to considering how our beliefs about the nature of stress may influence indicators of wellbeing such as vitality and depressive symptoms (e.g., Jiang et al., 2019). How depressive symptoms and vitality are related to stress may be explained by the Transactional Model of Stress (Lazarus & Folkman, 1984). This theory posits that beliefs about stress influence how an individual appraises a stressful situation, which in-turn influences psychological wellbeing. Consequently, efforts to investigate the indirect association between beliefs about stress and psychological wellbeing (Kilby et al., 2020) may shed more light on the mechanisms of such relationships and subsequently help individuals in dealing with stress.

As part of their sporting pursuits, athletes are a group of people who experience a wide range of stressors. This may include organisational stressors (e.g., disrupted sleep patterns) and personal stressors (e.g., maintenance of relationships) (Rice et al., 2016), but it is competitive stressors that may particularly increase their experience of stress. In training and in competitive fixtures, athletes strive to meet the demands and expectations placed on themselves as well as others. They face de-selection, heightened risk of injury, and the risk of losing income that may be tied to their success, and stressors such as these may be exacerbated for those performing at elite levels (Fletcher et al., 2012). Athletes' interpretations of stressful encounters are important in determining how they respond (Perry, 2020) and they may employ a range of self-regulation and coping strategies to enable them to achieve adaptive outcomes (Nicholls & Perry, 2016). This means that exploring how stress, coping, and appraisals that contribute to athlete psychological wellbeing warrants attention for researchers (Didymus & Jones, 2021).

One stress-related aspect that may influence psychological wellbeing is how we view stress (Kilby et al., 2020), and our meta-beliefs about the nature of stress can be conceptualised as stress mindset (Jamieson et al., 2018). Stress mindset refers to the extent to which an individual believes that stress has enhancing or debilitating consequences (Crum et al., 2013). Those who perceive that stress can have positive consequences on stress-related outcomes, such as health, productivity and performance are said to possess a 'stress-is-enhancing' mindset, whilst those who view stress as a maladaptive construct possess a 'stress-is-debilitating' mindset (Crum et al., 2013). Rather than being two dichotomous states, individuals' beliefs will sit somewhere along the stress mindset continuum, although it is thought that most individuals perceive stress to be debilitating (Crum et al., 2013). It is possible to alter stress mindset (e.g., Keech et al., 2021), and adopting facilitative views about stress may increase the likelihood of coping with demanding situations (Kim et al., 2020; Smith et al., 2020), perhaps due to the adaptive influence of stress mindset on stress appraisals (Kilby & Sherman, 2016). Holding a 'stress-is-enhancing' mindset is also reported to facilitate responses to stress (Park & Hahm, 2019), improve work productivity (Crum et al., 2013) and enhance academic performance (Keech et al., 2018). However, research in the domain of stress mindset is still fairly novel, and explorations continue as to how exactly it influences stress-related outcomes.

Beyond stress mindset, stress appraisal in the form of challenge and threat appraisals has also been found to relate to psychological wellbeing. Individuals may be predisposed to appraise ongoing relationships with the environment as either a challenge or a threat on a consistent basis (Lazarus, 1991). Those who believe that they possess the resources to cope with the demands of situations will likely experience challenge appraisal tendencies whilst the opposite is true of threat appraisal tendencies (Lazarus et al., 1980). Challenge appraisal tendencies are associated with

strong coping expectancies and positive emotions, and in contrast, those who tend to adopt threat appraisal styles may be more likely to experience weak coping expectancies and negative emotions (Skinner & Brewer, 2002). Importantly, challenge appraisal tendencies may inform state challenge appraisals when confronted with stressors meaning that the more an individual exhibits a trait challenge appraisal tendency, the more likely they will be to appraise specific stressful situations as a challenge rather than a threat (Skinner & Brewer, 2002; Cumming et al., 2017b). Additionally, challenge appraisals are related to lower levels of depression (Mak et al., 2004) and beneficial perceptions of emotions (Skinner & Brewer, 2002), and individuals who adopt challenge appraisals are more likely to mobilise increased energy for action (Carenzo et al., 2020) consistent with vitality (Lavrusheva, 2020). Hence, challenge appraisal tendencies are considered to have positive downstream influences on psychological wellbeing.

Despite their similarities in being associated with cognitions of stressful situations, distinctions exist between the concepts of stress mindset and challenge and threat appraisals (Crum et al., 2013). Stress mindset theory focuses on metacognitive beliefs about the nature of stress in general, and disregards contextual information about specific stressors (Crum et al., 2017). In contrast, appraisals are concerned with cognitive evaluations of stressors, which may be in relation to general appraisal styles (e.g., Cumming et al., 2017b) or those of specific events (Kilby & Sherman, 2016). Therefore, adopting a 'stress-is-enhancing' mindset is not a guarantee of enhancing challenge appraisal tendencies, but adopting this mindset may contribute to cognitive, emotional, and behavioural responses that are adaptive when faced with stressful situations (Crum et al., 2017). However, due to their similarities, beliefs about the nature of stress (e.g., stress mindset) are thought to relate to the appraisals of specific stressful situations as a challenge or a threat (Jamieson et al., 2018).

The potential for stress mindset to relate to stress appraisals tendencies has been noted by Kilby and Sherman (2016). Furthermore, stress appraisals are thought to mediate the relationship between stress mindset and psychological wellbeing, however, there has been little research which has explored these associations at trait level. Mansell (2021; see Chapter 2) tested the associations between stress mindset, challenge appraisal tendencies, vitality, and depressive symptoms. Path analysis demonstrated support for the Transactional Model of Stress (Lazarus & Folkman, 1984), as stress mindset was indirectly associated with vitality (positively) and with depressive symptoms (negatively), through challenge and threat appraisal tendencies. Specifically, a more 'stress-is-enhancing' mindset was associated with greater challenge appraisal tendencies which were associated with greater vitality. In turn, vitality was associated with lower depressive symptoms. Previous findings have suggested that stress mindset and threat appraisals may not be related during the absence of an imminent stressor (Kilby & Sherman, 2016). This may be due to the notion that challenge and threat appraisals are not necessarily two extremes at opposite ends of a scale, but two separate constructs (Evans et al., 2018), which suggests that it makes conceptual sense to assess the positive constructs separately to the negative constructs (Skinner & Brewer, 2002). As the study by Mansell (2021) was conducted with athletes, it is important to investigate whether similar findings are also replicated in non-athlete samples, and to how ascertain how the associations between stress mindset and challenge appraisal tendencies may occur.

Although some studies have reported a direct relationship between stress mindset and challenge appraisal tendencies (e.g., Mansell, 2021), other studies suggest that relationships between stress mindset and positive outcomes may be indirect (Kirby et al., 2020; Klussman et al., 2020). As those who possess adaptive mindsets often engage in facilitative coping strategies tend

to experience positive outcomes (e.g., Yeager et al., 2016), it may be that the association between a 'stress-is-enhancing' mindset and challenge appraisal tendency could be due proactive coping. Considered a suitable method of preparing for confrontation with inevitable stressors (Serrano et al., 2021), proactive coping is characterised by perceiving risks and demands to be opportunities for growth and by taking constructive actions to deal with stressors (Greenglass & Fiksenbaum, 2009). This distinguishes proactive coping from other adaptive coping strategies as it refers to the accumulation of resources and strategies before a stressor is present (Greenglass & Fiksenbaum, 2009). The accumulation of these personal resources provides individuals with greater feelings of control and optimism (Aspinwall & Taylor, 1997), leading to approach-type behaviours (e.g., problem-solving; Devonport et al., 2013) indicative of challenge appraisals (Jones et al., 2009). Indeed, employees who reported a 'stress-is-enhancing' mindset were found to use more approach-coping efforts when faced with a high workload, which was also associated with greater vigour and task performance (Casper et al., 2017). Accordingly, this may explain the known association between proactive coping and challenge appraisals (Raper & Brough, 2021) as individuals experience a greater sense of control. In addition to associations with stress mindset (e.g., Keech et al., 2018), proactive coping has also been found to be negatively associated with depressive symptoms (Wagner & Martin, 2012). This adds to the suggestion that proactive coping may play an important role in influencing stress-related outcomes. However, despite coping's inseparability from stress appraisals (Tamminen, 2021), little is known about how proactive coping specifically may contribute to challenge appraisal tendencies.

Based on recent studies (e.g., Keech et al., 2018), it is likely that stress mindset predicts proactive coping. Both stress mindset and proactive coping consist of general beliefs before stress has occurred (Greenglass & Fiksenbaum, 2009) rather than beliefs about a particular situation

(Wagner & Martin, 2012), and they comprise of realistic and flexible thought processes (Lazarus & Folkman, 1984). This relationship between the two may be explained using the ABC framework of Rational Emotive Behaviour Therapy (REBT; Ellis & Dryden, 2007) in that individuals who possess a 'stress-is-enhancing' mindset may believe that it is not an adverse situation (A) that leads to behavioural and emotional consequences (C), but rather their beliefs about the situation (B). This ABC approach to cognitions (likely displayed by someone with a greater 'stress-is-enhancing' mindset) is said to enhance proactive coping (Wood & Turner, 2020). Furthermore, individuals who possess a 'stress-is-enhancing' mindset may view stress as a challenge (Guo et al., 2017), which is symptomatic of individuals who adopt proactive coping strategies (Pirkkalainen et al., 2019). Taken together, it can be suggested that the relationship between stress mindset and challenge appraisal tendencies may operate through proactive coping.

Previous experiences play an important role in how individuals view stress (Holmes & Rahe, 1967). For instance, athletes may have accumulated experiences of stressful situations, such as regular competition (Perry, 2020). Although exposure to more severe stressful experiences can be detrimental to athletes (McLoughlin et al., 2021), athletes may develop tendencies to view stress (e.g., competitive situations) in a more positive light when compared to non-athletes through regular exposure to moderately stressful situations (Fletcher & Arnold, 2021) and subsequently, a more facilitative view of stress may be developed. Furthermore, through regular exposure to stress, athletes can engender 'stress inoculation' and learn strategies to cope with stress and consequently perceive stressful situations to be an opportunity rather than a threat (Turner et al., 2013). In support of this notion, Mansell (2021) found mean stress mindset scores of athletes to appear higher than those of non-athletes reported in other studies (e.g., Crum et al., 2013; Kilby & Sherman, 2016). This suggests athletes may have a more 'stress-is-enhancing' mindset. However,

the paucity of stress mindset research in athletes means this has yet to be sufficiently examined and research is yet to directly compare stress mindset in athletes to that in non-athletes.

Aims and Hypothesis

Despite the apparent relationships between stress mindset and challenge appraisal tendencies (e.g., Mansell, 2021), and challenge appraisal tendencies with both vitality and depressive symptoms, research has yet to understand how stress mindset relates to challenge appraisal tendencies, and the subsequent relationships with vitality and depressive symptoms. Based on the identified associations between stress mindset and proactive coping (Keech et al., 2018), and proactive coping with challenge appraisal (Raper & Brough, 2021), it seems logical to suggest that proactive coping may mediate the relationship between stress mindset and challenge appraisal tendencies. Therefore, the aims of the present study were to investigate the extent to which proactive coping mediated the relationship between stress mindset and challenge appraisal tendency, and examine how this in turn related to vitality and depressive symptoms. The hypothesised model was based on that demonstrated by Mansell (2021) in which stress mindset was positively related to challenge appraisal tendencies, and challenge appraisal tendencies were positively related to vitality, whilst vitality was negatively related to depressive symptoms. However, proactive coping was also proposed to explain the relationship between stress mindset and challenge appraisal tendencies by fully mediating the relationship between the two variables. Therefore, it was hypothesised that stress mindset would be positively associated with proactive coping which in turn would be positively associated with a greater challenge appraisal tendency. Consequently, it was also hypothesised that the direct association between stress mindset and challenge appraisal tendency would be non-significant and instead an indirect positive association

between stress mindset and challenge appraisal tendency would operate through proactive coping. In line with findings by Mansell (2021), it was predicted that challenge appraisal tendency would positively relate to vitality, and vitality would negatively relate to depressive symptoms. The hypothesised model is displayed in Figure 3.1. A secondary aim of the present study was to investigate whether there were any differences in stress mindset between athletes and non-athletes. It was hypothesised that athletes would hold a greater 'stress-is-enhancing' mindset compared with non-athletes.

Method

Participants

Two hundred and seven individuals ($n = 153$ females, $n = 53$ males, $n = 1$ genderfluid, $M_{age} = 22.76$ years, $SD = 4.94$) participated in the study. The sample consisted of a mixture of athletes ($n = 101$) and non-athletes ($n = 106$). Athletes stated that they regularly took part in sport ranging in competitive level from recreational ($n = 32$), through to club ($n = 47$), and regional and above ($n = 27$). Exclusion criteria included not having any medically diagnosed mental health conditions at the time of taking part in the study, whilst inclusion criteria were that individuals were aged 18-35, proficient in reading English, and had access to the internet. Ethical approval was granted from the author's university ethics committee before advertisements were launched to recruit participants on campus and throughout the UK via social media channels such as Facebook and Twitter.

Measures

Stress Mindset

Stress mindset was assessed using the 8-item unidimensional Stress Mindset Measure - General (SMM-G; Crum et al., 2013). Four statements emphasise more of a stress-is-enhancing mindset (e.g., "*Experiencing stress enhances my learning and growth*"), and four statements

represent a more stress-is-debilitative mindset (e.g., “*Experiencing stress depletes my health and vitality*”). Participants rated the extent that they agreed with each of the eight statements on a 5-point Likert scale ranging from 0 (*strongly disagree*) to 4 (*strongly agree*). The four negatively worded items are reverse scored before all 8 items are averaged together on one subscale. A higher value reflects that an individual possesses a more ‘stress-is-enhancing’ mindset. The SMM-G has been used in other similar studies (e.g., Mansell, 2021) and has been reported to produce valid and reliable stress mindset scores (Crum et al., 2017). The present study demonstrated good internal reliability using Cronbach alpha’s coefficient (.82).

Proactive Coping

The Proactive Coping Scale (PCS; Greenglass et al., 1999) was employed to assess the extent to which an individual’s cognitions and behaviours are reflective of proactive coping (Greenglass et al., 1999). The PCS is a subscale from the multidimensional Proactive Coping Inventory (Greenglass et al., 1999) and has been reported to be a valid and reliable measure (Sohl & Moyer, 2009), with use in other similar studies involving psychological wellbeing (e.g., Wagner & Martin, 2012). Fourteen items (e.g., “*I turn obstacles in to positive experiences*”) form the PCS and participants select the extent to which they agree with each statement on a 4-point Likert scale ranging from 1 (*not at all true*) to 4 (*completely true*). Negatively worded items are reverse scored before all items are summed, with higher scores indicating a greater tendency to proactively cope. The Cronbach alpha coefficient in the present study was .85, indicating good levels of internal reliability.

Challenge Appraisal Tendency

The challenge subscale of the Cognitive Appraisal Scale (CAS; Skinner & Brewer, 2002) was used to assess the extent to which individuals tend to appraise meaningful situations as a

challenge (e.g., *“Overall I expect that I will achieve success rather than experience failure”*). The CAS is an 18-item questionnaire with 8 items assessing challenge appraisal tendency and 10 items assessing threat appraisal tendency. Participants indicate the extent to which they agree or disagree with each statement by responding on a 6-point Likert scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). For the purpose of the present study only the challenge subscale was used. Mean scores were generated so a higher score indicated a greater challenge appraisal tendency. The Cronbach alpha coefficient in the present study was .75, indicating acceptable levels of internal reliability. The CAS provides valid and reliable challenge appraisal tendencies scores and has been used in other similar studies (Williams & Cumming, 2012).

Vitality

Participants' feelings of positive affect and personal energy were assessed using the Subjective Vitality Scale (SVS; Ryan & Frederick, 1997). Seven items are included in total (e.g., *“I have energy and spirit”*) in which participants indicate the extent to which each statement reflects their views about their life in general. Responses are made on a 7-point Likert scale ranging from 1 (*not at all true*) to 7 (*very true*). One item (*“I don't feel very energetic”*) was reverse scored, and all items are then summed so that a higher score indicates a greater subjective vitality. The Cronbach alpha coefficient in the present study was .91, indicating high levels of internal reliability. The SVS has been found to be a valid and reliable measure of vitality (Mansell, 2021) and has been used in other recent studies that have investigated psychological wellbeing (Davis & Turner, 2020).

Depressive Symptoms

The depressive symptoms subscale of the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) was used to assess depressive symptoms. This subscale is made up of 7 out of 14 HADS items. For each item (e.g., *“I feel cheerful”* and *“I look forward with enjoyment to*

things”) participants are asked to consider which reply comes closest to describing how they have been feeling over the last two weeks. Responses are made on a 4-point Likert scale ranging from 0 to 3 and anchors are worded slightly differently depending on the item. For example, in response to “*I feel as if I am slowed down*”, participants can select responses ranging from 0 = “*Not at all*” to 3 = “*Nearly all the time*”. Positively worded items are reverse scored, and scores are then summed with higher scores indicating higher levels of depressive symptoms. The HADS has been found to be a valid and reputable measure of depressive symptom severity (Zigmond & Snaith, 1983) and has been used recently in other studies (e.g., Weber et al., 2018). The Cronbach alpha coefficient in the present study was .77, indicating acceptable levels of internal reliability.

Procedures

Data collection took place for five months from October 2020 – February 2021. Potential participants were provided with an information sheet about the study (see Appendix 3), including inclusion/exclusion criteria, and details of key ethical considerations such as data confidentiality and their freedom to withdraw at any time. Those individuals agreeing to take part provided informed consent (see Appendix 4) before completing an online questionnaire pack obtaining some demographic and sport information (if they played a sport) and containing the SMM-G, PCS, CAS, SVS and HADS. The questionnaire pack took around 20 minutes to complete, and participants were thanked for taking part in the study upon completion.

Data Availability and Analyses

The data that support the findings of this study are available from the corresponding author upon reasonable request. Data were screened and cleaned in SPSS (IBM, version 27). The data were found to have less than 5% of missing responses. Little’s MCAR Test was employed to confirm that this data was missing completely at random ($p > .05$), and accordingly, the

expectation maximisation method was utilized as a suitable method to complete the data set (Tabachnick & Fidell, 2013). Next, data were checked for outliers and normality. Checks with boxplots revealed no significant univariate outliers, and no multivariate outliers were discovered when using Mahalanobis distance at $p < .001$ (Tabachnick & Fidell, 2013), so all data were retained for the analysis. All normality tests met the assumptions necessary for parametric data analysis.

One-way ANOVAs were conducted to see whether there were any gender and athlete vs. non-athlete differences in the different variables of interest (i.e., stress mindset, proactive coping, challenge appraisal tendency, vitality, and depressive symptoms) due to differences emerging in previous research (e.g., Mak et al., 2004; Ouwehand et al., 2008). Participants who identified their gender as 'genderfluid' were not included in this analysis due to the number of people in this group not being comparable to the numbers in the other groups to conduct the relevant analyses of variance. Pearsons correlations were also conducted to test for associations between age and the variables of interest. These findings were used to identify whether gender, sport participation, and age should be controlled for when testing the hypothesised model.

The hypothesised model was tested using path analysis in AMOS (version 27). To determine whether stress mindset was associated with challenge appraisal via proactive coping, pathways were inserted from stress mindset to proactive coping and from proactive coping to challenge appraisal. The direct pathway between stress mindset and challenge appraisal was also added with the hypothesis being that this would be non-significant due to the relationship operating via proactive coping. Based on previous research, pathways were also inserted from challenge appraisal to vitality, and from vitality to depressive symptoms. Gender and sport participation were controlled for in the analysis. The hypothesised model is displayed in Figure 3.1.

The model's goodness of fit was examined using the chi square likelihood statistic ratio (χ^2 ; Jöreskog & Sörbom, 1993). Additionally, the CFI and the TLI were used as measures of incremental fit, with values of ≥ 0.95 and ≥ 0.90 demonstrating an excellent model fit (Hu & Bentler, 1999). Furthermore, the RMSEA and SRMR were chosen as indices of absolute model fit, where criteria of ≤ 0.05 and ≤ 0.08 reflected excellent and adequate model fit respectively (Hu & Bentler, 1999; Byrne, 2010). Similar measures of model fit were also used in other comparable studies (e.g., Chadha et al., 2019). In cases of poor model fit, modification indices were examined and meaningful covariances with larger regression weights were considered and included into subsequent iterations of the proposed model (Byrne, 2010). Standardized regressions were reported for all direct and indirect effects. Indirect effects were examined using 95% bias-corrected confidence intervals generated from bootstrapping of 1000 samples.

Results

Descriptive Statistics, Gender Differences, and Sport Participation Differences

Participant means and standard deviations of stress mindset, proactive coping, challenge appraisal tendency, vitality, and depressive symptoms for the sample as a whole and broken down for males and females and sport participation are displayed in Table 3.1. One-way ANOVA results revealed that males recorded significantly higher proactive coping, $F(1, 205) = 6.44, p = .012, \eta_p^2 = .03$, and challenge appraisal, $F(1, 205) = 6.73, p = .001, \eta_p^2 = .06$, compared with females. There were no significant gender differences in stress mindset, vitality, or depressive symptoms. Further one-way ANOVA results revealed that athletes reported a significantly greater 'stress-is-enhancing' mindset $F(1, 205) = 8.93, p = .003, \eta_p^2 = .04$ and higher vitality $F(1, 205) = 7.95, p = .005, \eta_p^2 = .04$ compared with non-athletes, whilst non-athletes recorded significantly higher depressive

symptoms $F(1, 205) = 8.49, p = .004, \eta_p^2 = .034$ compared with athletes. There were no significant sport participation differences in proactive coping or challenge appraisal tendencies.

Associations with Age

Correlation analysis of the extent to which age was associated with stress mindset, proactive coping, challenge appraisal tendency, vitality, and depressive symptoms are displayed in Table 3.2. The present study found no significant correlations between age and any of the variables of interest (p 's $\geq .12$). As such, only gender and sport participation were controlled for in the hypothesised model.

Table 3.1

Participant Characteristics, Male and Female Differences, and Sport Participation Differences in Stress Mindset, Proactive Coping, Challenge, Depressive Symptoms and Vitality

	Overall Sample Mean (SD)	Males Mean (SD)	Females Mean (SD)	Athletes Mean (SD)	Non-athletes Mean (SD)
Stress mindset	1.88 (0.63)	2.03 (0.70)	1.83 (0.60)	2.01** (0.60)	1.75 (0.64)
Proactive coping	2.92 (0.44)	3.05** (0.44)	2.88 (0.44)	2.96 (0.60)	1.75 (0.60)
Challenge	4.41 (0.60)	4.65** (0.58)	4.33 (0.59)	4.45 (0.62)	4.36 (0.55)
Vitality	28.69 (8.64)	30.06 (8.84)	28.21 (8.55)	30.31** (8.14)	26.97 (8.85)
Depressive symptoms	4.87 (3.53)	4.28 (3.15)	5.08 (3.65)	4.19** (2.85)	5.60 (4.03)

Note. * = $p < .05$ (sig. 2 tailed), ** = $p < .005$ level (sig. 2). Participants who identified their gender as 'genderfluid' were not included in this analysis due to the number of people in this group not being comparable to the numbers in the other groups to conduct the relevant analyses of variance.

Table 3.2

Age Correlations with Stress Mindset, Proactive Coping, Challenge, Depressive Symptoms and Vitality

	Pearson Correlation
Stress mindset	-.054
Proactive coping	-.051
Challenge	-.109
Depressive symptoms	.060
Vitality	-.096

Model

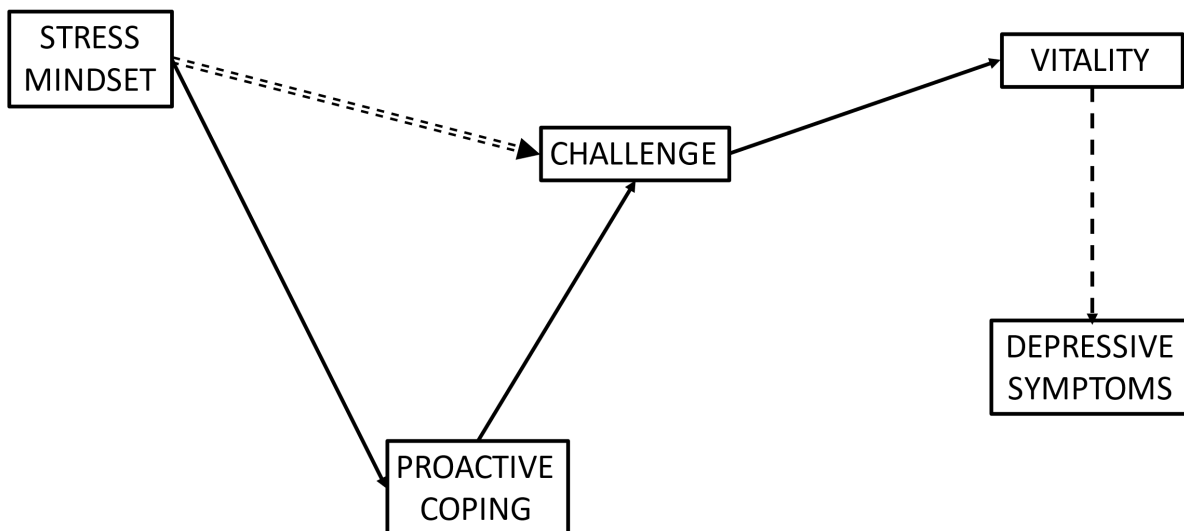
Path analysis revealed that the hypothesised model demonstrated a good fit to the data $\chi^2(7) = 28.30, p < .05, GFI = .96, TLI = .84, RMSEA = .12$ (CI = .08 to .17) SRMR = .07. However, modification indices recommended an additional direct pathway from stress mindset to vitality. This pathway was considered to make sense conceptually and was subsequently added to the hypothesised model. Indeed, given that vitality is associated with subjective feelings of psychological and physiological energy (Lavrusheva, 2020), it is plausible to suggest that possessing a 'stress-is-enhancing' mindset may directly lead to higher vitality as well as through proactive coping and challenge appraisal tendency. Following the addition of this pathway, the revised model demonstrated an improved and good fit to the data $\chi^2(6) = 22.72, p = .001, GFI = .97, TLI = .85, RMSEA = .12$ (CI = .07 to .17), SRMR = .06. The standardized path coefficients for each individual path are displayed in Figure 3.2. Stress mindset was positively associated with proactive coping ($p < .001$), accounting for 5% of the variance. In turn, proactive coping was positively associated with challenge appraisal tendency ($p < .001$) accounting for 45% variance, thus mediating the non-significant relationship between stress mindset and challenge appraisal tendency. A non-significant direct path was found between stress mindset and challenge appraisal tendency. Additionally, challenge appraisal tendency was positively associated with vitality ($p < .001$), accounting for 20% variance, whilst vitality was negatively associated with depressive symptoms ($p < .001$), accounting for 52% variance.

Results of the indirect effects demonstrated that stress mindset had a significant indirect relationship with challenge appraisal tendency ($\beta = .15, p = .023, 95\% CI = .06$ to $.26$) through proactive coping. Stress mindset also had a significant indirect relationship with vitality

($\beta = .10, p = .005, 95\% \text{ CI} = .05 \text{ to } .27$) through proactive coping and challenge appraisal tendency. Furthermore, stress mindset also indirectly related to depressive symptoms ($\beta = -.18, p = .023, 95\% \text{ CI} = -.28 \text{ to } -.06$) through proactive coping, challenge appraisal tendency, and vitality. Proactive coping was found to have a significant indirect effect on vitality ($\beta = .30, p = .023, 95\% \text{ CI} = .19 \text{ to } .41$) through challenge appraisal tendency, and on depressive symptoms ($\beta = -.22, p = .015, 95\% \text{ CI} = -.29 \text{ to } -.13$) through challenge appraisal tendency and vitality. Finally, challenge appraisal tendency was reported to have a significant indirect effect on depressive symptoms ($\beta = -.32, p = .030, 95\% \text{ CI} = -.40 \text{ to } -.20$) through vitality.

Figure 3.1

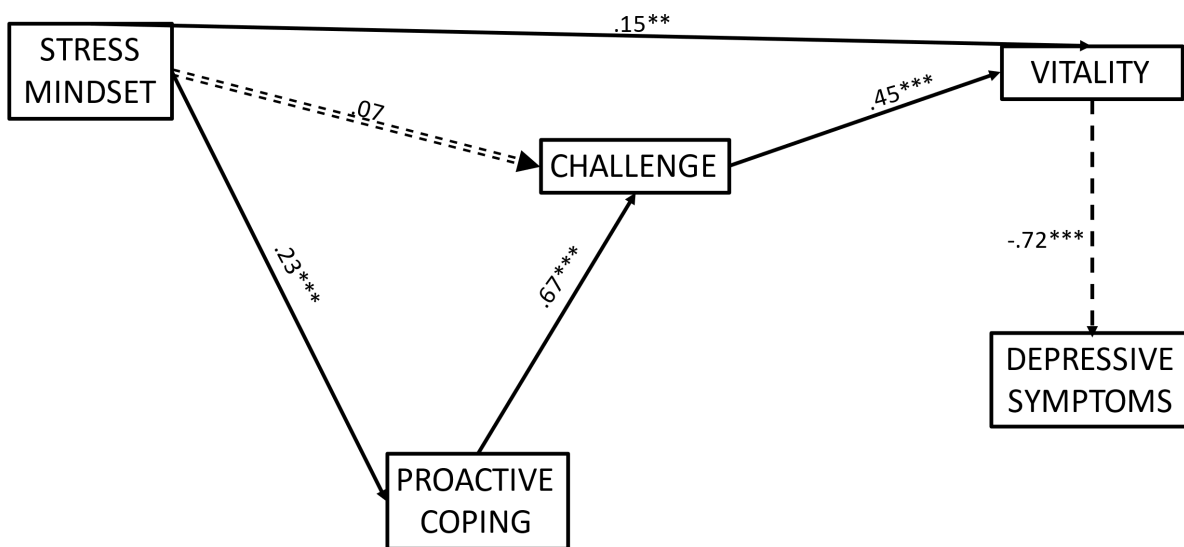
Hypothesised Model



Note. Dashed lines represent negative associations and unbroken lines represent positive associations. Double-dashed lines represent a non-significant path. For visual simplicity, control variables are not displayed.

Figure 3.2

Final Model Displaying the Effect of Stress Mindset on Challenge Appraisal Tendency Mediated by Proactive Coping, and on Depressive Symptoms and Vitality Through Proactive Coping and Challenge Appraisal Tendency.



Note. Numbers refer to standardized beta values. * = $p < .05$, ** = $p < .01$, *** = $p < .001$. For visual simplicity, control variables are not displayed.

Discussion

The aims of the present study were to investigate the extent to which proactive coping mediated the relationship between stress mindset and challenge appraisal tendency and examine how this in turn related to vitality and depressive symptoms. In support of the hypothesis, stress mindset was positively associated with proactive coping, which was in turn positively associated with a greater challenge appraisal tendency. Moreover, the direct association between stress mindset and challenge appraisal tendency was non-significant, supporting the hypothesised

indirect positive association between stress mindset and challenge appraisal tendency through proactive coping. Although previous studies have found that stress mindset is positively associated with challenge appraisal tendency (e.g., Mansell, 2021), the findings of the present study extend the literature by demonstrating an apparent mechanism through which this relationship operates.

The positive association between stress mindset and proactive coping supports the work by Keech et al. (2018) and may be explained through the REBT framework (Ellis & Dryden, 2007). To elaborate, REBT proposes that it is not an adverse situation (A) in itself that leads to behavioural and emotional consequences (C), but rather an individual's beliefs about the situation (B). Often, an individual's behavioural and emotional consequences (C) are a direct result of an adverse situation (A) (i.e., $A \rightarrow C$). However, an individual's beliefs about an adverse situation can influence the way in which they respond (i.e., $A \rightarrow B \rightarrow C$) which can lead to more positive approaches to stressful situations. Thus, individuals who hold more of the belief that 'stress-is-enhancing' can apply such beliefs (B) to adverse situations (A), leading to more flexible and adaptive responses including coping tendencies (C). Indeed, this $A \rightarrow B \rightarrow C$ approach to thinking is said to lead to higher proactive coping (Wood & Turner, 2020). To illustrate, individuals who agree with items from the SMM-G (Crum et al., 2013) such as "*Experiencing stress facilitates my learning and growth*" and possess a 'stress-is-enhancing' mindset (B) are more likely to respond in a proactive way (C) to cope with adverse situations (A).

The flexible and adaptive responses of proactive coping may explain the positive association it has with challenge appraisal tendencies. This finding is in accordance with research by Raper and Brough (2021), who demonstrated that proactive coping allows individuals to prepare for future events by developing their skills or accumulating personal resources. In turn,

this likely increases their resource appraisals and may subsequently lead to a challenge appraisal tendency. For example, items on the PCS (Greenglass et al., 1999) such as *“When I experience a problem, I take the initiative in resolving it”* appear to be closely aligned with the approach-focused behaviours suggested as indicative of challenge appraisals within the TCTSA (Jones et al., 2009). When considered from an REBT viewpoint, this may mean that challenge appraisals are a secondary behavioural and emotional consequence (C) of a ‘stress-is-enhancing’ mindset (B). Individuals experience challenge appraisals when they perceive the conditions of a meaningful event to be favourable for success (Meijen et al., 2020), and the actions and cognitions associated with proactive coping may enhance an individual’s perceived resources prior to stressful situations, which is said to be an antecedent of challenge appraisals (Jones et al., 2009). Furthermore, the relationships between stress mindset, proactive coping, and challenge appraisal tendency supports theoretical concepts suggested within the TCSTA-R (Meijen et al., 2020) in that trait beliefs are important in determining challenge appraisals. That said, it may not always be the case that challenge appraisals will be experienced as a result of these beliefs and coping strategies because each individual and stressful situation are different. Overall, the findings suggest that a ‘stress-is-enhancing’ mindset may fuel proactive coping strategies that occur prior to stressful situations, and this may develop challenge appraisal tendencies. Subsequently, when stressful situations arise, an individual is more likely to appraise such events as a challenge and not as a threat.

It was predicted that challenge appraisal tendency would positively relate to vitality, and vitality would negatively relate to depressive symptoms. The results of the present study support these specific hypotheses and replicate the findings by Mansell (2021), whilst extending the literature by examining these relationships in a mixed sample of athletes and non-athletes.

Associations, between challenge appraisals and psychological wellbeing have previously been established (e.g., Skinner & Brewer, 2004). The present study focuses on vitality as an indicator of psychological wellbeing, and perhaps an explanation for the relationship between challenge appraisal tendency and vitality is through feelings of higher energy. Previous studies have suggested this as a reason for this association (e.g., Carenzo et al., 2020), which supports cognitive appraisal theories of stress in that cognitive appraisals influence physiological responses (Tomaka et al., 1997). Psychologically, it may be that the generation of positive emotions resulting from challenge appraisals (Skinner & Brewer, 2004) means that an individual feels alert, energised and optimistic (Lavrusheva, 2020). Subsequently, these positive feelings associated with vitality may act as a buffer against the intensity of depressive symptoms that an individual experiences (Ryan & Frederick, 1997). The findings of the present study therefore suggest that positive stress appraisal tendencies are related to negative mental health indicators (i.e., depressive symptoms) through positive mental health indicators (i.e., vitality).

The secondary aim of the present study was to examine whether there were any differences between athletes and non-athletes in stress mindset. In support of the hypothesis, athletes reported a more 'stress-is-enhancing' mindset compared with non-athletes. This is the first known study to compare differences in stress mindset between athletes and non-athletes, although previous studies have reported seemingly higher mean scores in stress mindset in an athlete-only sample (Mansell 2021) compared to a general population sample (e.g., Crum et al., 2013), thus suggesting a more 'stress-is-enhancing' mindset in athletes. The present study confirms this appears to be the case. A possible explanation for this distinction in athletes and non-athletes' stress mindset is that athletes may have accumulated a greater number of opportunities to experience stressful situations. On a regular basis in both training and competitive situations,

demands of high performance are placed on athletes (Perry, 2020). In addition to life's daily demands, this exposes them to frequent situations of pressure – situations in which they will accumulate experiences they consider to be a success (e.g., winning, performing well). Therefore, a curvilinear relationship between stress and positive outcomes may be evident whereby frequent exposure to moderate levels of athletic-based stressful situations may lead to facilitative stress-related outcomes (Fletcher & Arnold, 2021). As such, these successful stressful experiences are likely to lead to developing beliefs that stress can be enhancing – particularly for performance and productivity – that are likely manifested in a more 'stress-is-enhancing' mindset compared to non-athletes. Perhaps the greater 'stress-is-enhancing' mindset partially explains the significantly better psychological wellbeing that was reported by athletes compared with non-athletes.

Furthermore, athletes' more regular exposure to stressful situations compared with non-athletes may also act as a form of stress inoculation (Turner et al., 2013), whereby factors that may increase the perception of situations as stressful, such as novelty and uncertainty (Lazarus & Folkman, 1984) can be ameliorated. This explanation may be reflective of resilience, whereby regular exposure to stressful situations can lead to individuals perceiving stressful situations to be more manageable (Seery, 2011), thus aiding the development of a 'stress-is-enhancing' mindset. In the present study, the sample of athletes was drawn from a varied pool ranging from recreational to regional and above, and it may be that athletes pursuing their sport at higher levels experience a greater degree of pressure than recreational athletes (Fletcher et al., 2012). Accordingly, future research may wish to investigate whether there are significant differences in stress mindset in athletes at elite levels compared with recreational athletes. Research of this nature may help to explain if athletes develop a 'stress-is-enhancing' mindset *because* of their athletic pursuits.

Given the ubiquity of stress and the known potential for stress to have deleterious effects on psychological wellbeing, the findings of the present study may offer insight for practitioners who work in stress-related fields. Although the findings of the present study are cross-sectional and do not suggest causation, results imply that a 'stress-is-enhancing' mindset may trigger a set of cognitions and appraisals that could positively influence psychological wellbeing. This said, it is important to note that individuals should not seek to encounter a greater frequency and intensity of stress to experience the benefits associated with a 'stress-is-enhancing' mindset (Crum et al., 2013). Instead, the development of a 'stress-is-enhancing' mindset may be expedited by reframing stressful experiences as useful learning opportunities rather than something to avoid (e.g., Jamieson et al., 2018). Providing opportunities for individuals to thrive in stressful situations (e.g., sporting competitions) and reflect on how their stress responses may have facilitated coping (Tamminen, 2021) may be fruitful in developing a 'stress-is-enhancing' mindset. Given that prolonged exposure to intense stressors may lead to psychological illbeing (Casper et al., 2017), practitioners who wish to enhance positive beliefs about stress should present that stress *can be* enhancing rather than is *wholly* enhancing (Keech et al., 2021). The novel aspect of the present study was the finding that the stress mindset is related to challenge appraisal tendencies indirectly through proactive coping. Accordingly, practitioners may wish to implement interventions that not only focus on the upsides of stress but also promote the use of proactive coping strategies prior to experiencing stress. This may include strategies that enhance perceptions of control by taking charge of stressful situations, or by encouraging the deployment of problem-solving strategies prior to stressful situations (Greenglass & Fiksenbaum, 2009). Results of the present study imply that this may lead to greater challenge appraisal tendencies and psychological wellbeing.

A strength of the present study was the relatively even samples of athletes ($n = 106$) and non-athletes ($n = 101$) enabling a comparison between the two groups in mindset. Furthermore, a cross-section of athletic ability was represented in the study's sample. Future research may wish to consider investigating whether elite athletes possess differing levels of stress mindset to recreational athletes. As used in other similar studies (e.g., Mansell, 2021), the use of path analysis may be considered as a strength of the present study as it accounts for multiple associations simultaneously. Path analysis also examines direct and indirect pathways, which was important to test the indirect effect of stress mindset on challenge appraisal through proactive coping. The visual representation of the model also allows for clear representation of how the variables relate (Byrne, 2010). Future research may wish to use full Structural Equation Modeling with a larger sample size by using latent variables to explore a full model.

A limitation of the present study is that it is cross-sectional and does not imply causation. Consequently, it is important future research investigates whether interventions designed to enhance stress mindset subsequently result in increases in proactive coping and challenge appraisal tendencies, and whether these changes also result in enhanced performance in stressful situations as well as greater vitality and lower depressive symptoms. As the present study measured trait beliefs and appraisals and not those before an imminent stressor, future research could conduct similar measures immediately before a situation of pressure (Kilby et al., 2020). A study design of this nature may have more applied use as to how individuals prepare to face stressful situations. Future research may also wish to complement the use of psychological data with the addition of physiological or qualitative data immediately before a stressful event, such as a sporting competition. Indeed, as the data for this study was collected during the Covid-19 pandemic, it may be that this had an impact on results and influenced the responses of athletes

specifically due to the additional stressors experienced during this period (Arnold & Fletcher, 2021). Additionally, future research may wish to combine measures of eudemonic wellbeing with hedonistic wellbeing (i.e., positive affect) to fully capture psychological wellbeing (e.g., Brown et al., 2017). The present study excluded individuals who had medically diagnosed mental health conditions, but future research may wish to investigate whether these results are replicated in individuals who have a clinical diagnosis of anxiety, for example. Moreover, future research may wish to assess whether the findings of the present study are also present in adults over the age of 35.

In conclusion, the present study aimed to investigate the extent to which proactive coping mediated the relationship between stress mindset and challenge appraisal tendency and examined how this in turn related to vitality and depressive symptoms. Using path analysis, data supported the model whereby holding more facilitative views of stress was associated with greater challenge appraisal tendencies through more proactive coping. In turn, a challenge appraisal tendency related to greater vitality, which related to lower depressive symptoms. Results add to the growing amount of literature which support the importance of stress mindset in psychological wellbeing (e.g., Crum et al., 2013), suggesting that a 'stress-is-enhancing' mindset are a set of beliefs that may influence behavioural and emotional consequences in the form of proactive coping and challenge appraisal tendencies. Based on the TCTSA-R (Meijen et al., 2020), this may be because individuals who hold these beliefs about stress may feel better equipped to deal with stressful situations through a perception of greater personal resources. In turn, this chain of beliefs and cognitions may lead to greater vitality and lower depressive symptoms. Results also suggest that athletes may hold more facilitative beliefs about stress than non-athletes, offering support for the experience of moderately stressful experiences and stress inoculation as a

potential method for enhancing positive beliefs about stress.

CHAPTER 4

ASSESSING WHETHER AN EDUCATION AND IMAGERY INTERVENTION CAN ENHANCE STRESS MINDSET, STRESS APPRAISALS, AND MOTOR TASK PERFORMANCE

Experiencing stress, such as in the form of competition in sport, can have maladaptive consequences on an individual's cognitions and emotions (Rice et al., 2016) which may result in decrements to performance (e.g., Moore et al., 2013). An emotion often experienced during stress which can influence athletic performance is anxiety. Anxiety is a multidimensional construct consisting of both cognitive and somatic anxiety. Cognitive anxiety relates to worry and apprehension about forthcoming events such as a competition (Hanton & Jones, 1999), whilst somatic anxiety refers to the physical manifestation of anxiety, such as the acceleration of heart and breathing rates (Pulido et al., 2018). Individuals may experience varying levels of cognitive and somatic anxiety which can affect performance differently (e.g., Neil et al., 2006), and therefore it is important to assess both cognitive and somatic anxiety when examining experienced anxiety during stress.

Although anxiety is known to sometimes reduce athletic performance (e.g., Martens et al., 1990; Moore et al., 2013), it is proposed in some instances to be facilitative for athletes (Salminen et al., 1995). This is because anxiety is thought to stimulate a response to counter the stressful situation (Lazarus & Folkman, 1984). Therefore, attempts to reduce anxiety may be unproductive (Chamberlain & Hale, 2007) and it may be more appropriate for techniques to aim to alter the interpretation of the anxiety and physiological arousal (Jamieson et al., 2018). In support, evidence suggests that more facilitative views of anxiety (i.e., the anxiety direction), and not the anxiety intensity, is associated with better performance in tasks such as golf putting (Chamberlain & Hale, 2007). Accordingly, techniques to elicit more positive perceptions of cognitive and somatic anxiety may be fruitful intervention methods for improved performance under pressure or during stress (Brooks, 2014).

Appraising anxiety more facilitatively often results from how an individual evaluates the stressful situation (Sammy et al., 2017). The Theory of Challenge and Threat States in Athletes (TCTSA; Jones et al., 2009) proposes that an athlete assesses their available resources to cope with the demands of the situation. When an athlete perceives that they have sufficient resources to meet the demands of the competition, they likely appraise the scenario as a challenge (Jones et al., 2009). By contrast, an athlete who does not feel that they have sufficient resources to meet the demands is thought to appraise the scenario as a threat (Jones et al., 2009). Athletes who appraise stressful situations as a challenge experience more adaptive responses, and emotions typically considered as “negative” – such as anxiety – are perceived as being facilitative for performance (Moore et al., 2012). In turn this is thought to be associated with better athletic performance (Hase et al., 2018). With this in mind, it is important to establish ways in which practitioners can promote a challenge appraisal during competitive scenarios to elicit more positive anxiety and optimise performance.

The TCTSA proposes the antecedents of challenge and threat appraisals consist of self-efficacy, perceptions of control, and goal orientation (Jones et al., 2009). Self-efficacy (or situation-specific confidence) is considered to influence an athlete’s resource appraisals as they evaluate whether they possess the requisite resources to cope with the demands of the situation (Jones et al., 2009). If levels of self-confidence (or self-efficacy) are high as they approach a competition, an athlete is likely to experience a challenge appraisal (Jones et al., 2009). In contrast, individuals who have lower levels of confidence are more likely to experience a threat appraisal (Williams & Cumming, 2012). Self-confidence has been found to be an important factor in performing well under pressure (Turner et al., 2013) and may act as a buffer against high levels of anxiety (Jones & Swain, 1995). Indeed, it is thought that

the relationship between self-confidence and performance occurs due to more facilitative interpretations of anxiety (Thomas et al., 2007). Thus, increasing self-confidence during stressful situations may be an effective way to increase challenge appraisal, reappraise anxiety as facilitative, and in turn enhance performance.

A concept that appears to be related to self-confidence, challenge appraisals, and anxiety is stress mindset (Mansell, 2021; Chapter 2). Stress mindset refers to the extent to which an individual holds the belief that stress has enhancing or debilitating consequences on stress-related outcomes, such as wellbeing and performance (Crum et al., 2013). Several studies support the notion that individuals who possess a 'stress-is-enhancing' mindset are more likely to associate stressors and responses to stress as being beneficial (e.g., Crum et al., 2017; Keech et al., 2019), whilst individuals who possess a 'stress-is-debilitating' mindset consider that stressors and responses to stress result in deleterious effects on wellbeing and performance. Compared to individuals who hold a 'stress-is-debilitating' mindset, those who adopt a 'stress-is-enhancing' mindset are less likely to experience anxiety (Crum et al., 2013), and more likely to perform better (Casper et al., 2017).

The relationship between stress mindset and athletic performance has thus far been the subject of little academic research. One study reported that there is a positive relationship between stress mindset and performance in US Navy SEALs (Smith et al., 2020), and research based on academic performance suggests that this relationship may operate indirectly (Wang et al., 2022). Furthermore, specific to athletes, Mansell (2021) reported significant associations between stress mindset and challenge (positively), and threat (negatively). These associations may lead individuals to believe that they can perform well in such situations as they predict that they are more likely to cope with the stressor (Jones,

1995), which is indicative of challenge appraisals (Park et al., 2018). In contrast, those with a 'stress-is-debilitating' mindset are more likely to view stress as a barrier to their pursuits (Park et al., 2018). Indeed, the relationship between stress mindset and academic performance is said to be mediated by challenge and threat appraisals (Wang et al., 2022). However, research is yet to sufficiently examine whether altering stress mindset can alter performance during a competitive motor task and whether this seems to be due to changes in self-confidence, stress appraisals, and anxiety interpretations.

While mindsets are generally considered to be stable, they can be altered through interventions such as short videos. Videos highlighting the concept of a 'stress-is-enhancing' mindset do not seek to alter the intensity of stressors but instead focus on an individual's beliefs that stress can be enhancing if they choose to utilise the physiological and psychological responses to stressors (Crum et al., 2017). These interventions have been effective in enhancing workplace performance (Crum et al., 2013), classroom performance (Jamieson et al., 2016), and levels of positive affect (Keech et al., 2019). In relation to motor performance, the efficacy of such interventions has yet to be examined, although research in similar areas suggest that it would likely be effective (Brooks, 2014). Consequently, such videos may be effective altering athletes' stress mindset with subsequent benefits to confidence, appraisals, anxiety interpretation and ultimately, motor performance.

One technique that has regularly been used to enhance athletic performance is imagery (e.g., Simonsmeier & Buecker, 2017). Imagery can enable facilitative reappraisals of emotions and cognitions prior to performance (Holmes et al., 2007), such as increasing self-confidence (Hanton & Jones, 1999) and more facilitative interpretations of anxiety (Cumming et al., 2017a), as well as more adaptive appraisals of stressful situations (Williams

et al., 2017). Based on Lang's (1979) Bioinformational theory, imagery can support facilitative responses to stressful situations by focusing on how responses to stress (e.g., increased heart rate) are interpreted by the person (e.g., an increase in heart rate could be interpreted as showing the individual they are ready to perform well). Evidence shows that athletes who were given an imagery script promoting a challenge appraisal were less likely to appraise the competition as a threat and interpreted physiological responses to the competition as facilitative, whilst the threat promoting script led to a greater threat appraisal and the same physiological responses were viewed as more debilitating (Williams et al., 2010). Although research demonstrates imagery's effectiveness in altering appraisals and responses to stressful situations (e.g., Williams & Cumming, 2017), only one study has examined imagery's ability to alter stress mindset. Keech et al., (2021) found that an imagery-based stress mindset intervention was able to enhance stress mindset, proactive behaviour, and academic performance in individuals. However, imagery's efficacy to promote a 'stress-is-enhancing' mindset as an additional part of a stress mindset intervention to enhance athletic performance has yet to be examined.

Aims and Hypothesis

The apparent effectiveness of videos altering stress mindset and appraisals, and imagery altering appraisals and anxiety interpretations is established in the literature. However, little is known about how such videos may influence stress mindset, self-confidence, appraisal, anxiety interpretations, and subsequently performance of a competitive motor task. It is also unknown whether imagery as an additional component to a stress mindset video can produce a greater intervention effect. Therefore, the aims of the present study were to investigate whether a stress mindset video intervention could alter

the stress mindset in a group of athletes compared to a control group, and whether any alteration in stress mindset would be accompanied by higher levels of self-confidence, a greater challenge appraisal, lower threat appraisal, more facilitative anxiety, and better performance of a competitive golf putting task. Second, the study aimed to ascertain whether the combined effect of a stress mindset video and imagery intervention would bring about greater changes in stress mindset and previously listed variables. It was hypothesised that while there would be no group differences in stress mindset at baseline, following the intervention, participants in the video and imagery group would display a significantly greater 'stress-is-enhancing' mindset compared to the video only group who in turn would display a significantly greater 'stress-is-enhancing' mindset compared to the control group. It was also hypothesised that individuals in the video and imagery intervention group would demonstrate better performance, higher self-confidence intensity and direction, greater challenge appraisal, lower threat appraisal, and more positive cognitive and somatic anxiety interpretations compared to the video only group who would in turn perform better and display higher self-confidence intensity and direction, greater challenge appraisal, lower threat appraisal, and more positive cognitive and somatic anxiety interpretations compared to the control group.

Method

Participants

One hundred and twenty participants ($n = 59$ females, $n = 61$ males, $M_{age} = 19.72$ years, $SD = 1.45$) took part in the study. All participants stated that they were healthy and took part in regular physical activity. Exclusion criteria included individuals who play golf regularly or have a golf handicap, any injuries that would prevent them from taking part in the study, no medical history of epileptic seizures, no immune, cardiovascular or metabolic

conditions, and no medically diagnosed mental health conditions at the time of testing. Inclusion criteria were that participants were at least eighteen years of age and were proficient in reading English. Participants who were studying at the university were offered 'research credits' towards their module with the additional incentive of prizes in the form of £20, £10 and £5 Amazon vouchers for a top three place based on putting performance. On arrival to the laboratory, participants were assigned to one of three experimental groups including a control group ($n = 41$), a video intervention group ($n = 41$) and a video and imagery intervention group ($n = 38$).

Measures

Stress Mindset

Stress mindset was assessed using the 8-item Stress Mindset Measure - General (SMM-G; Crum et al., 2013). Four statements emphasise more of a stress-is-enhancing mindset (e.g., "*Experiencing stress enhances my performance and productivity*"), and four statements reflect a more stress-is-debilitative mindset (e.g., "*The effects of stress are negative and should be avoided*"). Participants rated the extent to which they agreed with each of the eight statements on a 5-point Likert scale ranging from 0 (*strongly disagree*) to 4 (*strongly agree*). Negatively worded items are reverse scored and then all items were averaged together so that a higher value represented a more 'stress-is-enhancing' mindset. The SMM-G was reported to produce valid and reliable stress mindset scores (Crum et al., 2017). The Cronbach alpha coefficient in the present study was .86, indicating high levels of internal reliability.

Cognitive and Somatic Anxiety and Self-Confidence

The Immediate Anxiety Measures Scale (IAMS; Thomas et al., 2002) assessed the intensity and direction of cognitive and somatic anxiety as well as self-confidence

immediately prior to the motor task. Participants first rate the extent to which they are cognitively anxious (i.e., the intensity rating), using a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*extremely*). Next, they rate the extent to which they perceive the anxiety experienced as being positive or negative towards their upcoming golf putting performance (i.e., the direction rating), using a 7-point Likert scale ranging from -3 (*very debilitating/negative*) to +3 (*very facilitative/positive*). The questionnaire then repeats the same process for somatic anxiety before finishing with self-confidence. Thomas et al. (2002) reported that the IAMS is a valid and reliable method of assessing cognitive and somatic anxiety and self-confidence, and it has been used in many similar laboratory studies involving stress evoking situations (e.g., Williams et al., 2017).

Trait Challenge and Threat

The Challenge and Threat in Sport Scale (CAT-Sport Scale; Rossato et al., 2018) was used to assess participants' trait dispositions of challenge and threat in anticipation of competition. The CAT-Sport Scale is a 12-item questionnaire with 5 items assessing challenge (e.g., "*I look forward to the opportunity to test my skills and abilities*") and 7 items assessing threat (e.g., "*I feel like competing in my sport is a threat*"; Rossato et al., 2018). Participants indicate the extent to which they agree or disagree with each statement by responding on a 7-point Likert scale ranging from 1 (*totally disagree*) to 7 (*totally agree*), before mean scores are generated for challenge and threat subscales. The Cronbach alpha coefficient in the present study was .61 for challenge and .91 for threat, indicating high levels of internal reliability for threat but not for challenge (Rosatto et al., 2018). The scale has also been recently used in other similar studies (Mansell, 2021).

Challenge and Threat

To measure challenge and threat appraisals, participants completed six items developed by McGregor and Elliot (2002) that have been used in previous laboratory studies assessing challenge and threat states (e.g., Williams et al., 2010). Three items assessed a challenge appraisal (e.g., *"I view the task as a challenge"*) and three assessed a threat appraisal (e.g., *"I feel threatened by the situation"*). Participants were asked to rate the extent to which they agreed with each statement on a 7-point Likert scale ranging from 1 (*not at all true*) to 7 (*very true*). The three items for challenge and threat are each averaged to produce separate challenge and threat scores, with higher scores reflecting greater challenge and threat appraisals. McGregor and Elliott (2002) reported that the items produce reliable scores for both challenge and threat. The Cronbach alpha coefficients in the present study were .82 for challenge and .86 for threat, indicating high levels of internal reliability.

Trait Anxiety

Trait anxiety was assessed using the 14-item Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). Seven of the fourteen items assess trait anxiety (e.g., *"I get sudden feelings of panic"*), with participants rating the extent to which they agree with the statements on a 4-point Likert scale ranging from 0 to 3. Several of the items are reverse scored before all items are summed with a higher score indicating a higher trait anxiety. The anxiety subscale of the HADS (HADS-A) has been found to have excellent internal reliability and validity (Bjelland et al., 2002). In the present study, the Cronbach alpha coefficient was .72, indicating acceptable levels of internal reliability.

Manipulation Checks

Five single-item measures were administered immediately after the motor task to capture participant engagement in the task and interventions. The first two items measured the extent to which participants were trying to perform the motor task as instructed and how stressful they found the task. Participants responded to both items on a 7-point Likert scale ranging from 1 (*not at all/ not at all stressed*) to 7 (*very much so/ extremely stressed*).

The remaining items were completed by participants depending on their assigned experimental group and all responses were on a 7-point Likert scale. The third item was completed by participants assigned to both the video group and the video and imagery group and measured how engaged participants were in the video (1 = *none of the time*, 7 = *all of the time*). Participants in the video and imagery intervention group completed two final items to assess engagement when listening to the imagery (1 = *none of the time*, 7 = *all of the time*) and how easy it was to image the content described (1 = *very hard*, to 7 = *very easy*).

Interventions

Video intervention

A video was designed for the present study to educate participants that stress can be facilitative for performance during instances of competition and stress. The video was based those previously used by Crum et al., (2013) and was three minutes in duration. Using Microsoft PowerPoint, each slide remained on the screen for approximately eight seconds before automatically moving to the next slide. Instrumental music by Noel Gallagher's High-Flying Birds entitled 'Fort Knox' was playing in the background which was designed to sharpen the focus of the participant rather than seek to make them feel relaxed. Content

was conveyed in text form and provided information to the participants about how responses to stressful situations may be adaptive and encouraged the participant to think back to when they had performed well in a situation of pressure. For example, the video stated that *“your heart rate increases”* and *“as a result, you feel alert and focused for the forthcoming event”*. Some of the slides include relevant pictures to maintain the interest of the participant, such as including a picture of a pilot to illustrate that *“Across all walks of life, the most skilled performances happen under situations of pressure”*. Rather than describe stress as a wholly positive experience, the video was adapted based on the work of Keech et al., (2021) to demonstrate that stress *can* be enhancing. For example, the video stated that participants should *“acknowledge both sides of the effects of stress...but choose the upside”*. The video was pilot tested ($n = \sim 10$) and further refined based on feedback received. The video was played to participants on a computer screen while they remained seated and watching for the duration.

Imagery intervention

Participants in the video and imagery intervention group listened to an imagery script in addition to watching the same video previously described. Based on Lang’s (1979) Bioinformational theory, the imagery script was designed to contain stimulus response and meaning propositions, and drawing on the work of Williams et al., (2017) included responses to stress framed in a positive way through use of these response and meaning propositions. This was aligned to literature on stress mindset (Crum et al., 2013) and would reinforce the information in the video content by describing stress responses (e.g., *“your elevated heart rate is increasing the amount of blood flowing through your body”*), encouraging a positive meaning of these responses (e.g., *“this is helping you to feel in control and energised for your putting performance”*). Subsequently, participants were

encouraged to consider their own previous successful performances in stressful situations and how they felt during these occasions before being asked to imagine themselves taking part in the motor task and how stress responses may facilitate their performance in the task (e.g., *"you feel the adrenaline rushing through your body... feelings like this are an important part of helping you produce your best putting performance"*). The imagery script was administered in the form of two-and-a-half-minute long audio clip which was pilot-tested ($n = \sim 10$) and adapted to ensure that the content was clear and relevant to the forthcoming motor task. The clip was recorded in a neutral-sounding voice and was played to the participants via headphones.

Motor Task

The task was performed on 500cm level artificial putting green using the same Ping Zing2 blade putter with the same set of 'Wilson Ultra' standard-sized golf balls. The task consisted of aiming for a 2cm² marked target square from four different marked distances (150cm, 200cm, 250cm, 300cm). Participants were asked to take 3 putts from the four different distances starting from the closest distance away from the 2cm² target square (150cm) moving away each time to the furthest point (300cm). Once the first set of four putts had been completed, the participants would repeat the same process twice more, meaning that there was a total of twelve putts. Using a standard measuring tape, the researcher would measure the distance after each putt was completed from where the ball stopped to the middle of the target square. After each putt, participants were not informed of their score, with researchers only communicating to the participants by saying 'Next putt please' once the next ball was lined up on the putting green for them. To instil feelings of pressure for the task, each participant was informed that they would have the opportunity to win an Amazon voucher for finishing in the top three places. The researchers also turned

on a video camera and explained to participants that their performance would be video recorded and potentially shown to undergraduate students as part of a module on performance under pressure. The recordings were deleted immediately after and were not actually going to be shown to anyone. Prior to the task participants were given eight practice putts consisting of two putts from each distance.

Procedures

Ethical approval was obtained from the university ethics committee and participants were recruited by sending emails to students, displaying posters around the campus buildings, and promotion via social media channels. Data collection took place for five months from October 2019 – March 2020. On arrival to the laboratory, participants were provided with an information sheet (see Appendix 5) about the study by two trained researchers, including inclusion/exclusion criteria, details of key ethical considerations such as data confidentiality and their freedom to withdraw at any time. After providing informed consent (see Appendix 6), all participants were invited to sit comfortably and were attached to some physiological monitoring equipment¹. Participants then completed an online questionnaire including demographic information, baseline stress mindset, trait cognitive and somatic anxiety, and self-confidence before listening to an audio clip which detailed the forthcoming procedure for their respective group. All participants then completed their practice putts, which was then followed by listening to an audio clip which described the incentives on offer for the best performers. The control group were then instructed to sit quietly and think about the upcoming task for three minutes and then immediately completed a pre-task questionnaire pack to reassess stress mindset, and assess challenge

¹ Participants were attached to blood pressure and heart rate monitoring devices. The data for this is not reported in this chapter as it does not fit with the study's hypothesis and was used for a third-year undergraduate project.

and threat appraisals, and the intensity and interpretation of their cognitive and somatic anxiety and self-confidence in relation to the upcoming task. The video only group and the video and imagery group received their respective intervention materials (see example in Appendix 7 and Appendix 8) and were also asked to sit quietly and think about the upcoming task for three minutes before completing the same pre-task questionnaire pack. All participants then took part in the competitive motor task under the supervision of the researchers. Participants then completed the post-task questionnaire pack consisting only of the manipulation check questions. Overall, the study took around 75 minutes to complete, and participants were thanked for taking part upon completion.

Data Analyses

Data were screened and cleaned in SPSS (IBM, version 26). The data contained less than 5% of missing responses, including six missing entries in the data file for trait anxiety items and two missing entries for stress mindset items. Little's MCAR Test demonstrated that this data was missing at random ($p > .05$), so with minimal missing data, the expectation maximisation method was employed to complete the data set to avoid unrealistic or over-fitted data (Tabachnick & Fidell, 2013). Next, data were checked for outliers and normality. The process of checking for outliers revealed no univariate or multivariate outliers when using Mahalanobis distance at $p < .001$ (Tabachnick & Fidell, 2013) meaning all data was retained for the analysis.

Descriptive statistics were calculated, and one-way ANOVAs were conducted to assess whether there were any differences in the manipulation check data between the three groups for task engagement and task stressfulness (see Table 4.1 for mean scores). A one-way ANOVA was also conducted to investigate whether there were any differences in

video engagement between the video intervention and the video and imagery intervention group. The findings from previous research (e.g., Mansell, 2021) suggest gender differences in the variables of interest. Therefore, gender was controlled for when investigating any group differences to eliminate the effect of gender. First one-way analyses of covariance (ANCOVAs) controlling for gender were employed to test for any group differences in trait variables that could potentially influence the intervention including trait anxiety and challenge and threat appraisal tendencies.

For the main analysis ANCOVAs controlling for gender were conducted to ascertain whether there were any group differences in baseline stress mindset and pre-task stress mindset. Finally, in relation to the competitive motor task, ANCOVAs controlling for gender examined any group differences in performance as well as self-confidence intensity and direction, challenge and threat appraisals, and cognitive and somatic anxiety intensity and direction. Effect sizes were reported as partial eta squared (η_p^2) and the alpha level was set at .05 for all analyses conducted. Significant effects were followed up with Bonferroni post hoc pairwise comparisons.

Results

Manipulation Checks

Table 4.1 displays the mean scores for the manipulation check items broken down by group. One-way ANOVAs revealed no significant differences between the groups' perceived task engagement ($F(2,117) = 1.87, p = .159, \eta_p^2 = .031$) and task stressfulness ($F(2,117)=1.003, p=.643, \eta_p^2 =.008$). Mean scores indicated that participants in all groups were generally engaged in the motor task and that they found it only moderately stressful. There were also no significant differences between the video group and the video and

imagery groups' perceived video engagement ($F(1,77) = 1.58, p = .213, \eta_p^2 = .020$). Mean scores for the engagement in the video revealed that participants were able to engage in the video well. Finally, the video and imagery group's mean and standard deviation scores for imagery engagement and ease revealed that participants were able to perform the imagery task well and were engaged with the imagery script.

Table 4.1

Means (Standard Deviations) of Manipulation Check Items Broken Down by Group

	Control Group	Video Only Group	Video and Imagery Group
Task engagement	5.73 (1.14)	5.61 (0.92)	5.74 (1.08)
Task stressfulness	3.02 (1.14)	3.83 (1.30)	3.11 (1.33)
Video engagement	-	5.37 (1.13)	5.66 (0.91)
Imagery engagement	-	-	5.05 (1.14)
Ease of imagery	-	-	5.11 (1.07)

Note. All ratings ranged from 1 (e.g., very hard to image) to 7 (e.g., very easy to image).

Trait Group Differences

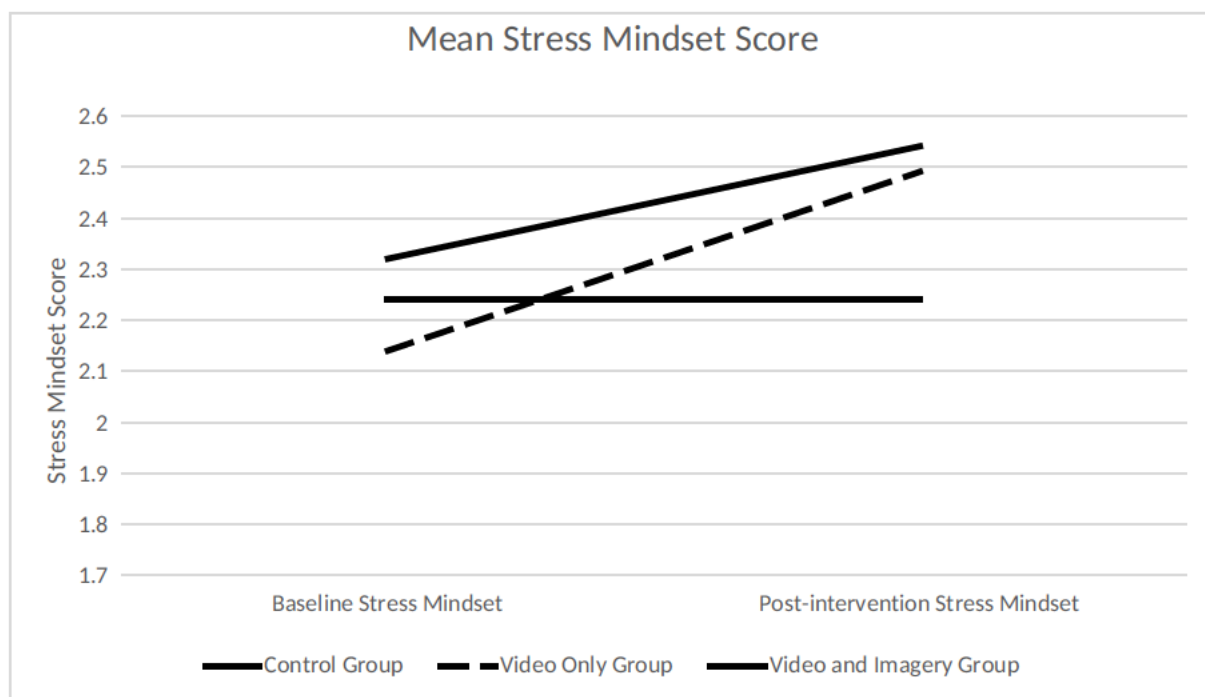
One-way ANCOVAs revealed there were no significant differences between the groups' trait anxiety ($F(2, 116) = .612, p = .544, \eta_p^2 = .001$), challenge appraisal tendency ($F(2, 116) = .153, p = .859, \eta_p^2 = .003$), or threat appraisal tendency ($F(2, 116) = .520, p = .596, \eta_p^2 = .009$), suggesting that groups were similar in their trait anxiety and appraisal tendencies.

Stress Mindset

Figure 4.1 displayed the means and standard errors of stress mindset for the three groups at baseline and post intervention. Two separate three group (i.e., control group, video group, and video and imagery group) one-way ANCOVAs with gender as a covariate revealed no significant differences in stress mindset at baseline ($F(2, 116) = .757, p = .471, \eta_p^2 = .013$) but significant differences were revealed between the groups in stress mindset following the intervention ($F(2, 116) = 3.363, p = .038, \eta_p^2 = .055$). Post-hoc comparisons for the post intervention difference indicated that the mean scores for the control group were significantly lower than the video and imagery group.

Figure 4.1

Group Mean and Standard Errors of Stress Mindset Scores at Baseline and Post-Intervention



Task Measures

Means and standard deviations of the task measures for each group are reported in

Table 4.2.

Table 4.2

Means (Standard Deviations) of Pre-Task Mean Scores

	Control Group	Video Only Group	Video and Imagery Group
Challenge	4.35 (1.06)	4.82 (1.04)	4.78 (0.97)
Threat	1.88 (0.88)	1.98 (0.83)	1.88 (0.87)
Self-confidence Intensity	4.05 (1.28)	4.02 (1.41)	4.50 (1.23)
Self-confidence Direction	1.12 (1.50)	1.34 (1.51)	1.97 ^{a*} (1.20)
Cognitive Anxiety Intensity	2.90 (1.39)	2.80 (1.17)	2.89 (1.29)
Cognitive Anxiety Direction	-.22 (1.56)	.41 (1.47)	.63 ^{a*} (1.26)
Somatic Anxiety Intensity	2.56 (1.30)	2.83 (1.32)	3.03 (1.48)
Somatic Anxiety Direction	-.46 (1.40)	.22 (1.48)	.47 ^{a*} (1.37)

Note. A = significantly greater than the control group. * $p < .05$, ** $p < .01$, *** $p < .001$

Self-Confidence

The one-way ANCOVA for self-confidence intensity indicated no significant group differences ($F(2, 116) = 2.272, p = .108, \eta_p^2 = .038$), while the one-way ANCOVA for self-confidence direction ($F(2, 116) = 4.209, p = .017, \eta_p^2 = .068$) demonstrated a significant effect. Subsequent post-hoc comparisons showed that the confidence experienced prior to the motor task was reported as being significantly more helpful towards performance by participants who received the video and imagery intervention compared to the control

group participants.

Challenge and Threat

The one-way ANCOVA indicated no significant differences between the groups for challenge ($F(2, 116) = 2.621, p = .077, \eta_p^2 = .043$) or threat ($F(2, 116) = .179, p = .837, \eta_p^2 = .003$) appraisal of the task.

Cognitive and Somatic Anxiety

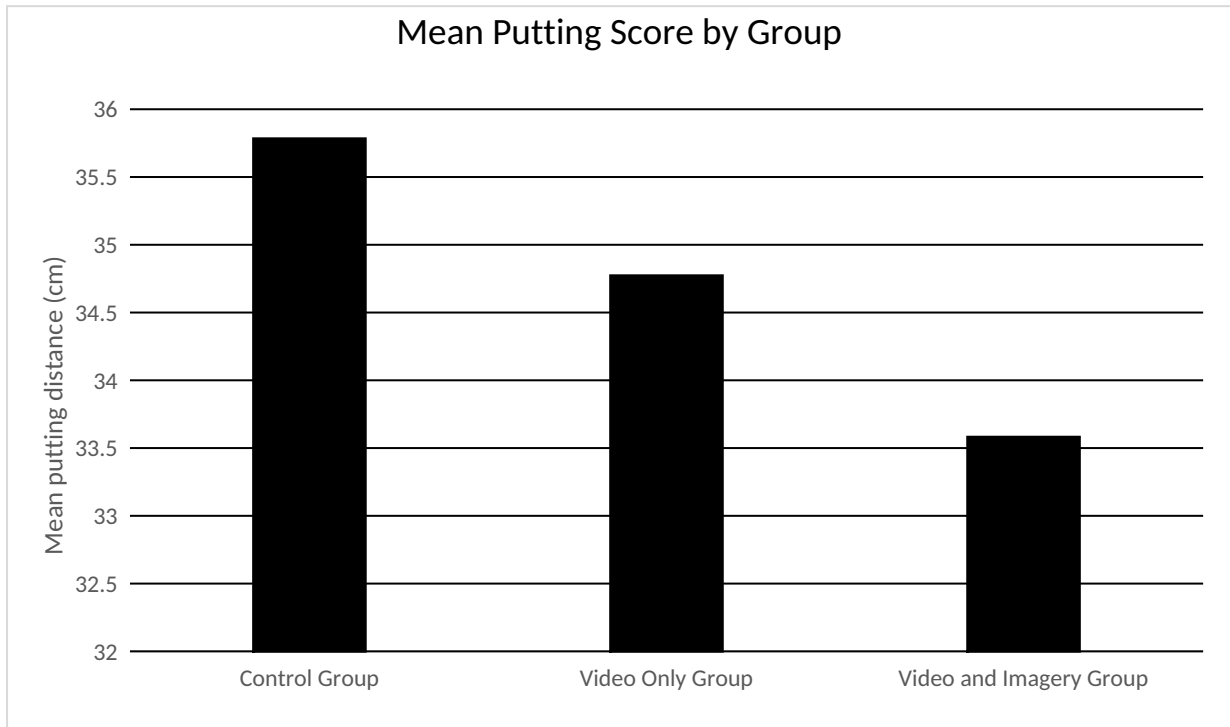
The one-way ANCOVA suggested no significant differences between the groups in cognitive anxiety intensity ($F(2, 116) = .069, p = .933, \eta_p^2 = .001$) and somatic anxiety intensity ($F(2, 116) = 1.142, p = .323, \eta_p^2 = .019$). However, significant differences were revealed between the groups in cognitive anxiety direction ($F(2, 116) = 3.863, p = .024, \eta_p^2 = .062$), with post-hoc comparisons indicating that participants in the video and imagery group viewed cognitive anxiety as significantly more facilitative than the control group participants. Furthermore, significant differences were discovered between the groups in somatic anxiety direction ($F(2, 116) = 4.673, p = .011, \eta_p^2 = .075$). Post-hoc comparisons indicated that participants in the video and imagery group interpreted somatic anxiety as significantly more facilitative to performance than those in the control group.

Performance

A three-group one-way ANCOVA with gender as a covariate indicated no significant differences between the groups in putting performance ($F(2, 116) = .570, p = .567, \eta_p^2 = .010$), although mean scores are depicted in Figure 4.2.

Figure 4.2

Group Means and Standard Errors of Putting Average Distance from the Target



Discussion

The aims of the present study were to investigate whether a stress mindset video intervention could alter the stress mindset compared to a control group, and whether any alteration in stress mindset would be accompanied by group differences in self-confidence, challenge and threat appraisals, anxiety direction, and better performance of a competitive motor task. Additionally, the study aimed to examine whether the addition of an imagery intervention combined with the stress mindset video would elicit further changes in stress mindset and subsequent group differences in the previously listed outcome variables.

Partially in support of the hypothesis, the video and imagery group reported a significantly greater 'stress-is-enhancing' mindset compared to the control group following the intervention. A large effect size of $\eta_p^2 = .055$ was reported, which is similar to the findings by Keech et al. (2021). This finding aligns with the work by Crum et al., (2013) and Jamieson et al., (2018), demonstrating that stress mindset can be altered via short interventions. The finding also extends the literature by revealing that stress mindset held prior to a competitive motor task can be more positive towards stress by using a video and imagery intervention. Similar to the study by Keech et al., (2021), the present study offered balanced information about stress rather than promoting a wholly 'stress-is-facilitative' view, which may have enabled those who received the interventions to hold more adaptive views of stress due to its realistic portrayal. For example, participants in the study by Keech et al., (2021) were told that, "*While stress can interfere with our memory in critical moments... The stress response is actually our body's way of mobilising resources so that we can meet our demands.*" However, there was no significant difference in stress mindset between the video only group and the control group following the intervention. This is contrary to other findings that have used videos to prompt significant increases in a 'stress-is-enhancing' mindset (e.g., Crum et al., 2013). Perhaps the more balanced portrayal of stress in the intervention materials diluted the 'stress-is-enhancing' message, and therefore it may be that content with a greater ratio of the upside of stress is necessary to encourage participants to adopt a 'stress-is-enhancing' mindset to a larger degree. To elicit greater increments in stress mindset, future research may wish to consider including more opportunities for the participants to reflect on the information provided from the video intervention (Tamminen & Holt, 2012), perhaps through the more frequent use of reflective questioning after the video by a social agent, such as a coach (Brown & Fletcher, 2017).

Participants could also be asked to write down information from the video they perceived as helpful, which may subsequently act as affirmations to support adaptive cognitive processes prior to competition (Hallet & Hoffman, 2014).

Despite the video and imagery group displaying a greater 'stress-is-enhancing' mindset following the intervention, contrary to the hypotheses there were no significant group differences in performance in the motor task. Mean putting performance scores were as hypothesised, with participants in the video and imagery group recording lower mean putting scores than the video group, who in turn performed better than the control group. However, the analysis was non-significant. Of importance is that the results for performance were considerably underpowered (.144) which questions the possibility of making a Type II error. Despite this non-significant finding, previous research has suggested that a 'stress-is-enhancing' mindset is associated with better physical performance in US Navy SEALs (Smith et al., 2020) and academic performance (Wang et al., 2022). To explain, it has been suggested by Park et al., (2019) that holding a 'stress-is-enhancing' mindset could improve physical performance due to the physiological advantages, such as wider blood vessels, or by being able to direct more attention to the performance rather than reducing feelings of stress (Crum et al., 2020). However, despite the promising hypothesised mean putting performance scores, additional research is required to confirm whether a stress mindset and imagery intervention is able to enhance motor task performance.

The present study is the first to examine stress mindset in competitive motor tasks such as golf putting. A similar line of work shows that arousal reappraisal can improve golf putting performance (Moore et al., 2015). Although reappraisal seeks to alter cognitions and responses towards a particular stressor rather than changing more generally whether stress

is seen as being facilitative or debilitating (as is the case with stress mindset; Crum et al., 2013), both techniques are similar in that they encourage people reconsider how stress and the responses are viewed. Collectively, these previous studies suggest that techniques may be able to influence putting performance through regulating stress mindset. Future research must use a larger sample size in each group to establish whether increasing a 'stress-is-enhancing' mindset through a video and imagery intervention can be accompanied by better motor task performance.

In contrast to the hypothesis, there were no significant differences between the groups in self-confidence intensity, and challenge and threat appraisal. Despite high levels of engagement in the video ($M = 5.37$), and imagery ($M = 5.66$) intervention materials, the non-significant differences may be due to the task itself. This could include the practice attempts overriding any facilitative impact that the intervention had on self-confidence intensity due to performance accomplishments being the strongest source of self-efficacy (Bandura, 1997). Additionally, the perceived task stressfulness was reported as relatively low ($M = 2.98$). A more stressful task may have invoked greater differences between the groups in self-confidence intensity. The low stress task ratings and lack of group differences in self-confidence intensity may have led to the relatively low levels of challenge and threat and no group differences respectively. First, the TCTSA (Jones et al., 2009) states that for challenge and threat to be experienced an individual must perceive the situation as a 'motivated performance' situation. Second, self-efficacy (i.e., situation specific confidence) is an antecedent of challenge and threat states suggesting that if groups were similar in their task confidence, then this likely led to similar challenge and threat appraisals. Resultingly, no intervention was required to further enhance challenge appraisals. Future research may wish to examine whether a more stressful task yields differences in self-confidence and if

this subsequently leads to differences in challenge and threat appraisals.

Partially supporting the hypothesis, participants in the video and imagery group perceived their self-confidence to be significantly more facilitative to performance than the control group. The intervention potentially acts as a reminder to the participants that their trait self-confidence can contribute towards better motor performance. For example, the content of the imagery script encouraged participants to remember how they felt on an occasion when they performed well, and that these feelings (e.g., butterflies in the stomach) prepared them for a successful performance. Although self-confidence direction differences did not appear to translate to differences in performance, in applied settings, it may be that perceiving self-confidence to be facilitative is more beneficial than simply increasing the intensity of self-confidence given that under some circumstances, self-efficacy that is too high may undermine preparation for motor tasks and subsequent performance (Beattie et al., 2011).

In support of the hypothesis, while there were no significant differences in anxiety intensity, cognitive and somatic anxiety was perceived as more facilitative by individuals in the video and imagery group compared to the control group. This was expected given the intervention was not designed to eliminate stress, but to interpret these responses as facilitative (Jamieson et al., 2018). Researchers had called for studies to investigate whether stress mindset interventions could elicit more facilitative views of anxiety (e.g., Ginty et al., 2021). In answering that call the present study was the first to demonstrate that through the use of a video and imagery intervention, a 'stress-is-enhancing' mindset can lead to more facilitative perceptions of anxiety in response to a forthcoming motor task performance. In contrast to the hypothesis, there were no significant differences in anxiety

direction between the video and control groups. Using a series of short videos (e.g., Crum et al., 2013) rather than just one video may be an effective way to reinforce content and lead to greater differences in anxiety direction.

Collectively the differences that emerged between the control group and the imagery and video group in the present study could be due to the addition of imagery. Perhaps the wording of the imagery script was perceived to be more personal in using phrases such as *“you are simply acknowledging that you feel stressed”* in contrast to the more generic wording of the video. However, based on the study design, it is unknown whether the intervention effectiveness is a combination of the video and imagery intervention or if it is the imagery alone that is responsible for the observed differences in stress mindset, confidence direction, and cognitive and somatic anxiety direction. Indeed, Williams et al. (2017) demonstrated that imagery alone can help individuals interpret their anxiety before a stress task as more facilitative. The present study extends these findings by demonstrating that the addition of a stress mindset video intervention to an imagery intervention also elicits facilitative interpretations of anxiety. Whilst there is much evidence to support imagery’s effectiveness as an intervention to enhance anxiety direction (e.g., Cumming et al., 2007), there is only preliminary work that supports imagery’s effectiveness to alter stress mindset (Keech et al., 2021). It is therefore important that future researchers conduct a similar study including an additional ‘imagery only’ group to examine how much of the observed effect is solely due to imagery versus a combined imagery and video intervention. Due to the study being underpowered, a larger sample size may also provide answers as to whether the video intervention works on its own and how this compares to an imagery only condition.

While future research is needed to examine whether increasing a 'stress-is-enhancing' mindset can improve motor performance, the findings of the present study suggest that adding imagery to existing mindset interventions such as videos may be an effective way to increase a 'stress-is-enhancing' mindset. However, the addition of a fourth group would have implications for the sample size required to achieve results with sufficient power. According to G*Power (3.1.9.7), a total of 400 participants would be required to run the appropriate ANCOVA tests based on an alpha level of .05 and a medium effect size. Based on the existing stress mindset literature, this may lead to more positive performance-based outcomes, such as academic performance (e.g., Jamieson et al., 2016). Future research should also investigate whether similar interventions are an effective way to increase facilitative views of stress, anxiety and self-confidence over a prolonged period of time. This may be important when considering whether changes in these variables can enhance performance given that additional time is often required for the benefits of such interventions to be manifested (Brown & Fletcher, 2017). In applied settings, practitioners may wish to consider the addition of imagery to a stress mindset video intervention to promote a 'stress-is-enhancing' mindset and enhance facilitative interpretations of anxiety and self-confidence. The present study provides further evidence that interventions of this nature can promote adaptive cognitions and emotions in a low-cost and time-efficient manner (Hagger et al., 2020).

Strengths of the present study include its experimental nature, use of questionnaires that have been validated in previous research, and the robust design of the intervention materials based on previous studies (e.g., Keech et al., 2021). Limitations of the present study should also be acknowledged, such as the shortcomings of the design of the motor task. Despite including stress-invoking aspects to the design of the study, such as

introducing competition and offering rewards, participants did not perceive the task to be particularly stressful. Similar future studies should consider ways to increase the perceived stressfulness of the task, such as by increasing the rewards at stake (Hangen et al., 2019) or by creating more ecologically valid scenarios for athletes in their chosen sports. For example, performing a similar intervention with runners immediately prior to an important race or a coach-led delivery (Brown & Fletcher, 2017) may provide more fruitful situations to demonstrate the effectiveness of the intervention. The recruitment criteria of the present study being healthy participants with no diagnosed mental health conditions also means that results are only generalizable to young, non-clinical populations. Future research may wish to examine the effects of stress mindset interventions in clinical populations (e.g., clinically anxious individuals) to determine whether such interventions can promote a more adaptive views of stress and anxiety.

In conclusion, the present study aimed to test the efficacy of a video intervention and a video and imagery intervention in promoting a more 'stress-is-enhancing' mindset and subsequently more adaptive cognitions, emotions, and performance of a competitive motor task. These interventions were compared to a control group comparison. Compared to a control group, the video and imagery intervention elicited a more 'stress-is-enhancing' mindset and more facilitative interpretations of anxiety and self-confidence prior to a competitive task. However, there were no significant group differences in self-confidence intensity, challenge and threat appraisals, or performance in the putting task. While the findings offer some support for the use of a video and imagery intervention to promote a more 'stress-is-enhancing' mindset and more adaptive anxiety, future research should re-examine the effects of these interventions in a larger sample, under conditions of greater perceived stressfulness, alongside the inclusion of an imagery only group to draw stronger

conclusions regarding the interventions' effects.

CHAPTER 5

GENERAL DISCUSSION

The overarching aim of the thesis was to explore how stress mindset and irrational beliefs may determine psychological wellbeing and performance under pressure. Chapters 2 and 3 employed a cross-sectional design and used path analysis to explore the relationships between stress mindset, challenge and threat appraisal tendencies, and psychological wellbeing, with Chapter 2 also assessing the role of irrational beliefs in these relationships. As athletes are said to experience additional stressors as a result of their sporting pursuits which may contribute to prevalent rates of psychological distress (e.g., Rice et al., 2016), they were chosen as the sample in Chapter 2. Chapter 3 extended Chapter 2 by assessing the mediating role of proactive coping between stress mindset and challenge appraisal tendency. It also compared athlete stress mindset to non-athlete stress mindset by including a population of athletes and non-athletes. Based on the associations between stress mindset and challenge appraisal tendencies established in Chapters 2 and 3, an experimental study was employed in Chapter 4 to ascertain whether changes in stress mindset resulting from a brief education and imagery intervention were accompanied by changes in challenge and threat appraisal states (i.e., enhanced challenge), and whether this led to more facilitative interpretations of anxiety symptoms and better performance under pressure compared to a control group.

Results of the thesis broadly supported the hypothesis that a 'stress-is-enhancing' mindset is associated with more adaptive stress-related outcomes. Stress mindset was found to be positively associated with challenge appraisal tendencies and negatively associated with threat appraisal tendencies. The association with stress appraisal tendencies explained the indirect positive association between stress mindset and subjective vitality, and indirect negative association between stress mindset and depressive symptoms. Consequently, the findings provide more conclusive evidence of the association between a

'stress-is-enhancing' mindset and greater challenge appraisal tendencies reported by Kilby and Sherman (2016) – a notion that has been proposed (e.g., Casper et al., 2017) but not sufficiently supported (Kilby et al., 2020).

The literature has speculated on the potential for the relationships between stress mindset and stress appraisal tendencies to be indirect (Kilby et al., 2020). Chapter 3 tested this hypothesis by including proactive coping as a potential mediator and aimed to replicate Chapter 2's finding that challenge appraisal tendencies were related to vitality. Chapter 3 found that the relationship between stress mindset and challenge appraisal tendency was mediated by proactive coping. Both Chapters 2 and 3 supported suggestions by Casper et al. (2017), and Greenglass and Fiksenbaum (2009) that there may be a significant positive association between challenge appraisal tendencies and vitality, whilst Chapter 2 supported findings from previous studies (e.g., Mak et al., 2004) that maladaptive stress appraisal tendencies are related to poor mental health (i.e., depressive symptoms). Taken together, the findings of associations between stress appraisals and psychological wellbeing in this thesis highlight the need to cultivate challenge appraisal tendencies as a potential route to enhanced psychological wellbeing. It may be that as stress mindset appears to predict challenge appraisals, targeting both stress mindset and stress appraisals may lead to enhanced vitality and reduced depressive symptoms.

Irrational beliefs were also included as a trait disposition in Chapter 2, and the four types of irrational beliefs were found to relate to stress-related outcomes in different ways. The prevalence of depreciation beliefs appears to be a key finding from the study and were found to significantly relate to stress mindset and challenge appraisal tendencies negatively, and to threat appraisal tendencies and depressive symptoms positively. Perhaps this is due

to the global evaluative nature of depreciation beliefs compared with the other irrational beliefs, which mainly refer to beliefs about specific events. As this data was cross-sectional, it would be interesting to measure whether differences would be apparent immediately prior to a stressful event. The associations between irrational beliefs and stress appraisal tendencies support the findings from previous studies (e.g., Chadha et al., 2019) and offer an extension by suggesting how the various types of irrational beliefs relate to stress appraisal tendencies in differing ways. However, this is the first known study to investigate whether irrational beliefs and stress mindset relate. Given that a 'stress-is-debilitating' mindset and irrational beliefs may both reflect notions from REBT theory (Ellis & Dryden, 2007) in that they are fixed, illogical, and extreme beliefs, it perhaps is a surprise that only depreciation beliefs were found to predict stress mindset. That said, the significant relationship between depreciation and stress mindset supports previous findings that depreciation beliefs may be particularly prominent in athletes (e.g., Cunningham & Turner, 2016). Ascertaining whether these results would be replicated in non-athlete samples may be of interest as part of future research.

The findings of Chapter 2 demonstrate a significant negative correlation between age and stress mindset. It is thought that beliefs about stress are formed through a combination of socialisation, formal learning processes (e.g., whilst at school), and through experiences (Kilby & Sherman, 2018). In athletes, such beliefs may be shaped by coaches, parents, and the media (King et al., 2022), and it may be through the accumulation of successfully navigating stressful events such as competitions (Moore et al., 2018), athletes can build up a range of effective coping strategies to deal with future stressful situations (Turner & Allen, 2018). Subsequently, they may begin to form more facilitative beliefs about stress as they age. As such, future research may wish to compare how stress mindset may

differ between children and younger adults. Indeed, further investigation into the relationship between stress mindset and age may produce a greater understanding as to why older adults possess a 'stress-is-enhancing' mindset in athlete and non-athlete samples. Learning how these beliefs about stress develop may be useful in helping younger individuals to possess a 'stress-is-enhancing' mindset more rapidly, and thus experience the known associated benefits of this mindset.

Turning to the experimental chapter of the thesis, a brief stress mindset education and imagery intervention elicited a significantly greater 'stress-is-enhancing' mindset, more facilitative interpretations of anxiety, and greater self-confidence direction compared with a stress mindset education only group and a control group prior to a competitive putting task. However, there were no significant differences between the groups in self-confidence intensity and stress appraisals. There were also no differences between the stress mindset education only group and control group. Mean scores demonstrated that performance was better in the stress mindset and imagery group compared with the other two groups, but this did not reach statistical significance.

Although cross-sectional associations between stress mindset and stress appraisal tendencies were found in Chapter 2 and 3, it is interesting that similar associations were not replicated when stress mindset was manipulated prior to performance. This was unexpected given that it is likely that individuals who possess high challenge appraisal tendencies are also likely to possess high state challenge appraisals when faced with stressful situations (Cumming et al., 2017b). It may be that a greater dose of intervention was needed to elicit such changes, or that the golf-putting condition was not considered motivationally relevant enough to participants for them to fully engage in the stress appraisal process (Jones et al.,

2009). If similar measures were to be taken prior in a more ecologically valid setting (i.e., prior to an examination), it may be that a stress mindset and imagery intervention could lead to significantly greater challenge and lower threat appraisals. Taken together, the results of the Chapters 2 and 3 suggest that stress mindset may play an important role in determining stress appraisals and psychological wellbeing, whilst Chapter 4 suggested that a brief stress mindset and imagery intervention can elicit more favourable beliefs about stress immediately before a competitive motor task.

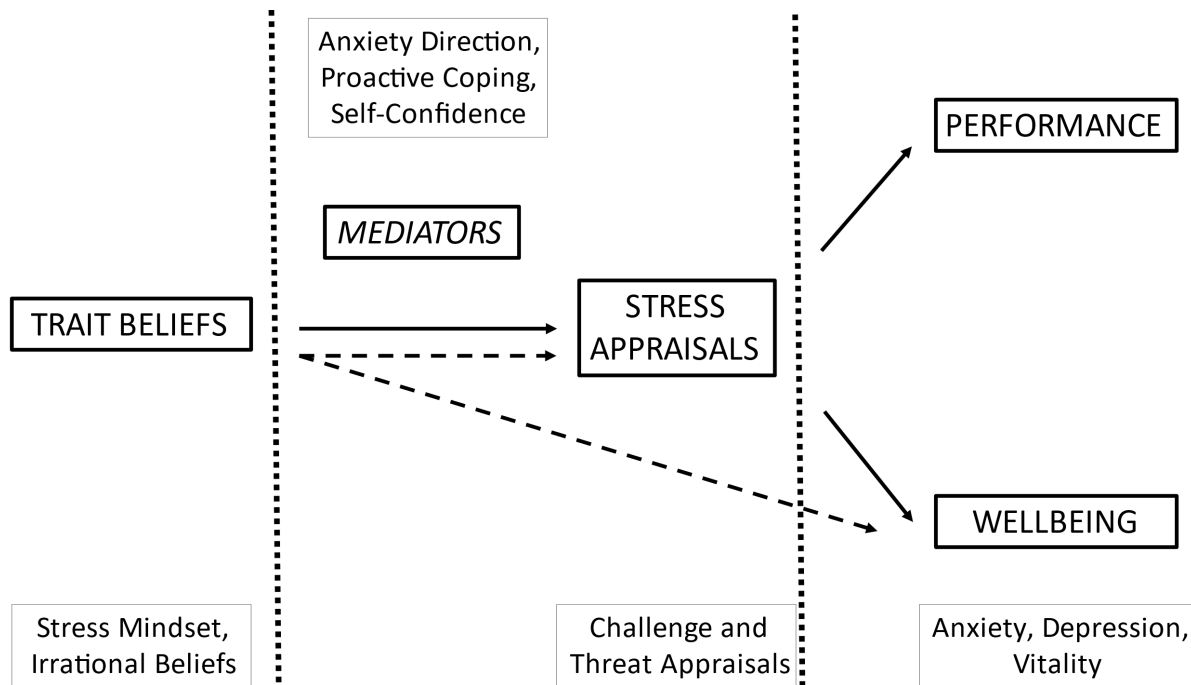
Returning to the theoretical framework of beliefs, stress appraisals, psychological wellbeing and performance depicted in Figure 1.1, the studies within this thesis largely support the model's proposals. In Chapter 2, evidence suggests that trait beliefs (stress mindset and irrational beliefs) are related to stress appraisals, and in turn, stress appraisals are related to psychological wellbeing (depressive symptoms and vitality). Chapter 3 supported these findings and offered proactive coping as a mediator between stress mindset and challenge appraisal tendencies. The experimental Chapter 4 demonstrated that altering trait beliefs (stress mindset) was accompanied by changes in facilitative interpretations of anxiety symptoms, however, it was not able to support the suggestion that enhancing stress mindset could also enhance challenge appraisals and performance with respect to a competitive motor skill task. This means that the inclusion of performance within Figure 1.1, although based on extant theories (e.g., TCTSA-R; Meijen et al., 2020), remains subject to further research.

Whilst the aim of the framework is to provide a general overview of how the variables within the thesis may relate, it does not capture the nuances of the indirect relationships found in Chapters 2 and 3. Indeed, the complexity of the interplay between

the variables in the present thesis are challenging to capture within one model given the variety of study designs (cross-sectional and experimental). Additionally, Chapter 2 demonstrated that particular trait beliefs may influence stress appraisals and psychological wellbeing directly, such as the relationship between depreciation and depressive symptoms, whilst Chapter 3 highlighted that stress mindset is related directly to vitality. The implications of the postulated model within the thesis are discussed in more depth on page 138, but in short, it appears that targeting trait beliefs through applied work could be a fruitful method of enhancing athletes' stress appraisals and psychological wellbeing. Based on the findings of Chapters 2-4, a revised theoretical framework that incorporates the variables within the thesis is proposed in Figure 5.1. This has now been updated to reflect that trait beliefs may influence stress appraisals and psychological wellbeing directly and indirectly.

Figure 5.1

Revised Theoretical Framework of Beliefs, Stress Appraisals, Wellbeing and Performance



Note. Dashed arrowed lines are additional proposed direct pathways.

The findings from Chapter 4 suggest that the combined approach of education and imagery may be a more effective way to enhance stress mindset and facilitative interpretations of anxiety. An explanation for these findings is via the A → B → C framework posited by REBT (Ellis & Dryden, 2007). This framework supports the notion that individuals' behavioural and emotional consequences (C) are not influenced by experiencing adversity (A) in the pursuit of goal-related activity alone. Instead, it is their beliefs (B) about an adverse situation that influence how they think, feel, and respond. Indeed, due to its similarity with the principles of REBT, the Bioinformational theory of imagery (Lang, 1979) is likely to be an effective theoretical framework to deliver stress mindset and reappraisal content and help individuals to experience more facilitative thoughts, feelings, and

responses in relation to stress.

Thesis Implications

The prevalence of mental health, particularly conditions such as anxiety and depression, are well-established in the literature (Vos et al., 2015) and are set to continue to grow in the UK (Mental Health Foundation, 2022). Accordingly, the present thesis aimed to investigate the factors that may be associated with, or able to enhance psychological wellbeing and reduce psychological distress – two important determinants of mental health.

One factor that is said to exacerbate poor mental health is stress (Bor, 2014) – particularly chronic stress (Dhabhar & McEwen, 1997). Across all walks of life, experiencing stress is unavoidable. Although stress can be used to facilitate performance and wellbeing (e.g., Otten, 2009), it is often portrayed negatively (Jenkins et al., 2021) and this perpetuates the notion that all stress results in maladaptive consequences for health and performance.

Recent research has demonstrated that although it is not always possible to control the stressful situations that we may face, it is possible to control how we view them. Aligned with the REBT framework, the intervention material used Chapters 4 and 5 were designed to reduce the demonization of stress and encourage individuals to adopt a balanced set of beliefs about stress, which in turn may lead to the adaptive stress-related outcomes demonstrated in previous studies (e.g., Crum et al., 2013) and in Chapters 2 and 3 (i.e., greater challenge appraisal tendencies and psychological wellbeing). The implications of these findings are that practitioners who aim to promote psychological wellbeing may wish to challenge negative beliefs about stress through REBT-informed interventions to encourage the development of a ‘stress-is-enhancing’ mindset. The question remains as to whether enhanced performance may also be evident as a result of such interventions.

However, when taking a person-centred approach (e.g., McCarthy, 2020), it could be argued that even if performance increments are not evident as a result of a stress mindset intervention, the benefits to an individual's psychological wellbeing alone would make such interventions worthwhile.

Performing under pressure is a requirement for most individuals at various points in their life. However, the need for athletes to perform well under pressure is incessant, and this can often lead to them experiencing poor mental health (e.g., Schaal et al., 2011). Surprisingly, there is no known research that has investigated how athletes' trait beliefs about stress may relate to their psychological wellbeing. The present thesis contains the first study to investigate stress mindset in athletes, and the results demonstrate how stress mindset is associated with other stress-related outcomes. Although these athlete-specific findings were cross-sectional, the results suggest that cultivating a 'stress-is-enhancing' mindset may lead to more adaptive stress appraisals and better psychological wellbeing in athletes. Furthermore, the results of Chapter 3 suggest that stress mindset may play a role in stress appraisals and psychological wellbeing beyond athletes in more generic settings. Stress mindset theory and interventions posit that individuals can utilise stress rather than seeking to avoid stress, and demonstrating that a 'stress-is-enhancing' mindset is positively associated with adaptive stress-related outcomes is useful given that experiencing stress is inescapable (Dhabhar, 2014). Consequently, targeting deeper held cognitions about stress that individuals may not always be consciously aware of alongside use of other techniques (e.g., reappraisal, goal setting, arousal regulation training) may be a more effective way of helping individuals cope with pressure and stress.

Applied Recommendations

Chapter 2 is the first known study to simultaneously investigate how stress mindset and irrational beliefs may relate to each other, and in turn, how they relate to stress appraisals and wellbeing. Based on the REBT framework, the present thesis posits that when individuals possess a 'stress-is-debilitating' mindset, this is akin to irrational beliefs. So, if a 'stress-is-debilitating' mindset is considered as a type of irrational belief, then practitioners may wish to use REBT interventions to dispute illogical, extreme, and fixed beliefs about stress, thus altering a 'stress-is-debilitating' mindset. Resultingly, given the associations demonstrated between stress mindset and adaptive stress-related outcomes in Chapters 2 and 3, the deployment of REBT may enable those with a 'stress-is-debilitating' mindset to change the way they think about stress and in turn experience greater challenge appraisal tendencies and psychological wellbeing. However, it is noted that targeting individuals with a greater degree of negative beliefs about stress could be more fruitful in enhancing adaptive stress-related outcomes than in those who already possess more facilitative beliefs about stress (Jamieson et al., 2021).

Based on the findings of Chapter 4, practitioners may wish to consider using a combination of education and imagery as a method to promote more facilitative beliefs about stress and facilitative interpretations of anxiety prior to a stressful situation. The results of the study in Chapter 4 suggest that such changes can happen quickly (i.e., in less than seven minutes-worth of content), and that learning about the adaptive properties of stress immediately before a stressful event can significantly influence an individual's beliefs about stress. These findings add to previous suggestions that such interventions are cost-effective can be delivered in a variety of settings due to its portability (Hagger et al., 2020). Noting that only the stress mindset video and imagery group experienced significant changes in stress mindset and facilitative interpretations of anxiety symptoms, it is

suggested that practitioners adopt an integrated method of education and imagery to bring about enhancements in stress mindset immediately prior to a stressful event rather than relying on education alone. Furthermore, the adaptive outcomes supported through the intervention in Chapter 4 may be added to by increasing the duration of the intervention. Accordingly, practitioners may wish to design imagery interventions that are underpinned by the Bioinformational theory and REBT to enhance stress mindset and other stress-related outcomes.

In order for changes in stress mindset to occur, it is important that content presented about stress as part of an intervention should be truthful and be something that individuals can realistically believe (Keech et al., 2021). It is not appropriate to label stress as always enhancing given that chronic stress can be deleterious for a range of stress-related outcomes. However, the findings from Chapter 4 suggest that presenting that stress *can be* enhancing is balanced and appropriate, and if neutral definitions of stress are used rather than the more traditional negatively valenced definitions (Carver & Connor-Smith, 2010), this may help to decouple the 'stress' from 'distress'. Hence, practitioners should educate individuals about the upsides of stress, acknowledge the pitfalls of chronic stress (Dhabhar & McEwen, 1997), and promote that if we choose to focus on the adaptive properties of stress, it can lead to adaptive stress-related outcomes. Although the study in Chapter 4 was conducted mainly with sports students ahead of a golf-putting task, it is possible that the content could be adapted to suit other imminent stressful situations, such as examinations. Stress mindset theory focuses on health, performance and productivity holistically and does not have to be typecast as useful only in specific domains (i.e., with athletes).

As suggested by Coudray et al. (2019), practitioners may find that targeting individuals who possess a 'stress-is-debilitative' mindset may benefit more from a stress mindset intervention than those who already possess more facilitative beliefs about stress. Hence, adopting a screening measure to assess stress mindset and only proceeding with those demonstrating a 'stress-is-debilitating' mindset would potentially allow greater changes in stress mindset to occur (Jamieson et al., 2021). For example, previous studies have produced mean SMM-G scores of around 1.5 (e.g., Avery & Shipherd, 2021; Crum et al., 2013) and mean Stress Control Mindset Measure (SCMM; Keech et al., 2019) scores of approximately 3.3 (Keech et al., 2021), and similar scores could be used as a cut-off put to determine those that might benefit most from a stress mindset intervention. However, as research in the area of stress mindset is still fairly novel, it should be noted that cut-off points to determine that an individual possess a 'stress-is-debilitating' mindset are not fully established. Future research may wish to explore this classification of stress mindset. In summary, it is not proposed that stress should be portrayed as wholly enhancing, but instead that practitioners present content as part of stress mindset interventions that turns the dial towards more optimistic views of stress.

As individuals become more accustomed to performing under pressure, it is proposed that they experience stress inoculation (Kelsey et al., 1999), and resultingly, they can perform better under pressure (LeBlanc, 2009). Although individuals will respond in different ways to stressful situations, it may be that adopting a 'stress-is-enhancing' mindset expedites an individual's stress inoculation. In contrast to an individual who hold a 'stress-is-debilitating' mindset, (i.e., considering stress to have maladaptive consequences for performance), an individual who possesses a 'stress-is-enhancing' mindset is more likely to view stress responses as part of preparing to perform well. The implications of this are that

educating individuals about the adaptive properties of stress may mean that they become more comfortable with experiencing stress responses. This educative approach to stress may be quicker than accumulating positive experiences of stress, and therefore may be beneficial for performance by acting as a shortcut to stress inoculation.

Strengths and Limitations

In addition to the novel aspects of the thesis, such as the unique exploration of the role of stress mindset in the psychological wellbeing of athletes, there are several strengths and limitations that should also be highlighted. A strength of the thesis is the deployment of path analysis to examine how the variables in Chapter 2 and 3 related to each other, and that it enabled the testing of the indirect relationships. A further strength of the thesis is the variation in study design. Using a combination and progression of cross-sectional studies, an experimental study, and culminating with the design of an intervention protocol, the thesis provides comprehensive examination of the role of stress mindset in relation to stress-related outcomes. Beginning with cross-sectional studies, Chapters 2 and 3 established the relationships and provided a theoretical basis to design an experimental study to alter stress mindset in an attempt to elicit changes in stress appraisal, confidence, anxiety, and performance. Indeed, the combination of previous literature and the findings from the present thesis meant that the design of the intervention protocol was informed by a broad range of contemporary information that have permeated all four studies within the thesis, such as stress mindset theory (Crum et al., 2013) and the REBT framework (Ellis & Dryden, 2007).

The limitations of the thesis also should be acknowledged and can provide learnings for future research. With respect to the experimental study, the participants were mainly

recruited from sports courses, and given many are athletes, they likely tend to report a greater 'stress-is-enhancing' mindset than non-athletes (see Chapter 3). This may have meant that any changes in stress mindset and subsequently any stress-related outcomes would be less pronounced than if the sample was more reflective of the general population. Equally, the results of Chapter 4 may have been influenced by the participation of sports students completing a competitive sporting task, so perhaps a different set of results would have been produced by non-sports students completing a competitive sporting task. Future studies may wish to create an athlete group and a non-athlete group to test whether different results in stress-related outcomes (e.g., stress appraisals) are evident as a result of a stress mindset intervention immediately prior to a stressful event.

A further limitation of the thesis could be considered the measure of stress mindset that was employed. To assess stress mindset, the SMM-G (Crum et al., 2013) was used in Chapters 2, 3, and 4 having demonstrated excellent validity and reliability in other similar studies (e.g., Karampas et al., 2020). Although this demonstrates a consistent approach to measuring stress mindset throughout the thesis, this measure has been criticised for the dichotomous nature of the wording of the items and appears to frame stress as something that can only be 'good' or 'bad'. Since the commencement of this thesis, the SCMM (Keech et al., 2019) was developed partly to address this issue by phrasing items that are more aligned to stress mindset theory. For example, the items such as "*Stress can be used to enhance my performance and productivity*" reflect stress mindset theory in that stress *can be* enhancing rather than *is* enhancing. In future, using the SCMM may provide more accurate representations of individuals' stress mindset due to its more accurate alignment with stress mindset theory, although there remains a lack of other studies which are able to corroborate Keech et al.'s (2019) findings that the SCMM is a valid and reliable measure of

stress mindset. To develop the area of the measurement of stress mindset, future studies may wish to compare the SMM-G and SCMM to ascertain whether one or both measures accurately reflect individuals' stress mindset.

Another limitation of the thesis is that participants were typically healthy young adults who are white in ethnicity. This means that it is unknown whether the results demonstrated within this thesis are generalisable to different ages and ethnicities. For example, there is little research that has investigated stress mindset in cultures other than Western populations, however studies in Japan (Iwamoto et al., 2020) and Korea (Park et al., 2018) have demonstrated some similar findings to the present thesis (i.e., demonstrating that a 'stress-is-enhancing' mindset is related to more adaptive stress-related outcomes). Furthermore, individuals who were currently diagnosed with a mental health condition were excluded from the studies. Given the associations between stress and mental health, it would be of interest to understand how stress mindset may influence the mental health of individuals who are experiencing clinical levels of anxiety and depression (Jenkins et al., 2021).

Future Directions

The present thesis relies on quantitative self-report data only – specifically psychometric data. The deployment of physiological data would have strengthened the experimental study in Chapter 4 by offering additional data to complement the psychometric measures of stress mindset and stress appraisals. Indeed, by recording participants' DHEAS (Crum et al., 2017) and cortisol levels (Arthur et al., 2019), further conclusions may have been drawn about changes in participants' stress mindset and stress appraisals, respectively. Furthermore, the inclusion of qualitative data may also be

employed to gain a greater understanding into participants' stress mindset (Ben-Avi et al., 2018). For example, adopting a qualitative approach might enable a greater insight into how an individual's stress mindset has developed over time, and how exactly their stress mindset may have changed as a result of an intervention or a significant life event. Future studies may wish to include a combination of psychometric and physiological data or adopt a qualitative approach to add to the knowledge generated by the psychometric-dominated studies. Indeed, addressing the limitations of the cross-sectional studies in Chapters 2 and 3, randomised control trials should be used as a design feature of future studies to ascertain whether stress mindset plays a causal role in determining stress-related outcomes (Hagger et al., 2009).

In addition to ascertaining whether this intervention enhances stress mindset and psychological wellbeing, future research may seek to discover whether enhancements in performance are also possible. In populations where mental health conditions are prevalent and performing under pressure is important (e.g., students preparing for examinations), the deployment of stress mindset interventions may be of particular importance (Wang et al., 2022). Indeed, considering students as potential recipients of this intervention may allow researchers to test the efficacy of the intervention in an ecologically valid context (Kilby et al., 2018).

In conjunction with education about stress, Chapter 4 used imagery as medium to deliver stress mindset content. Although this remains a theoretically sound combination (e.g., Keech et al., 2021), imagery should not be the only method that is considered to deliver stress mindset content (Goyer et al., 2021). Imagery may not be a suitable intervention method for everyone (e.g., those unable to image) and developing a range of

methods to deliver stress mindset and reappraisal content is important to add flexibility to practitioner's approaches. For example, future research may wish to design a self-talk intervention to enhance stress mindset and other stress-related outcomes (i.e., stress appraisals and psychological wellbeing). As with the imagery intervention, researchers may wish to test a stress mindset and reappraisal intervention in a group setting rather than with individuals alone. Whichever medium is employed to deliver a stress mindset and reappraisal intervention, future research should ascertain whether any alterations in stress mindset and stress-related outcomes remain present over time, and hence, longitudinal study designs with repeated follow-up measures could be conducted (Jamieson et al., 2021). This may advance knowledge regarding the quantity of intervention that is required to elicit adaptive changes in stress mindset, and whether follow-up sessions are required to support a 'stress-is-enhancing' mindset in the long term (Crum et al., 2013).

Future research may also wish to measure stress mindset in different populations. As Chapter 2 was the first study to investigate the stress mindset of athletes, additional research may be required in this area. Do elite athletes demonstrate a greater stress mindset than recreational athletes? If so, this may enable practitioners to understand how stress mindsets develop, and such knowledge can be used to enhance the efficacy of subsequent interventions. Furthermore, stress mindset was found to have a significant negative relationship with age in the athlete sample in Chapter 2, but these findings were not replicated in the general population sample in Chapter 3. Given these notable differences, it may be of interest to further investigate this relationship. This may enable practitioners to understand how and why stress mindset may be different for individuals from children to older adults.

Conclusion

Overall, the results of the present thesis offer support for the role that stress mindset plays in determining stress-related outcomes such as stress appraisals and psychological wellbeing. The results regarding the relationships between beliefs (i.e., stress mindset and irrational beliefs), stress appraisal tendencies, and psychological wellbeing may be explained by considering the role of beliefs within the $A \rightarrow B \rightarrow C$ framework posited by REBT. The cross-sectional studies in Chapters 2 and 3 demonstrated significant positive relationships between stress mindset, challenge appraisal tendencies, and psychological wellbeing, with Chapter 3 suggesting that proactive coping mediates the relationship between stress mindset and challenge appraisal tendencies. Contrastingly, altering stress mindset in Chapter 4 was not accompanied by changes in challenge and threat states. This said, the thesis offers support for the ability of imagery to be effective at enhancing stress-related outcomes by demonstrating it is a suitable medium for enhancing stress mindset, facilitative interpretations of anxiety, and self-confidence direction.

Finally, the present thesis has confirmed some existing associations between stress mindset and stress-related variables whilst also offering novel data that extends the evidence base in relation to stress mindset. Building on the promising literature which demonstrates positive associations between stress mindset and other adaptive stress-related variables, further evidence is required regarding the outcomes of altering stress mindset. This is especially the case in two domains – psychological wellbeing and performance under pressure. Exploring how interventions could enhance both outcomes across a variety of populations should now be a priority for researchers and practitioners.

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Information Sheet for Participants

Study Title: Situation Appraisal and Emotion in Sport

Dear Participant,

Thank you for considering taking part in this study, which has been approved by the University of Birmingham's Ethical Review Board.

What is the study about?

This study will measure various different psychological traits and dispositions and look at how different psychological constructs relate to one another.

Can anyone take part?

Anyone aged 18 and over can take part as long they are proficient in reading English, take part in sport at any level, are currently not suffering from any injuries which have prevented participation in physical activity for two weeks or more and are not currently suffering from a diagnosed mental illness.

What will your participation involve?

If you are willing to participate, you will be asked to complete a questionnaire pack containing several questionnaires which will assess various personality and dispositional factors such as anxiety, emotions, appraisal of stress and resilience. Although some may consider some questions to be of a sensitive nature (e.g., assessing anxiety and depression), questionnaires completed are no more demanding than questions and activities experienced in daily living and you are free to not answer any question you do not wish to answer. If you require any additional support with some of the issues linked to mental health in this study, appropriate contact details are provided at the bottom of this information sheet as well as the questionnaire itself. The questionnaire pack will take no more than 30 minutes to complete

All your personal data will remain confidential and will be solely used for academic purposes. Consequently, we would be grateful if you were honest in your responses to the questionnaires. The data will not be anonymous but will only be identifiable using a unique ID number. This is to give you the option to withdraw your data from the study after you have completed the study. In accordance with the Data Protection Act (1998) raw and processed data from this investigation will be kept for a period of ten years following completion of the study or post-publication. Questionnaires and computer files containing

processed data will be kept securely in a locked filing cabinet and will only be accessed by the study investigators. After this time period, all the data collected will be destroyed.

Our overall findings will be used to understand how different constructs relate to one another. You will not be individually identified in any publication.

Do I have to take part?

Please note, your participation in this study is voluntary and you may withdraw at any time up to two weeks after you complete the questionnaire pack, without explanation or any negative consequences. If you choose to withdraw from the study, please contact Mr Paul Mansell (contact details at the end of this information sheet) to inform us of your decision. If you choose to withdraw before the two weeks have elapsed, your data will be destroyed and not included in the data analyses. A brief summary presenting the results and findings will be available upon request at the end of the study.

What are the benefits and risks?

If you are a first year or second year student in the School of Sport, Exercise & Rehabilitation Sciences, you can receive 1 research hour when you have finished the questionnaire pack. The risks of taking part in this study are no more than those of day to day stressors. However, if you find any questions distressing you do not need to answer and sources of support can be found at the bottom of this information sheet. All information that we collect will be strictly confidential.

Can I change my mind?

If, at any point before or during completion of the study, you wish to withdraw, then you may do so. You do not need to give any reason for this, participation is not compulsory. If you decide to withdraw, you may withdraw at any time up until 2 weeks after the questionnaire pack has been completed and the data that we collected from you will be destroyed and will not be used for the study. If you choose to withdraw while completing the questionnaire pack you will not be compensated a research hour. If you chose to withdraw after completing the questionnaire pack, you will still be awarded the research hour for completing the study.

Who else is taking part?

We will be recruiting other individuals who like you fit the inclusion criteria described previously.

Do I have to sign anything?

Yes, if you agree to participate we will ask you to sign a Consent Form. This is to show that you have understood what is involved and that you have read the Information Sheet. After signing the consent form you may still withdraw at any time up 2 weeks after the questionnaire pack has been completed without having to give us an explanation.

Contact details

Paul Mansell, researcher

Tel: [REDACTED]
[REDACTED]

Dr Sarah Williams, research supervisor

Tel: [REDACTED]
[REDACTED]

In the unlikely event that you wish to seek advice and/or information as a result of completing the questionnaires, here are some recommended sources: a) your GP, b) the Birmingham and Solihull Mental Health NHS Foundation Trust on 0121 301 0000, website: www.bsmhft.nhs.uk. If you are a student at the University of Birmingham, you can also access the Mental Health and Wellbeing Services. For information about their services and online resources, please have a look at this link: <https://intranet.birmingham.ac.uk/student/welfare/mental-health/index.aspx>. Or Tel 0121 4145130. Furthermore, this is an online self-referral process at <https://intranet.birmingham.ac.uk/student/welfare/mental-health/personalised-support/access.aspx>, and University well-being drop in services, which are held Mon-Thurs 13:30-14:30 and Fri 11:30-12:30 at Aston Webb Student Hub (R7 on Edgbaston Campus map).

Please note that these services are not provided as part of the research study, hence we will not be responsible for any related fees or charges.

Situation Appraisal and Emotion in Sport

Study Consent Form

	Initial to consent
I confirm that I have read and understand the information sheet and have had the opportunity to ask questions.	
All questions have been answered to my satisfaction.	
I understand that my participation is voluntary and that I am free to withdraw at any time up to two weeks after submission of my data without giving any reason or my rights being affected.	
I give consent for the data that I provide to be used for research purposes.	

If you would like to receive a summary of the results please tick the relevant box below.

	Initial to consent
I would like to receive a summary of the results of the study.	
Email:	

If you have any more questions about the study, please feel free to contact us on the details on the information sheet.

Print name

Signed

Date

Information Sheet for Participants (Phase 1)

Study Title: Investigating Stress and Wellbeing

Dear Participant,

Thank you for considering taking part in this study, which has been approved by the University of Birmingham's Ethical Review Committee.

What is the study about?

This study seeks to investigate the relationship between stress and psychological wellbeing.

Can anyone take part?

Anyone aged 18-35 can take part if they are proficient in reading English, has access to the internet, and does not currently have a diagnosis of a mental health condition.

What will your participation involve?

If you are willing to participate, you will be asked to complete a questionnaire pack, which will take between 20-30 minutes. The questionnaires will assess various personality and dispositional factors as well as beliefs about stress and measures of psychological wellbeing. Although some people may consider some questions to be of a sensitive nature (e.g., assessing anxiety and depression), questionnaires completed are no more demanding than questions and activities experienced in daily living and you are free to not answer any question you find distressing or do not wish to answer. If you require any additional support with some of the issues linked to mental health in this study, appropriate contact details are provided at the bottom of this information sheet.

All your personal data will remain confidential and will be solely used for academic purposes. Consequently, we would be grateful if you were honest in your responses to the questionnaires. The data will not be anonymous but will only be identifiable using a unique ID number. This is to give you the option to withdraw your data from the study after you have completed the study. In accordance with the Data Protection Act (2018) raw and processed data from this investigation will be kept for a period of ten years following completion of the study or post-publication. Computer files containing processed data will be kept securely on a password protected computer and will only be accessed by the study investigators. After this time period, all the data collected will be destroyed. You will not be individually identified in any publication.

Do I have to take part?

Please note, your participation in this study is voluntary and you may withdraw at any time up to two weeks after you complete the questionnaire pack, without having to give us an explanation or any negative consequences. If you choose to withdraw from the study, please contact Mr Paul Mansell (contact details at the end of this information sheet) to inform us of your decision. You do not need to give any reason for this, participation is not compulsory. If you decide to withdraw, you may withdraw at any time up until 2 weeks after completion of the intervention. If you choose to withdraw before the two weeks have elapsed, your data will be destroyed and not included in the data analyses.

What are the benefits and risks?

If you are a first year or second year student in the School of Sport, Exercise & Rehabilitation Sciences, you can receive 1 research hour when you have completed the questionnaire pack. If you are a student in another school within The University of Birmingham that offers remuneration for taking part in research, you may also be able to claim 1 hour of research credits. Eligibility for this is dependent on schools so please email Paul Mansell to check whether your school qualifies for the research hour. You also have the opportunity to indicate if you would like to be contacted about future research opportunities to receive more research hours or Amazon voucher. Your participation will help advance our understanding about how things stress relates to wellbeing.

The risks of taking part in this study are no more than those of day to day stressors. However, if you find any questions distressing you do not need to answer and sources of support can be found at the bottom of this information sheet. All information that we collect will be strictly confidential. A brief summary presenting the results and findings will be available upon request at the end of the study.

Who else is taking part?

We will be recruiting other individuals who like you fit the inclusion criteria described previously.

Do I have to sign anything?

Yes, if you agree to participate we will ask you to electronically sign a Consent Form by typing your name. This is to show that you have understood what is involved and that you have read the Information Sheet. After signing the consent form you may still withdraw at any time up 2 weeks after completing the questionnaire without having to give us an explanation.

On completion of the questionnaire pack, you will have the opportunity to leave your email address to be contacted about future studies. An expression of interest in being contacted does not mean you have to take part in any future studies, and you will receive information about these studies before deciding whether or not to take part. You can also opt out of being contacted at any time.

Contact details

Paul Mansell, researcher

Tel: [REDACTED]

Email: [REDACTED]

Dr Sarah Williams, research supervisor

Tel: [REDACTED]

Email: [REDACTED]

In the event that you wish to seek advice and/or information as a result of completing the questionnaires, here are some recommended sources: a) your GP, b) the Birmingham and Solihull Mental Health NHS Foundation Trust on 0121 301 0000, website: www.bsmhft.nhs.uk. If you are a student at the University of Birmingham, you can also access the Mental Health and Wellbeing Services. For information about their services and online resources, please have a look at this link: <https://intranet.birmingham.ac.uk/student/welfare/mental-health/index.aspx>. Or Tel 0121 4145130. Furthermore, this is an online self-referral process at <https://intranet.birmingham.ac.uk/student/welfare/mental-health/personalised-support/access.aspx>.

Consent Sheet (Phase 1)

Investigating Stress and Wellbeing

Phase 1 Study Consent Form

	Tick to consent
I confirm that I have read and understand the information sheet and have had the opportunity to ask questions.	
All questions have been answered to my satisfaction.	
I understand that my participation is voluntary and that I am free to withdraw at any time up to two weeks after completing the questionnaire without giving any reason or my rights being affected.	
I give consent for the data that I provide to be used for research purposes.	
I consent to taking part in the study.	
I confirm that I am aged 18-35, proficient in reading English, and do not currently have a diagnosis of a mental health condition.	

	Tick to confirm
I am interested in taking part in future research.	
I would like to receive a summary of the results of the study.	
Email:	

If you have any more questions about the study, please feel free to contact us on the details on the information sheet.

Name

Date

This study has been approved by the University of Birmingham Ethics Committee [INSERT ETHICS NUMBER]

Information Sheet for Participants

Study Title: Performing Under Pressure

Dear Participant,

Thank you for considering taking part in this study, which has been approved by the University of Birmingham's Ethical Review Committee.

What is the study about?

This study will measure your ability to successfully complete a golf-putting task under pressure.

Can anyone take part?

Anyone aged 18 and over can take part as long they are proficient in reading English; do not hold an official golf handicap or play golf regularly; are able to putt right-handed, are not currently suffering from any injuries or impairments which prevent completing a golf putting task, have no history of epileptic seizures; no history of mental health problems; no immune (e.g., glandular fever), cardiovascular (e.g., hypertension), metabolic, and kidney disease or conditions; no current illness; no prescribed medication in the last 4 weeks (excluding non-steroid asthma treatments).

What will your participation involve?

If you are willing to participate, you will be asked to complete a laboratory session in the School of Sport, Exercise, & Rehabilitation Sciences which should take no longer than 2 hours. In this session you will be asked to complete a golf putting task during which you will be video recorded. We will also ask you to complete some questionnaire packs before and after the task, and take some cardiovascular measurements from you in the form of heart rate and blood pressure readings. The questionnaires will assess various personality and dispositional factors such as anxiety, beliefs about stress and imagery ability. Although some people may consider some questions to be of a sensitive nature (e.g., assessing anxiety and depression), questionnaires completed are no more demanding than questions and activities experienced in daily living and you are free to not answer any question you do not wish to answer.

If you require any additional support with some of the issues linked to mental health in this study, appropriate contact details are provided at the bottom of this information sheet.

All your personal data will remain confidential and will be solely used for academic purposes. Consequently, we would be grateful if you were honest in your responses to the questionnaires. The data will not be anonymous but will only be identifiable using a unique ID number. This is to give you the option to withdraw your data from the study after you have completed the study. In accordance with the Data Protection Act (2018) raw and processed data from this investigation will be kept for a period of ten years following completion of the study or post-publication. Questionnaires and computer files containing processed data will be kept securely in a locked filing cabinet and will only be accessed by the study investigators. After this time period, all the data collected will be destroyed.

Our overall findings will be used to understand how different constructs relate to performance under pressure. You will not be individually identified in any publication.

Do I have to take part?

Please note, your participation in this study is voluntary and you may withdraw at any time up to two weeks after you complete the laboratory visit, without explanation or any negative consequences. If you choose to withdraw from the study, please contact Mr Paul Mansell (contact details at the end of this information sheet) to inform us of your decision. If you choose to withdraw before the two weeks have elapsed, your data will be destroyed and not included in the data analyses. A brief summary presenting the results and findings will be available upon request at the end of the study

What are the benefits and risks?

If you are a first year or second year student in the School of Sport, Exercise & Rehabilitation Sciences, you can receive 2 hours of credits when you have finished the experiment. Should you finish in the top 3 of the putting task, you will be rewarded with Amazon vouchers of £20 (1st place), £10 (2nd place) and £5 (3rd place). The risks of taking part in this study are minimal to participants. However, if you find any questions or situations distressing you do not need to answer and sources of support can be found at the bottom of this information sheet. All information that we collect will be strictly confidential.

Can I change my mind?

If, at any point before or during completion of the study, you wish to withdraw, then you may do so. You do not need to give any reason for this, participation is not compulsory. If you decide to withdraw, you may withdraw at any time up until 2 weeks after laboratory visit and the data that we collected from you will be destroyed and will not be used for the study. If you choose to withdraw while completing the experiment you will not be compensated the research hours. If you chose to withdraw after completing the experiment, you will still be awarded the research hours for completing the study but you will be ineligible for the prize money if your score finished in the top 3.

Who else is taking part?

We will be recruiting other individuals who like you fit the inclusion criteria described previously.

Do I have to sign anything?

Yes, if you agree to participate we will ask you to sign a Consent Form. This is to show that you have understood what is involved and that you have read the Information Sheet. After signing the consent form you may still withdraw at any time up to 2 weeks after completing your laboratory visit without having to give us an explanation.

Contact details

Paul Mansell, researcher

Tel: [REDACTED]

Email: [REDACTED]

Dr Sarah Williams, research supervisor

Tel: [REDACTED]

Email: [REDACTED]

In the event that you wish to seek advice and/or information as a result of completing the questionnaires, here are some recommended sources: a) your GP, b) the Birmingham and Solihull Mental Health NHS Foundation Trust on 0121 301 0000, website: www.bsmhft.nhs.uk. If you are a student at the University of Birmingham, you can also access the Mental Health and Wellbeing Services. For information about their services and online resources, please have a look at this link: <https://intranet.birmingham.ac.uk/student/welfare/mental-health/index.aspx>. Or Tel 0121 4145130. Furthermore, this is an online self-referral process at <https://intranet.birmingham.ac.uk/student/welfare/mental-health/personalised-support/access.aspx>, and University well-being drop in services, which are held Mon-Thurs 13:30-14:30 and Fri 11:30-12:30 at Aston Webb Student Hub (R7 on Edgbaston Campus map).

Please note that these services are not provided as part of the research study, hence we will not be responsible for any related fees or charges.

Performing Under Pressure

Study Consent Form

	Initial to consent
I confirm that I have read and understand the information sheet and have had the opportunity to ask questions.	
All questions have been answered to my satisfaction.	
I understand that my participation is voluntary and that I am free to withdraw at any time up to two weeks after my laboratory visit without giving any reason or my rights being affected.	
I give consent for the data that I provide to be used for research purposes.	
I consent to taking part in the study.	
I confirm that I am aged 18 or over, proficient in reading English; do not hold an official golf handicap or play golf regularly; are not currently suffering from any injuries or impairments which prevent completing a golf putting task, have no history of epileptic seizures; not currently suffering from a medically-diagnosed mental health condition; no immune (e.g., glandular fever), cardiovascular (e.g., hypertension), metabolic, and kidney disease or conditions; no current illness; no prescribed medication in the last 4 weeks (excluding non-steroid asthma treatments).	
I consent to my golf putting performance being video recorded for use within teaching sessions at the university	

If you would like to receive a summary of the results please tick the relevant box below.

	Initial to consent
I would like to receive a summary of the results of the study.	
Email:	

If you have any more questions about the study, please feel free to contact us on the details on the information sheet.

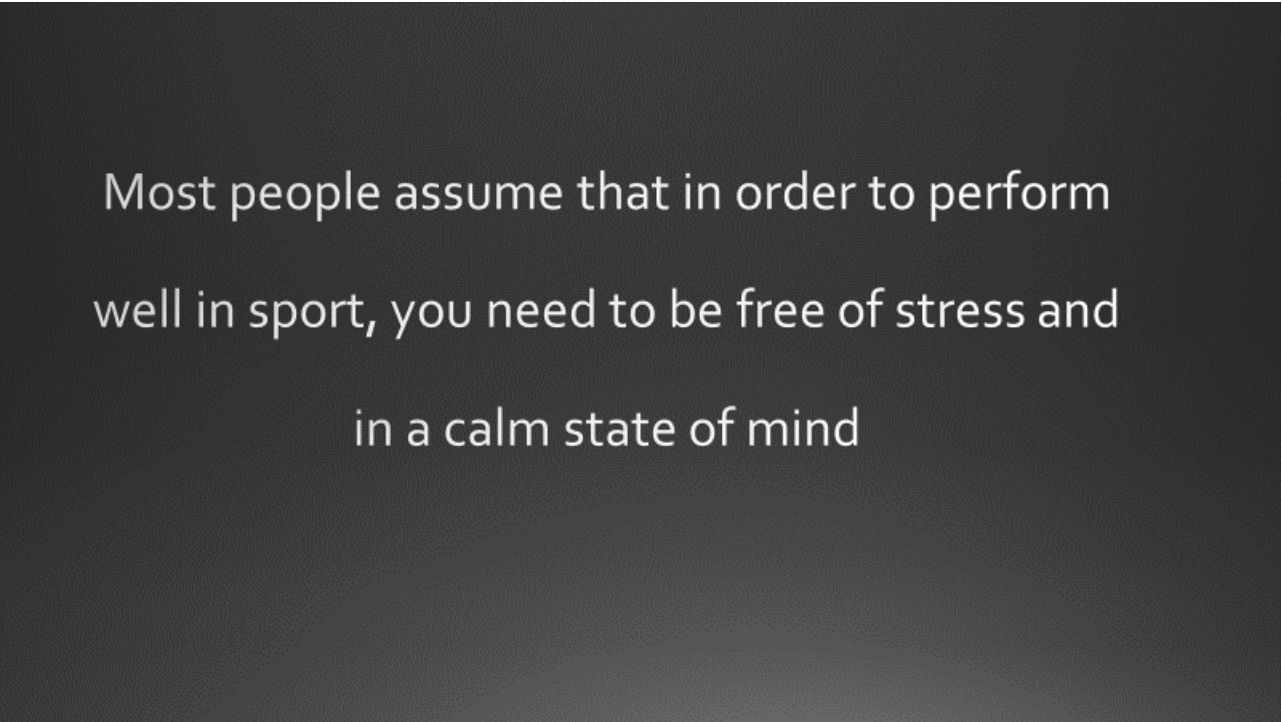
Print name

Signed

Date

Stress Mindset Video Example Slides

The below is an example of the type of video content to be included in the stress mindset videos. Content will be modified with pilot testing but encourage stress to be considered as a positive experience which can lead to enhanced performance.



Most people assume that in order to perform well in sport, you need to be free of stress and in a calm state of mind

However, it is often pressure which acts as
the fuel for peak performance

Consider how you feel when you are
preparing for a sporting event

Your heart rate increases, you feel butterflies
in your stomach, your palms begin to feel
sweaty...

Appendix 8: Golf Putting Imagery Script (Chapter 4)

You have finished your practice putts, and are now just a couple of minutes away from the start of the competition..... you can feel your heart beating faster than usual and your breathing rate has increased the butterflies in your stomach make you realise the importance of doing well and winning the prize money... but you know these feelings also tell you that you feel alert and ready to perform wellthis is an opportunity to demonstrate what you can do.....

your elevated heart rate is increasing the amount of blood flowing through your body.....this is helping you to feel energized and in control of your putting performance these responses are fuelling you for peak performance..... and because of this, you are confident in your ability to perform well.....you acknowledge that the feelings you are experiencing are usually associated with stressful or competitive situations.....and you know that this just means you are ready to perform well.....

think back to a time you have previously experienced these types of feelings during a pressurised situation and performed well... It may have been an important sports fixture or speaking in front of a group of people..... because the situation meant something to you, your body experienced symptoms associated with stress..... think about these responses you experienced.... Perhaps it was elevations in heart rate, or butterflies in your stomach..... it was these responses that enabled your mind and body to be energised and prepared to perform well..... you know that the same is about to happen now with the putting task.....

think about the video camera in today's lab..... you consider this an opportunity to demonstrate just how well people can perform under pressure.... and you relish the opportunity to have a go at the task, trying to putt as well as possible..... you think of the task as a challenge... and you know you are someone capable of meeting that challenge.....

you feel the adrenaline rush through your body, reaching all of your muscles..... these positive feelings have made you feel alert, focussed, and ready to perform well.... feelings like this are an important part of helping you produce your best putting performance...this is a great opportunity to do well and show the experimenters just how well you can perform under pressure.

Appendix 9: Questionnaires Used During Chapters 2-4

Cognitive Appraisal Scale (Chapters 2 and 3)

The purpose of this questionnaire is to obtain information about how you generally perceive different competitive sporting situations.

Please be as accurate as possible and take as long as you feel necessary to arrive at the proper rating for each statement. There are no right or wrong answers, because we are simply interested in your response.

	1	2	3	4	5	6
In relation to your sport, please indicate your level of agreement or disagreement with the following statements...	Strongly disagree	Disagree	More disagree than	More agree than	Agree	Strongly agree
I tend to focus on the positive aspects of any situation.	1	2	3	4	5	6
I worry that I will say or do the wrong things.	1	2	3	4	5	6
I often think about what it would be like if I do very well.	1	2	3	4	5	6
I believe that most stressful situations contain the potential for positive benefits.	1	2	3	4	5	6
I worry about the kind of impression I make.	1	2	3	4	5	6
I am concerned that others will find fault with me.	1	2	3	4	5	6
Overall I expect that I will achieve success rather than experience failure.	1	2	3	4	5	6
In general I look forward to the rewards and benefits of success.	1	2	3	4	5	6
Sometimes I think that I am too concerned with what other people think of me.	1	2	3	4	5	6
I feel that difficulties are piling up so that I cannot overcome them.	1	2	3	4	5	6

	1	2	3	4	5	6
In relation to your sport, please indicate your level of agreement or disagreement with the following statements...	Strongly disagree	Disagree	More disagree than	More agree than	Agree	Strongly agree
I lack self-confidence.	1	2	3	4	5	6
A challenging situation motivates me to increase my efforts.	1	2	3	4	5	6
In general I anticipate being successful at my chosen pursuits, rather than expecting to fail.	1	2	3	4	5	6
I worry what other people will think of me even when I know that it doesn't make any difference.	1	2	3	4	5	6
I am concerned that others will not approve of me.	1	2	3	4	5	6
I look forward to opportunities to fully test the limits of my skills and abilities.	1	2	3	4	5	6
I worry about what other people may be thinking about me.	1	2	3	4	5	6
I feel like a failure.	1	2	3	4	5	6

CAT-Sport Scale (Chapters 2 and 4)

How athletes approach competition may vary considerably and **THERE ARE NO RIGHT OR WRONG ANSWERS**.

The following sentences may or may not be relevant to you, but with reference to how you generally feel when you take part in your sport, please select the most appropriate response **FOR YOU** in relation to each of the statements below. Please answer **ALL** statements.

	Totally Disagree	Rather Disagree	Disagree to some	Agree to some	Rather Agree	Totally Agree
I worry that I will say or do the wrong things	1	2	3	4	5	6
I worry about the kind of impression I will make	1	2	3	4	5	6
I get concerned that others will find fault with me	1	2	3	4	5	6
I expect I will achieve success rather than experience failure	1	2	3	4	5	6
I look forward to the rewards and benefits of success	1	2	3	4	5	6
I get concerned with what other people will think of me	1	2	3	4	5	6
A challenging situation motivates me to increase my efforts	1	2	3	4	5	6
I think about being successful rather than expecting to fail	1	2	3	4	5	6
I worry what other people will think of me, even though it won't make any difference	1	2	3	4	5	6
I look forward to the opportunity to test my skills and abilities	1	2	3	4	5	6

Beliefs Scale (Chapter 2)

I worry about what other people think or believe about me (t)

Here are a set of statements that describe what some people think and believe. Read each statement carefully, and then decide how much you agree or disagree with it by selecting the appropriate response.

	1	2	3	4	5	6
I feel like competing in my sport is a threat (t)	1	2	3	4	5	6

		<i>Strongly Disagree</i>	<i>Disagree</i>	<i>Neither Agree nor Disagree</i>	<i>Agree</i>	<i>Strongly Agree</i>
1	I can't stand not reaching my goals	1	2	3	4	5
2	If I face setbacks it goes to show how stupid I am	1	2	3	4	5
3	I can't tolerate it when I fail at something that means a great deal to me	1	2	3	4	5
4	I need my manager/coach to act respectfully towards me	1	2	3	4	5
5	I have to be viewed favourably by people that matter to me	1	2	3	4	5
6	It is appalling if others do not give me chances	1	2	3	4	5
7	If decisions that affect me are not justified, it shows that I am worthless	1	2	3	4	5
8	If I am not given opportunities, then it shows that I am not a worthwhile person	1	2	3	4	5
9	I need others to think that I make a valuable contribution	1	2	3	4	5
10	I am a loser if I do not succeed in things that matter to me	1	2	3	4	5
11	I have to be respected by the members of my team	1	2	3	4	5
12	I can't bear not getting better at what I do	1	2	3	4	5
13	I absolutely should not be snubbed by people that matter to me	1	2	3	4	5
14	If my position in my team was not secure, then it would show I am worthless	1	2	3	4	5
15	I can't bear not being given chances	1	2	3	4	5
16	It's awful to not be treated fairly by my peers	1	2	3	4	5
17	It's terrible if the members of my team do not respect me	1	2	3	4	5
18	I must not be dismissed by my peers	1	2	3	4	5

19	I couldn't stand it if my competencies did not continually develop and improve	1	2	3	4	5
20	I can't stand failing in things that are important to me	1	2	3	4	5
21	It's awful if others do not approve of me	1	2	3	4	5
22	Decisions that affect me must be justified	1	2	3	4	5
23	It would be terrible to be dismissed by my peers	1	2	3	4	5
24	If my competencies did not continually develop and improve, it would show what a failure I am	1	2	3	4	5
25	I can't bear not succeeding in things that are important to me	1	2	3	4	5
26	It would be awful if my position in my team was not secure	1	2	3	4	5
27	If others think I am no good at what I do, it shows I am worthless	1	2	3	4	5
28	It's awful if others think I do not make a valuable contribution	1	2	3	4	5

Patient Health Questionnaire-9 (Chapter 2)

Over the last 2 weeks, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself – or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thought that you would be better off dead or hurting yourself in some way	0	1	2	3

Stress Mindset Measure (Chapters 2-5)

Please rate the extent to which you agree or disagree with the following statements within your sport.

	Strongly Disagree	Disagree	Neither Agree or	Agree	Strongly Agree
The effects of stress are negative and should be avoided.	0	1	2	3	4
Experiencing stress facilitates my learning and growth.	0	1	2	3	4
Experiencing stress depletes my health and vitality.	0	1	2	3	4
Experiencing stress enhances my performance and productivity.	0	1	2	3	4
Experiencing stress inhibits my learning and growth.	0	1	2	3	4
Experiencing stress improves my health and vitality.	0	1	2	3	4
Experiencing stress debilitates my performance and productivity.	0	1	2	3	4
The effects of stress are positive and should be utilized.	0	1	2	3	4

Subjective Vitality Scale (Chapters 2,3 and 5)

Please respond to each of the following statements by indicating the degree to which the statement is true for you in general in your life. Use the following scale and place the number next to the statement:

	Not at all True			Somewhat True			Very True
I feel alive and vital	1	2	3	4	5	6	7
I don't feel very energetic	1	2	3	4	5	6	7
Sometimes I feel so alive I just want to burst	1	2	3	4	5	6	7
I have energy and spirit	1	2	3	4	5	6	7
I look forward to each new day	1	2	3	4	5	6	7
I nearly always feel alert and awake	1	2	3	4	5	6	7
I feel energized	1	2	3	4	5	6	7

Immediate Anxiety Measure Scale (Chapter 4)

		Section 1						Section 2								
		To what extent would you experience anxiety and confidence (i.e., what level) before the task?						Do you regard these feelings as being positive or negative in relation to performance in the situation?								
		<i>Not at all</i>						<i>Extremely</i>		<i>Very debilitating (Negative)</i>			<i>Unimportant</i>		<i>Very facilitative (Positive)</i>	
		1	2	3	4	5	6	7	-3	-2	-1	0	+1	+2	+3	
1. I am cognitively anxious		1	2	3	4	5	6	7	-3	-2	-1	0	+1	+2	+3	
2. I am somatically anxious		1	2	3	4	5	6	7	-3	-2	-1	0	+1	+2	+3	
3. I am self-confident		1	2	3	4	5	6	7	-3	-2	-1	0	+1	+2	+3	

Hospital Anxiety and Depression Scale (HADS; Chapters 3 and 5)

These questions are designed to help us understand how you feel. Read each item and choose the reply which comes closest to how you have been feeling in the PAST 2 WEEKS. Don't take long over your replies; your immediate reaction to each item will probably be more accurate than a long thought-out response.

1. I feel tense or wound up	Most of the time	A lot of the time	From time to time occasionally	Not at all
2. I still enjoy the things I used to enjoy	Definitely	Not quite so much	Only a little	Hardly at all
3. I get a sort of frightened feeling as if something awful is about to happen	Very definitely & quite badly	Yes but not too badly	A little but it doesn't worry me	Not at all
4. I can laugh and see the funny side of things	As much as I always could	Not quite so much now	Definitely not so much now	Not at all
5. Worrying thoughts go through my mind	A great deal of the time	A lot of the time	From time to time but not too often	Only occasionally
6. I feel cheerful	Not at all	Not often	Sometimes	Most of the time
7. I can sit at ease and feel relaxed	Definitely	Usually	Not often	Not at all
8. I feel as if I am slowed down	Nearly all the time	Very often	Sometimes	Not at all
9. I get a sort of frightened feeling like "butterflies" in the stomach	Not at all	Occasionally	Quite often	Very often
10. I have lost interest in my appearance	Definitely	I don't take as much care as I should	I may not take quite as much care	I take just as much care
11. I feel restless as if I have to be on the move	Very much indeed	Quite a lot	Not very much	Not at all
12. I look forward with enjoyment to things	As much as I ever did	Rather less than I used to	Definitely less than I used to	Hardly at all
13. I get sudden feelings or panic	Very often indeed	Quite often	Not very often	Not at all
14. I can enjoy a good book or radio or TV programme	Often	Sometimes	Not often	Very seldom

Proactive Coping Scale (Chapters 3 and 5)

The following statements deal with reactions you may have to various situations. Indicate how true each of these statements is depending on how you feel about the situation. Do this by checking the most appropriate box.

	Not at all true	Barely true	Somewhat true	Completely true
1. I am a "take charge" person.	1	2	3	4
2. I try to let things work out on their own.	1	2	3	4
3. After attaining a goal, I look for another, more challenging one.	1	2	3	4
4. I like challenges and beating the odds.	1	2	3	4
5. I visualise my dreams and try to achieve them	1	2	3	4
6. Despite numerous setbacks, I usually succeed in getting what I want.	1	2	3	4
7. I try to pinpoint what I need to succeed.	1	2	3	4
8. I always try to find a way to work around obstacles; nothing really stops me.	1	2	3	4
9. I often see myself failing so I don't get my hopes up too high.	1	2	3	4
10. When I apply for a position, I imagine myself filling it.	1	2	3	4
11. I turn obstacles into positive experiences.	1	2	3	4
12. If someone tells me I can't do something, you can be sure I will do it.	1	2	3	4
13. When I experience a problem, I take the initiative in resolving it.	1	2	3	4
14. When I have a problem, I usually see myself in a no-win situation.	1	2	3	4

Challenge and Threat Scale (Chapter 4)

Challenge and threat can be defined as two motivational states reflecting how individuals engage in meaningful stress evoking situations. A challenge state is experienced when an individual perceives they have sufficient, or nearly sufficient, resources to meet the demands of a task or situation, whereas a threat state is experienced when an individual perceives they have insufficient resources to meet the demands of a task or situation.

Please answer the following questions in relation to how you feel about the upcoming task you are about to perform by circling the appropriate response:

	Not at all True						Very True
The situation presents itself as a challenge to me	1	2	3	4	5	6	7
I view the task as a threat	1	2	3	4	5	6	7
I feel threatened by the situation	1	2	3	4	5	6	7
I view the task as a challenge	1	2	3	4	5	6	7
The situation presents itself as a threat to me	1	2	3	4	5	6	7
I feel challenged by the situation	1	2	3	4	5	6	7