

Psychological flexibility: understanding how athletes regulate emotion and cope with stress while pursuing meaningful goals

Thomas C. Rutherford

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School of Psychology
Faculty of Health and Medical Sciences
University of Adelaide
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Abstract

Successful athletic performances depend on many factors, including stress management and emotion regulation. These skills are essential for athletic performance and overall life satisfaction. The concept of psychological flexibility (PF) as an adaptive response to stress and challenging situations, in the pursuit of difficult yet meaningful goals, aligns strongly with athletic performance. This study investigated how athletes respond to stress and regulate emotion while pursuing their sporting goals.

The Personalized Psychological Flexibility Index (PPFI) was adjusted for a sporting context (PPFI-Sport) and tested in a sample of athletes ($N=105$, $age=15+$) at a semi-professional Australian Rules football club. Participants identified a meaningful goal they were pursuing and completed the BFI-2-S to assess personality differences. The development of the PPFI expanded the conceptualisation of PF with a three-factor model (Avoidance, Acceptance and Harnessing). This multifactorial model was reflected in the PPFI-Sport by confirmatory factor analysis. Correlations assessed the relationship between individual differences, goal-setting measures, and PF. Open-mindedness was related to increased Acceptance; Conscientiousness was related to increased Harnessing, and decreased Avoidance. Challenging goals that were central to the athlete's life led to increased PF. No difference was found in PF between open and specific goals.

The findings present opportunities for education earlier in the athletic development pathway to promote adaptive appraisals of stress, emotion regulation, and identification of effective goals. Implications for training and coaching are considered to develop mental skills in athletes. Opportunities for further research are discussed, and potential adaptations of the PPFI-Sport for cultural and language differences are proposed.

Keywords: Psychological flexibility, PPFI, sport psychology, athlete development, stress response, goal setting, emotion regulation

Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University, and, to the best of my knowledge, this thesis contains no material previously published except where due reference is made. I give permission for the digital version of this thesis to be made available online, via the University of Adelaide's Digital Thesis Repository, the Library Search and through online search engines, unless permission has been granted by the School to restrict access for a period of time.

Thomas C. Rutherford

27 September 2021

Contribution Statement

In creating and writing this thesis, Associate Professor Carolyn Semmler and I collaborated to generate the overarching aims of the study, research questions of interest, and to design the appropriate methodology. I conducted the literature search and worked with my supervisor to complete the ethics application. I was responsible for all participant recruitment and data collection, and data analysis, using Jamovi, JASP and R. I wrote the thesis with my supervisor providing constructive and general feedback.

Psychological flexibility: understanding how athletes regulate emotion and cope with stress while pursuing meaningful goals

Successful athletic performances depend on multiple factors including physical, technical, tactical and psychological. The psychological factor is often the most significant in deciding results in competition (Liew et al., 2019; Brewer, 2009) and contributing to aspiring athletes realising their potential (Bailey et al., 2010). Psychological characteristics including self-awareness and self-reflection, goal setting, commitment and confidence are discriminating factors of performance outcomes (Gould et al., 2002; Bailey et al., 2010). Psychological elements that must be implemented in competition include stress management, resilience and effective coping (Galli & Gonzalez, 2015; Gould & Maynard, 2009). Consistently successful athletes use a variety of psychological skills in competition and training, including emotion regulation and goal setting (Thomas & Thomas, 1999). Effective sport-specific coping skills are considered important for not only effective performances in competition, but overall life satisfaction and reduced stress in everyday life (Kimbrough et al., 2007; Smith & Christensen, 1995; Surujlal et al., 2013).

In Acceptance and Commitment Therapy, psychological flexibility (PF) is considered the pinnacle of emotional health and well-being (Hayes et al., 2011; Kashdan & Rottenberg, 2010; Doorley et al., 2020). PF is the tendency to respond to situations in ways that facilitate valued goal pursuit, despite the presence of stress (Hayes et al., 2011; Kashdan & Rottenberg, 2010). PF is particularly useful when challenges arise during goal pursuit that produce stress. Meta-analytic data suggest that PF has an average correlation of .42 with a range of adaptive outcomes including overall quality of life and physical health and wellbeing (Hayes et al., 2006; Kashdan et al., 2020). PF focusses on the skills necessary to effectively cope with the stress of competition through adaptive appraisals. The underlying theory of PF suggests that pursuing valued goals and remaining open to any stress that may arise is at the core of living

well (Kashdan et al., 2020). The logic underpinning PF is that emotion regulation strategies are adaptive to the extent that they facilitate pursuit of valued goals (Doorley et al., 2020). The conceptualisation of PF as an adaptive response to stress during challenging situations, in the pursuit of difficult yet meaningful goals, aligns strongly with athletes' performance in sporting competitions.

Athletes with low PF may lack the effective behaviours and responses required for optimal performance (Moore, 2009). Athletes with psychological inflexibility exhibit higher symptoms of distress (severe and prolonged stress, and inability to adapt effectively to stress), including anxiety and depression (Zhang et al., 2014; Chen et al., 2017). Psychological inflexibility is therefore understood in direct relation to higher levels of distress and poor performance. Psychologically flexible individuals are less preoccupied with controlling the nature and type of uncomfortable internal states - they are readily able to detach from a constant need to minimise unpleasant (and maximise pleasant) feelings. Psychologically flexible individuals are willing to tolerate uncomfortable states if doing so facilitates meaningful goal pursuit (Kashdan et al., 2020). PF is important when focusing on performance-relevant cues during training and competition, to moderate the fluctuations in internal and external demands (Johles et al., 2020). Athletes, and particularly young and emerging athletes, represent a distinct population. They are expected to simultaneously navigate unique physical, academic and social challenges throughout adolescence and young adulthood (Wilson & Pritchard, 2005; Hwang & Choi, 2016). Discontinuation from sport and organised physical activity peaks during adolescence (Hedstrom & Gould, 2004). Physical activity is directly linked to increased cognitive function and healthy brain function in children, and the benefits of encouraging young athletes to stay involved in their sporting pursuits has widespread social, emotional and physical benefits (Chaddock et al., 2011;

Hillman, 2014). PF may be particularly important and beneficial for young athletes as they learn to adapt to the demands of competition.

Researchers in the elite sports psychology field have focussed on affective regulatory processes that allow athletes to succeed in competition (Martinent et al., 2015; Stanley et al., 2012; Campo et al., 2017). Interventions, including those based around mindfulness and acceptance, have led to improvements in athletic performance (Gross et al., 2018; Vidic & Cherup, 2021), lending indirect support to the idea that PF aids performance. Previous research has identified that working towards a valued end point is contextually important when considering enduring stress and negative thoughts and emotions (Henriksen et al., 2019). Existing approaches assessing PF have not considered the context in which flexibility matters most: the pursuit of valued goals (Doorley et al., 2020).

Emotion Regulation and Stress Response

Emotion regulation is the process by which individuals influence which emotions they experience, when they have them, and how they experience and express them (Gross, 1998). Athletes are expected to have the ability to cope with and regulate their emotions and physical reactions, and to remain focussed on relevant stimuli and their performance even in stressful situations (Gardner & Moore, 2004; 2007). PF is vital in sporting contexts as athletes must withstand a constant variety of stressors, anxiety, and pressure. The performance-specific context of sport requires a sustained focus of attention on cues relevant to goal attainment, while disengaging from disruptive stimuli (Gardner & Moore, 2007; Moore, 2009). Struggles in sport performance can result from a shift in attentional focus from appropriate external game- or task-related cues to internal, self-judging cues. These shifts in attention away from goal-related tasks and stimuli result in potentially negative performance (Klinger et al., 1981). Which stimuli individuals find most important is not merely random or accidental but is related to variables at the individual level, including motivation (Stevens &

Fiske, 1995). Individuals seek out visual stimuli congruent with their goals and avoid incongruent stimuli (Isaacowitz, 2006; Wadlinger & Isaacowitz, 2011).

The Biopsychosocial model and challenge and threat states

Understanding individuals' responses to stress is key for optimising performance in sporting contexts. Although some models explain success and failure in terms of psychology or physiology, the Biopsychosocial model (BPSM) (Engel, 1977) combines these perspectives (Blascovich & Mendes, 2000; Hase et al., 2019). The BPSM of challenge and threat states builds upon Lazarus and Folkman's (1984) Transactional Theory of Stress and Dienstbier's (1989) Theory of Physiological Toughness. Central to the BPSM is the assumption that challenge and threat states only occur in motivated performance situations. Motivated performance situations are situations that are relevant to the goal being pursued, require evaluation, and are potentially stressful (Hase et al., 2019). Athletes striving for high performance in sporting competition is one such situation (Hase et al., 2019). Successfully navigating motivated performance situations preserves wellbeing and ensures personal growth (Blascovich & Mendes, 2000).

Stress and maladaptive responses to it happen because of appraisals. Confronted with a situation that threatens survival or wellbeing, the brain prioritises available resources to cope with the perceived threat at the expense of current tasks or goals (LeDoux, 2012; Cohen & Oschner, 2018). A challenge state is experienced when an individual perceives they have sufficient resources to meet situational demands; a threat state is experienced when an individual perceives they have insufficient resources to meet situational demands (Meijen et al., 2013). The Transactional Theory of Stress emphasises the positive connotations of challenge appraisal and the negative connotations of threat appraisals (Lazarus & Folkman, 1984). A challenge state can give rise to a range of emotions, while a threat state is associated with only negative emotions. Further, emotions may be perceived as useful in a challenge

state but not in a threat state. Challenge and threat states influence effort, attention, decision-making and physical functioning, all of which are foundational aspects of successful sporting performance (Jones et al., 2009).

Challenge and threat are states that arise out of the appraisal process (Jones, et al., 2009; Seery, 2010). While the demands of any given situation may or may not differ, challenge and threat states arise from the evaluation of the available resources in relation to the demand (Meijen et al., 2013). It is the subjective, deeply personal evaluation of situational demands that promotes a challenge or threat state, not necessarily the situational demands themselves. The common finding that individuals who exhibited a challenge state outperform individuals who display a threat state is consistent with the predictions of the BPSM and holds relevance for athletes, coaches and organisations interested in optimising human performance (Hase et al., 2019).

Prior research has examined individual differences in athletes' perceptions of and responses to sport-related stress. A path analysis performed by Nicholls et al. (2016) described athletes' pre-competition appraisals of stress. Viewing difficulties as a surmountable challenge prior to competition was associated with positive emotions, task-orientated coping strategies, and increased performance satisfaction. Viewing difficulties as a personal threat was associated with negative emotions, distraction and disengagement-orientated coping strategies, and decreased performance satisfaction. Competition in sport with high personal relevance can be both a challenge and threat. A 2019 study found that adolescent athletes with greater emotional reactivity to stress were more likely to view impending competition as more stressful and appraised themselves as having less control, and deficient in coping resources (Britton et al., 2019). In the same study, young athletes with higher perceived stress reactivity that rated pre-competition stress levels as high, evaluated the competition as both a threat and a challenge. Adolescent athletes' perceptions of how

reactive they are to general life stressors has a direct effect on how they evaluate athletic competition (Britton et al., 2019).

Existing literature on enhancing performance of athletes is extensive but is yet to connect comprehensively with how athletes cope with and appraise stressors and regulate emotion in high-pressure environments. There is an opportunity to develop knowledge earlier in the performance pathway to promote adaptive appraisals of stress and develop skills to manage intense performance-related stress. This may help enhance performance, participation and enjoyment, promote more positive mental health among adolescent athletes, and ultimately facilitate the development of the skills necessary to flourish in life.

Goal setting

“What man [sic] actually needs is not a tensionless state but rather the striving and struggling for a worthwhile goal.” (Frankl, 2008, p. 110)

Goal pursuit is integral to effective sporting performance. Setting goals precipitates goal attainment, which increases an individual’s satisfaction with both life and self, and improves ability to achieve future success (King, 1992; 1994). Specific, difficult learning goals tend to increase performance, regardless of trait orientation (Seijts et al., 2004). Performance is highest in complex tasks when individuals pursue a learning goal and have a learning orientation (Locke & Latham, 2006). Performance-goal orientation tends towards avoidance of tasks where others may judge them unfavourably due to possible errors they might make. Hence, individuals with a performance-goal orientation tend to choose easy tasks in which they can appear favourably in the eyes of others. People with a learning-goal orientation tend to choose tasks in which they can acquire knowledge and skill (Locke & Latham, 2006). These considerations are especially relevant to adolescents and young adults, populations that are highly reactive and attuned to the social ramifications of choices and are

more sensitive to peer influence than young children or adults (Ciranka & van den Bos, 2019).

Assigning hard goals may not be effective when those goals are viewed as threatening. Appraising a difficult goal as a challenge versus a threat has a tangible impact on performance. Drach-Zahavy and Erez (2002) found that when a task was altered to pose new challenges (but with goal difficulty held constant), people who were made to view the situation as a threat (by focusing on potential failure) achieved significantly lower performance than those who were made to view the situation as a challenge (by focusing on success and the utility of effort). Specific, difficult goals lead to a higher level of task performance than easy or vague, abstract goals (Locke & Latham, 2006). There is a positive, linear relationship between goal difficulty and task performance when individuals are committed to the goal, have the necessary abilities to attain it, and the goal does not conflict with other pursuits (Locke & Latham, 2006). However, in certain contexts, specific and difficult goals may not be as effective as more general goals. For example, urging an athlete to “do their best” can mitigate the tunnel vision that specific goals elicit (Seijts & Latham, 2001).

The process by which goals are pursued may hold the most significant influence for change. Through planning, strategizing, measuring, system-formation, implementation, review and re-evaluation, it is the processes of goal pursuit that enhance performance, not the goal in and of itself (Weinberg, 2013). The significance of aligning goals and subsequent actions with values is crucial for successful performance and underpins overall wellbeing (Aldao et al., 2015; Henriksen, 2019).

Measuring psychological flexibility

The Personalized Psychological Flexibility Index (PPFI) is a recently validated psychometric inventory that may provide both a measurement of traits as well as skills

relevant to stress and performance in competition with high personal relevance. The PPFi is the first measure of PF linking reactions to stress and external obstacles to personally meaningful goals as chosen by the user (Kashdan et al., 2020). Individuals identify personally relevant goals which facilitates the operationalisation of the PPFi to reflect the theory of PF as a trait like propensity to respond adaptively to stress and obstacles while pursuing personally meaningful goals (Kashdan et al., 2020; Hayes et al., 1996; Hayes et al., 2011).

The Acceptance and Action Questionnaire and its revision (AAQ-II) have been used previously to measure adaption to stress. These measures are highly correlated with negative affect, neuroticism and emotional disturbances as opposed to the central tenet of PF – regulatory responses. The Multidimensional Psychological Flexibility Index (MPFI) was developed to measure PF within the framework of Acceptance and Commitment Therapy (Rolffs et al., 2018; Landi et al., 2021). The MPFI successfully distinguishes PF from distress (Landi et al., 2021). The MPFI identifies factors that obstruct values, however, there is no link to individuals' personally meaningful goals: this is a crucial gap in the measurement of PF (Kashdan et al., 2020).

Another scale of relevance is the Psychological Flexibility in Sport Scale (PFSS). The PFSS was developed for specific application and understanding of PF in athletes, and within sporting contexts (Johles et al., 2020). The PFSS identifies a singular factor of PF, closely linked to negative affect and associated with anxiety and depression (Johles et al., 2020). The study which produced the PFSS found that PF was associated with greater satisfaction of fundamental psychological needs of belonging, autonomy and competence (Johles et al., 2020). While the development of sport-specific PF measures broadens PF theory, the view of PF as a singular concept fails to encapsulate the nuanced view of PF afforded by the PPFi three-factor solution as established by Kashdan et al. (2020). PF is a multifaceted concept and construct that requires measurement capable of capturing the breadth and depth of

psychological adaptability in response to stress. Given the focus on negative emotionality of all seven items in the scale, the PFSS does not adequately address the criticisms of previous PF measures highlighting that item content may capture negative emotions themselves rather than the ability to pursue goals despite their presence (Kashdan et al., 2020).

The PPFi is the first measure of PF linking response to stress and external obstacles to personally meaningful goals chosen by the user (Kashdan et al., 2020). The development of the PPFi aimed to create a measure that was situationally dependent on uncomfortable internal experiences arising from and during pursuit of valued goals. The PPFi attempts to distinguish from merely measuring negative emotions themselves, but rather the level and range of PF used by an individual when faced with negative thoughts and emotions within personally relevant contexts. The PPFi measures a trait-like individual difference dimension which is related to a range of healthy personality and wellbeing constructs (Kashdan et al., 2020). The factor structure of the PPFi extends existing theory by including three distinct dimensions to understand responses to stress when pursuing a personally meaningful goal. These dimensions range from passive strategies typically linked with unhealthy outcomes (Avoidance), to increasingly active and healthy strategies (Acceptance), and a less common strategy to embrace and use negative emotions to drive goal pursuit (Harnessing) (Kashdan et al. 2020). Finally, a narrative scoping review of PF literature and prominent PF measures identified the PPFi as the best available measure to assess PF (Niven et al., 2021).

Individual differences and psychological flexibility

Personality traits and personal beliefs about emotions guide responses to emotional experiences; emotions are not experienced independently from this complex, personal emotional framework (Eldesouky & English, 2019; Kneeland et al., 2020). While much is known about the types of strategies people use to regulate emotions, less is known about individual differences that influence emotion regulation strategy selection (Brown et al.,

2021). Attaining PF may not be achievable or appropriate for every personality type.

Developing a broader understanding of how different personality types align with PF will underpin tailoring approaches to individual athletes.

Strategy selection to regulate distress may not be a uniform process and can be influenced by contextual and individual differences (Doré et al., 2016; Brown et al., 2021). Several studies have found that PF is associated with adaptive personality traits, including higher Conscientiousness and Open-mindedness, and lower Negative Emotionality (Kashdan et al., 2020). The Big Five Personality domain scales (Soto & John, 2019) have also been used to assess relationships between PF and individual differences. Kashdan et al. (2020) found a significant positive correlation between Negative Emotionality and Avoidance, and a significant negative correlation between Negative Emotionality and Acceptance. Conscientiousness and Open-mindedness were significantly positively correlated with Acceptance, and significantly negatively correlated with Avoidance. Conscientiousness was significantly positively correlated with Harnessing.

Higher Conscientiousness is linked to an increased ability to maintain focus on a relevant task, and to deploy attention to stimuli directly related to goal-attainment (Costa & McCrae, 1992). Individuals higher in Conscientiousness are more likely to be able to modify their engagement with a situation by adapting their behaviour, interactions or impacting the situation directly (Gross & John, 2003). Individuals high in Negative Emotionality are likely to lack the attentional resources required to accept and harness negative emotions (Nolen-Hoeksema et al., 1994; Gross & John, 2003). Open-mindedness has shown positive correlations with cognitive change through the ability of an individual to reappraise situations: cognitive change is a construct most closely linked with Harnessing (Gross & John, 2003; Gross, 1998). The role that individual differences play in explaining why people may harness difficulties – the precursors, interpersonal consequences, and adoption of

Harnessing during goal pursuit – has not been empirically investigated (Doorley et al., 2020).

This study will assess the transferability of some of these relationships to the factors of the PPFi-Sport.

Study aims

The underlying aim of research into PF in athletes is to provide athletes with the knowledge, earlier in their sporting journey, about how to respond effectively and adaptively to intense competition and performance-related stress, and how to direct their attention to performance-relevant actions and processes to achieve their best results. Increased PF benefits athletes through improved performance, higher quality of life, and lower levels of distress; lower PF has been linked to less successful performance outcomes (Johles et al., 2020). If athletes can improve their PF, they will focus more readily on goal-relevant cues and pursue behaviours aligned with their values, increasing the probability of improved performance (Henriksen, 2019; Moore et al., 2015; Johles, 2020; Josefsson et al., 2019).

The PPFi was shown to be a reliable and valid instrument in college students, general adult populations in the community, and working professionals in the US (Kashdan et al., 2020). To the knowledge of the researchers, the PPFi has not been validated outside of the US population. The Personalized Psychological Flexibility Index for Sport (PPFi-Sport) has been adapted for use with athletes, specifically assessing the pursuit of personally meaningful goals in relation to sporting competition and athletic performance. To the knowledge of the researchers, the PPFi has not previously been adapted for sporting contexts (PPFi-Sport). Previous studies of appraisal in sport have failed to incorporate measures which connect with meaningful, relevant goals. Pursuing meaningful goals provides the context to interpret PF – context is integral to understanding the operationalisation of psychological constructs (Aldao, 2013). The PPFi-Sport aims to fill this gap in the contemporary literature. Thus, the initial aim of this study is to assess the validity of the PPFi-Sport in an Australian elite and sub-elite

adolescent athlete sample. In addition, the study aims to assess the utility of the PFFI-Sport and the Big Five Inventory – 2 Short Form (BFI-2-S; see Appendix B) in understanding individual differences in athlete self-appraisal of stress regulation while pursuing personally meaningful goals.

This study aims to:

- Assess the validity of the PFFI-Sport in an Australian elite and sub-elite athlete sample using confirmatory factor analysis.

Additional hypotheses

To assess the relationship between the characteristics of the goal chosen and PF:

- Centrality to life and the level of challenge of the goal will be significantly correlated with scores on the PFFI-Sport subscales (Avoidance, Acceptance, Harnessing);
- Total PFFI-Sport Scores will be significantly different for specific and open goals.

To assess the relationship between the Big Five Personality domain scales and PF:

- Conscientiousness and Open-mindedness will be significantly positively correlated with Acceptance and Harnessing; Negative Emotionality will be significantly positively correlated with Avoidance.

Method

Ethics

Ethics approval was granted by the University of Adelaide Human Research Ethics Committee (Ethics Approval Number 21/44). Participants aged 18 and older at the time of taking the test provided informed consent by completing the digital Consent Form which was presented as the first section of the survey, and a hurdle requirement to proceeding to all subsequent sections. Participants aged 15 to 17 required the consent of a parent or caregiver; this Third-Party Consent Form was also embedded in the survey and was collected as a

hurdle requirement before progressing to the PFFI-Sport. All participants received the Participant Information Sheet (see Appendix F) either in person, digitally, or both, and were able to access digital copies at any time. Participants were informed of their right to terminate their participation at any time up until the survey was closed. Once the survey was closed, digitally signed Consent Forms were removed from the data file and saved separately, and only participant numbers were visible; after this point, it was not possible to remove any participant data as it had been anonymised. No participant asked to withdraw from the study or have their data removed. No coaching staff or anyone outside of the research team had any involvement with the project nor had access to the data. No compensation or reward was provided for involvement in the study; participation was wholly voluntary.

Study sample

A priori power analysis run using Soper's (2021) Sample Size Calculator (for structural equation models including confirmatory factor analysis) suggested that a minimum sample size required to test the model structure of the PFFI-Sport was $N=100$. The minimum sample size to detect an effect size of 0.35 with a desired statistical power level of 0.8 and conventional probability level of 0.05 was $N=81$.

Participants ($N=105$) were recruited from the playing squads of Norwood Football Club ("Norwood"), a semi-professional Australian Football Club competing in the South Australian National Football League and associated competitions. Norwood enters teams in male and female competitions with squads beginning at Under-13 level, through to open senior competition. Athletes aged 15 and older were invited to participate in the study; this included players from the male Under-16, Under-17 and Under-18 playing squads, female Under-16 squad, and senior men's and women's squads. Several former senior Norwood players that were still playing football elsewhere were also invited to participate.

Participation in the study was voluntary; in total, the opportunity was extended to 80 female

athletes and 155 male athletes. Of the 105 initial participants, 87 provided a complete survey response, of which 48 were male and 39 were female. Participants aged 15 to 17 comprised 50 of the 87 complete responses. This bias in age towards younger participants is representative of both elite and recreational team sport – a decline in participation in organised sport beginning in adolescence is ubiquitous across sports (Eime et al., 2019). Furthermore, opportunities in elite sport are more prevalent at junior level: the club used in this study, for example, has ten squads that compete in a full season of competition – only three of these are senior teams; seven are junior squads for ages 13 to 18.

Snowball sampling was a primary method of recruitment after the initial information sessions and group communications had been delivered. Data capture occurred during July and August 2021. Male participants across all squads were in-season at this time, excluding the male Under-16 squad, which had finished its program for 2021. However, all of those players were still actively in-season at other levels of football, whether through local clubs or school football. Of the female participants, only the junior (under 18) athletes were actively in-season; the senior women’s program finished one month prior to the survey opening.

Table 1

Characteristics of the final sample used for the data analyses

Age	N	Experience (years)	N	Highest Level Played	N
15-17	50	0-1	2	Local club/State League trial	24
18-19	9	2-3	12	State League Juniors	39
20-21	4	4-5	20	State Team - Junior	6
22-25	6	6-9	28	State League Seniors	10
26-29	10	10+	25	State Team - Senior	6
30+	8			AFL/AFLW	2

Measures

Personalized Psychological Flexibility Index for Sport (PPFI-Sport)

Participants completed the PPFi-Sport, which consists of 19 questions on a 1 to 7 Likert Scale (ranging from 1 = *Strongly Disagree* to 7 = *Strongly Agree*) in response to a personally significant goal that participants were asked to consider. The goal was specific to their chosen sport (in this case, Australian Rules football), for example, attempting to make selection for the upcoming underage state championships, be drafted to the national league on a professional contract (AFL/AFLW), improve a certain skill set or fitness to a specified level, recover from injury, or to perform in an upcoming match or series.

The PPFi-Sport measures three distinct dimensions of PF – Avoidance, Acceptance and Harnessing. Subscales for Avoidance, Acceptance and Harnessing consist of five questions. The first four questions of the PPFi-Sport capture potential covariates or moderators that are explicitly tied to the self-chosen goal (Kashdan et al., 2020). The remaining 15 questions (five per subscale) are scored from 1-7. A Total PPFi-Sport Score is produced by combining scores from the three subscales, with the Avoidance subscale reverse scored (i.e. higher scores indicate less avoidance) – see Appendix A.

Goal-setting measures

To assess the nature of the goal chosen, the first four items of the PPFi-Sport captured covariate measures – centrality to life, level of challenge, experience of stress, and negative emotions associated with the goal. These were answered on the same 1-7 Likert Scale as the other items of the PPFi-Sport. To analyse the relationship that different types of goals had with the factors of the PPFi-Sport and BFI-2-S, the specific goal that each participant used was coded as either open or specific – a pivotal characteristic of successful goal pursuit (Locke & Latham, 1990; 2002; 2006). Goals for the 87 participants with a full survey response were coded by two raters; the primary researcher, and a former graduate psychology student from the University of Adelaide. A goal-setting scoring framework was established to analyse and code each goal. Goals that included; 1) a specific and clearly identified event,

action or process, and 2) included a clearly defined timeframe, were coded as specific. Goals that did not meet criteria for both 1) and 2) were coded as open. An example of a specific goal was “Recover from broken leg and play again in 2021”; open goals included “Improve my skillset” and “win a premiership”. Cohen’s (1960) kappa was used to assess agreement between the two raters, as the recommended inter-rater reliability measure for two raters assessing nominal (categorical) data (Hallgren, 2012). Analyses were run in R using the irr package. Of the 174 observations, there were 152 agreements. Cohen’s kappa coefficient of .747 ($SE=.05$, 95% CI [.65, .85]) indicated substantial agreement (Landis & Koch, 1977).

Big Five Inventory – 2 Short Form (BFI-2-S)

The BFI-2-S is a 30-item short form of the BFI-2. The BFI-2-S was selected due to the need to ensure participants could complete it in less than five minutes to minimise total assessment time and respondent fatigue, while maintaining reliability and validity. Each item of the BFI-2-S was scored on a 1 to 5 Likert Scale (ranging from 1 = *Strongly Disagree* to 5 = *Strongly Agree*). The five Domain Scales (commonly referred to as the Big Five personality traits) of Extraversion, Agreeableness, Conscientiousness, Negative Emotionality and Open-mindedness were measured by six items per domain (Soto & John, 2019). Scores for the six items were combined to provide a score for each of the five Domain Scales for each participant.

Procedure

Participants were originally invited to attend an optional Club Testing Day planned for July 2021 to be held at Norwood Oval. However, due to the COVID-19 pandemic and associated restrictions and lockdowns, this was not able to take place at the scheduled time. The survey component of this testing day – incorporating the PPF1-Sport and BFI-2-S – was subsequently able to be conducted wholly online. Information sessions were held with players and coaching staff at Norwood informing them about the project, and Information

Sheets were sent to all eligible playing squads; either handed out in hard copy at an information session or training session, or digitally via group email and in private Facebook groups that Norwood staff maintain for each squad.

The items of the PFFI-Sport and BFI-2-S were loaded onto Qualtrics XM™, an online survey hosting platform, accessed through the University of Adelaide. The survey was established with four sections (Consent Form, demographic data, PFFI-Sport, BFI-2-S), each requiring completion before progressing. This hurdle requirement may explain the number of respondents who started the survey but provided incomplete response sets. Age, gender, study and employment status, how many years they had played football, and the highest level at which they have played football were provided by each participant before beginning the PFFI-Sport. A complete survey contained responses to all six demographic items and completed the PFFI-Sport (19 items) and the BFI-2-S (30 items).

Data Analysis

Participant responses were exported from Qualtrics XM™ to Microsoft Excel as a .csv file. Partial and invalid responses ($n=18$) were removed from the dataset, leaving 87 complete responses. Data analyses were primarily run using Jamovi and R, and tables and figures generated in Jamovi.

To establish the validity of the PFFI-Sport in an Australian sample of athletes, confirmatory factor analyses (CFA) using maximum likelihood estimation was conducted. CFA was used to hypothetically test the fit of the model with the observed data, and establish factor loadings for each of the three PFFI sub-scales (Avoidance, Acceptance, Harnessing) and associated restrictions. The following fit indices were used to determine the suitability of the observed data with the three-factor structure of the PFFI: the chi-square goodness-of-fit index, comparative fit index (CFI), Tucker–Lewis Index (TLI), root-mean-square error of approximation (RMSEA), and standard root-mean-square residual (SRMR). CFA was

conducted initially in Jamovi, and subsequently in JASP to run 1,000 bootstrapped models to provide robust confidence intervals.

The model fit indices indicated that the correspondence between the three-factor model of the PFFI-Sport and the sample covariance matrix was satisfactory. Given the data was appropriate for the three-factor model, the items of each of the three sub-scales were summed into factor scores for each participant for Avoidance, Acceptance and Harnessing. Avoidance sub-scale items were reverse-scored when combined with scores from the other two subscales to provide a Total PFFI-Sport score (they were not reverse-scored when Avoidance was assessed as a subscale).

To understand the relationship between demographics, goal-setting measures, the PFFI-Sport and subscales, and the Domain Scales of the BFI-2-S, correlation matrices were produced to determine significance and direction of relationships. An independent samples t-test assessed differences in Total PFFI-Sport Scores between specific and open goal types.

Results

Data screening and assumption testing

Data screening prior to analysis identified incomplete surveys. Excluding these surveys ($n=18$) left a final sample of 87, providing a ratio of 5.8 cases per item for the 15 items of the PFFI-Sport and subscales.

Factor correlations indicated separability and confirmed the direction and strength of relationships observed in the scale development studies (Kashdan et al., 2020): Avoidance and Acceptance ($r = -.29$), Avoidance and Harnessing ($r = -.47$), Acceptance and Harnessing ($r = .52$).¹ No multicollinearity was suggested as inter-correlations were below 0.90 (Tabachnick & Fidell, 2001). Tests for normality were conducted on the Total PFFI-Sport

¹ Avoidance subscale was reverse-scored for inclusion in Total PFFI-Sport Scores; it was not reverse-scored for analysis as a subscale.

and subscales (see Appendix C). Assessment of multivariate collinearity indicated the data was multivariate non-normal; bootstrapping was conducted on the maximum likelihood estimation, increasing accuracy of estimations of standard errors, bias-corrected confidence intervals (at 95%) and p -values (Byrne, 2010). (Assumption testing results can be viewed in Appendices C, D and E.)

Confirmatory factor analysis

Complete survey responses ($n=87$) were used to perform a confirmatory factor analysis using maximum likelihood estimation with 1000 bootstrapped samples. The model fit indices indicated that the correspondence between the three-factor model and the sample covariance matrix was satisfactory. A chi-square goodness-of-fit test was conducted, providing a significant result: $\chi^2(87) = 138.6, p < .001$. The significant chi-square result was insufficient as a standalone index of suitability due to the sensitivity of the result to sample size (Byrne, 2010). Additional fit measures were considered and suggested an acceptable fit for the three-factor model, including comparative fit index (CFI = .884) and Tucker Lewis index (TFI = .860) (Barrett, 2007). Additional measures were also considered when assessing suitability of fit – root mean square error of approximation (RMSEA) = .008 (95% CI [.006, .11]) and standardised root mean square residual (SRMR) = .086 – suggesting an acceptable marginal fit (Hu & Bentler, 1999). It is important to note that these fit indices should be treated as guidelines and are not definitive (Marsh et al., 2004).

Standardised estimates for the model are shown in Table 2. Factor loadings were consistent with loadings from the scale development (Kashdan et al., 2020). All items excluding Item 16 (“Harness2”) met comparable thresholds for moderate to high factor loadings ($>.50$) (Hu & Bentler, 1999). The standardised estimate for Item 16 (.14, 95% CI [- .14, .57], $p = .237$) suggests that this item may more directly predict worry rather than Harnessing.

Table 2

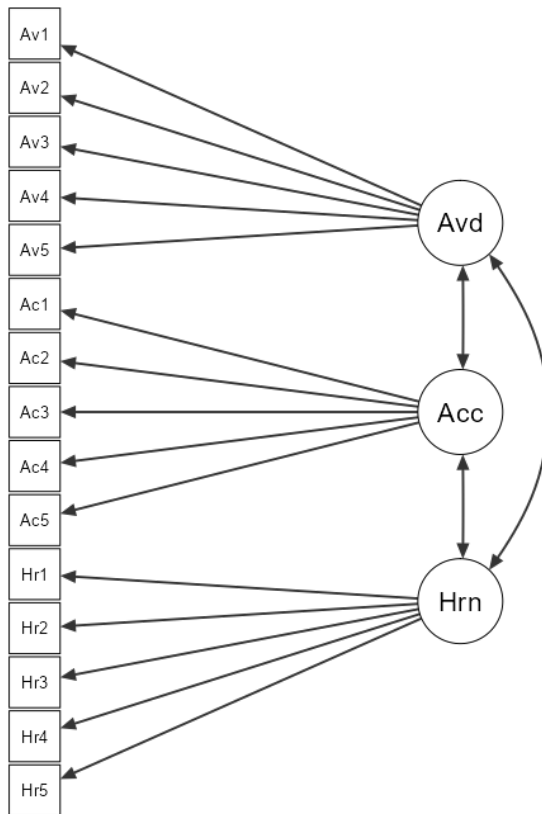
Factor loadings, standard error, 95% confidence intervals, test scores, significance values and standardised estimates of the confirmatory factor analysis of the PPFII-Sport

Factor	Item	Estimate	SE	95% CI		Z	p	Stand. Estimate
				Lower	Upper			
Avoidance	Avoid1	1.27	0.15	0.99	1.56	8.76	<.001	0.82
	Avoid2	1.32	0.14	1.04	1.60	9.26	<.001	0.85
	Avoid3	0.73	0.11	0.52	0.94	6.84	<.001	0.69
	Avoid4	0.73	0.15	0.43	1.03	4.76	<.001	0.51
	Avoid5	1.19	0.17	0.85	1.53	6.93	<.001	0.69
Acceptance	Accept1	0.64	0.10	0.44	0.84	6.19	<.001	0.64
	Accept2	1.09	0.13	0.83	1.36	8.12	<.001	0.79
	Accept3	0.82	0.12	0.59	1.05	6.94	<.001	0.71
	Accept4	0.60	0.13	0.34	0.86	4.48	<.001	0.50
	Accept5	0.81	0.14	0.53	1.10	5.61	<.001	0.59
Harnessing	Harness1	0.90	0.14	0.62	1.17	6.39	<.001	0.66
	Harness2	0.22	0.18	-0.14	0.57	1.18	0.237	0.14
	Harness3	1.11	0.18	0.75	1.47	6.07	<.001	0.63
	Harness4	1.14	0.19	0.77	1.50	6.13	<.001	0.65
	Harness5	0.82	0.16	0.51	1.14	5.12	<.001	0.55

Internal consistency of the PPFII-Sport was high: McDonald's (2013) coefficient omega ($\omega = .85$) was consistent with Cronbach's (1951) alpha reliability ($\alpha = .84$). Item-reliability tests revealed that removing Item 16 (Harnessing 2) increased scale reliability ($\alpha = .85$, $\omega = .86$); removing any other item decreased reliability.

Figure 1

Path analysis of the CFA of the three-factor model of the PFFI-Sport



Exploratory hypothesis tests

Centrality to life and the level of challenge of the goal will be significantly correlated with scores on the PFFI-Sport subscales

Due to non-normal distributions (see Appendices C and D) which can inflate Type I error rate and reduce power in Pearson's r significance tests, Spearman rank correlation method was used (Bishara & Hittner, 2012). Centrality to life of the goal being pursued had a weak positive correlation with Harnessing, and no significant relationship with Acceptance. The level of challenge of the goal being pursued was moderately positively correlated with Acceptance, and had no significant relationship with Harnessing. Level of challenge was not correlated with Avoidance, however there was a weak negative correlation between centrality to life and Avoidance.

Table 3*Correlations of goal-setting measures and subscales of the PPF1-Sport*

		Centrality.	Challenge	Avoidance	Acceptance
Avoidance	Spearman's rho	-0.26 *	-0.02	—	
	p-value	0.013	0.822	—	
Acceptance	Spearman's rho	0.13	0.28 **	-0.29 **	—
	p-value	0.226	0.008	0.006	—
Harnessing	Spearman's rho	0.25 *	0.13	-0.47 ***	0.52 ***
	p-value	0.019	0.226	< .001	< .001

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

Total PPF1-Sport Scores will be significantly different for specific and open goals

Assumptions of normality were met (see Appendix C), and homogeneity of variances were within acceptable limit for the Total PPF1-Sport Score, therefore a Welch's independent samples t-test was run (Delacre et al., 2017). Participants pursuing specific goals ($n=60$) did not display a statistically significant difference in Total PPF1-Sport Score compared to participants pursuing open goals ($n=27$), $t(52.09) = -1.76$, $p = .084$, $d = -.40$. This did not support the exploratory hypothesis proposed.

Conscientiousness and Open-mindedness will be significantly positively correlated with Acceptance and Harnessing; Negative Emotionality will be significantly positively correlated with Avoidance

Due to nonnormal distributions (see Appendices C and E), Spearman rank correlation method was used. Conscientiousness was significantly moderately positively correlated with Harnessing and showed no significant relationship with Acceptance. Open-mindedness showed the inverse relationship, with a significant positive and moderate correlation with Acceptance, and no significant relationship with Harnessing. Finally, Negative Emotionality

was significantly and positively moderately correlated with Avoidance (which was not reverse-scored for use as a subscale), as predicted.

Table 4

Correlations of the PFFI-Sport subscales and BFI-2-S Domain Scales

		Avoidance	Acceptance	Harnessing	Consc.	Open.
Acceptance	Spearman's rho	-0.29 **	—			
	p-value	0.006	—			
Harnessing	Spearman's rho	-0.47 ***	0.52 ***	—		
	p-value	< .001	< .001	—		
Consc.	Spearman's rho	-0.53 ***	0.12	0.27 *	—	
	p-value	< .001	0.288	0.011	—	
Open.	Spearman's rho	-0.13	0.22 *	0.02	0.00	—
	p-value	0.240	0.039	0.861	0.970	—
Neg. Emot.	Spearman's rho	0.42 ***	-0.41 ***	-0.25 *	-0.26 *	-0.07
	p-value	< .001	< .001	0.019	0.015	0.491

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

Discussion

The overarching aim of this study was to assess the validity of the PFFI-Sport in a sample of Australian athletes. The results confirmed the three-factor solution of the PFFI and suggest that the PFFI-Sport is a valid and useful measure of PF in Australian sub-elite and elite athletes. Addressing the primary shortcomings of existing PF scales, confirmatory factor analysis showed that the structure of the PFFI could be adapted for sporting contexts to consider personally relevant sporting goals, in the form of the PFFI-Sport. As the development of the PFFI showed (Kashdan et al., 2020), the PFFI-Sport differentiated PF from measures of Negative Emotionality. The PFFI-Sport retained the fundamental qualities and function of the PFFI as the superior measure of PF (Kashdan et al., 2020; Niven et al., 2021), in athletes and within sporting contexts. This multi-factorial methodology facilitates a

greater understanding of the psychological approach of athletes to stress and emotion regulation when pursuing meaningful goals.

Previous perspectives of PF based in Acceptance and Commitment Theory have considered PF on a continuum from acceptance to avoidance (Brown et al., 2003). The PPFi-Sport confirmed the three-factor model which incorporates Harnessing into the conceptualisation of PF. Harnessing is the utilisation of stress and negative emotions to serve goal-related ends. Harnessing is the least understood and most difficult to capture of the PF subscales. It is a complex meta-emotional phenomenon, and the Harnessing subscale of the PPFi-Sport consists of items that participants may find difficult to endorse (Kashdan et al., 2020). The item of the Harnessing subscale addressing worry provided an outlying result, which may have implications for subsequent use or modification of the PPFi-Sport.

To elicit adaptive responses across all three PPFi-Sport subscales, goals needed to be both central to the athlete's life and challenging. More challenging goals led to greater Acceptance. Negative emotions and stressors were more readily harnessed when goals were central to the athlete's life.

Total PPFi-Sport Score, which can be considered an overall PF score, was not significantly different for open and specific goals. This result may support the need for PF to be viewed through the nuanced, multifaceted approach afforded by the PPFi-Sport. Subsequent analysis using the PPFi-Sport subscales may highlight the impact that different goal types have on the dimensions of PF discerned by the PPFi-Sport.

Athletes in this study rated their goals as central to their lives – 72 of the 87 responses used in the final analyses rated their goal as central to their life. The importance of cultivating appropriate psychological skills to navigate the inevitable stressors and negative emotions that arise in pursuit of these goals must be a focus of holistic athlete development. Athletes' goals are important to them, and they are likely to experience difficulties in pursuit of them;

59% of athletes said they experienced negative emotions and 44% experienced stress while pursuing their goals. PF provides a basis from which to effectively deal with these challenges. If athletes can deal with difficulties in a healthy, adaptive way that supports the pursuit of meaningful goals, they are more likely to remain involved in sport and pursue their goals. Pursuing goals that align with an individual's personal values leads to increased resilience, performance and wellbeing (Henriksen, 2019). Increased acceptance leads to increased values-based actions and behaviours (Hayes et al., 2011). Integrating the PPFi-Sport into programs where athletes pursue personally meaningful goals, which align with their fundamental and core values, will underpin the development of mental skills, increase self-awareness, enhance athlete-coach relationships, ultimately leading to positive performance and wellbeing outcomes.

In line with previous PF and individual differences research (Kashdan et al., 2020; Costa & McRae, 1992; Gross & John, 2003), athletes high in Negative Emotionality were more likely to avoid and less likely to accept negative emotions and stress. Conscientiousness was associated with increased Harnessing and decreased Avoidance. Athletes with an open-minded personality were more likely to accept stress and negative emotions. Conscientiousness and Open-mindedness together elicited positive PF outcomes across all three subscales. Emotion regulation is predicted by the interplay of personality with situational contexts (Kobylińska & Kusev, 2019). The PPFi-Sport can be used as an important conduit, integrating psychological factors with personality traits in the context of goal pursuit to underpin a holistic conceptualisation of performance and development.

Developing psychological flexibility in athletes

Psychological factors contribute up to 50% of the variance in the efficacy of the development of individual athletes (Weinberg & Gould, 2003). A majority of young athletes identified as talented do not progress on to elite (or even sub-elite) sporting careers (Abbott et

al., 2002). Many elite adult athletes were not identified as talented or gifted children and were not identified through the standard talent pathways (Bloom, 1985). Talent identification of young athletes is a subjective process – junior players can find themselves removed from a system or not selected for arbitrary reasons (Bailey et al., 2010). It is therefore incumbent on programs that aim to nurture and develop aspiring athletes to provide them with a framework of mental skills to navigate the challenges of striving for success in their athletic pursuits. Utilising the PPFi-Sport will increase self-awareness within athletes, and increase knowledge of coaches of their athletes, allowing a tailored approach to athlete development based on the athlete's strengths, weaknesses and personality.

The ability to cope effectively with the stressors encountered along the developmental pathways towards high performance is a central component of athlete development (Côté, 1999). As athletes move through sporting development pathways, they must learn to self-regulate their behaviours and emotions. Although the ability to set goals is important at all stages of athletic development, it may be operationalised differently depending on the age and maturation of young athletes (Bailey et al., 2010). This underlines the necessity for programs and systems of athletic development that are adaptable and individualised. Using the PPFi-Sport to understand the PF of athletes within a system or program will assist in the personalisation of programs that seek to develop athletes holistically.

While much of the literature focuses on adolescent and young athletes, the sample used in this study covered sub-elite and elite athletes aged 15 and older. While the majority of athletes in the study were aged 15-21 (72%), the sample was taken from the playing group as a whole. This allowed the sample to cover the full range of elite athletic development, from junior development programs through to senior, professional athletes. However, this prevented analyses of the 15-21 age group in isolation. Future studies with access to larger samples of this athletes in this age group are warranted.

The role of training, coaches and parents in developing psychological flexibility in athletes

Parents and coaches are the two most prominent influences on young athlete participation, development and retention (Côté, 1999; Eime et al., 2019). Parents play a pivotal role in supporting young, talented athletes as they encounter the stressors of their sporting pathways and life more broadly, however, they are not always equipped to provide effective support (Elliott et al., 2017). Ongoing engagement with parents to develop awareness and understanding of PF and related concepts should be fundamental within elite sporting programs.

The personality and behaviour of coaches can contribute to athletes underperforming under pressure (Maher et al., 2020). The skills and abilities of the coach are primary factors that can inhibit development of mental toughness (Gucciardi et al., 2009). Successful sporting environments rely on a culture oriented towards learning, where psychological safety is foundational, and personally relevant, challenging and lofty goals are pursued. Key moderators of goal setting are: feedback, required to review and track progress; commitment, which is enhanced by self-efficacy and perception of the goal as important; task complexity; and situational constraints (Locke & Latham, 2006). All athletes experience varying degrees of failure as part of the learning process. Experiences of failure can intensify the fear of failure, lead to anxiety, or decrease perceived competence (Song et al., 2020). However, adverse experiences can also promote subsequent resilience, with resulting advantages for mental health and wellbeing (Seery et al., 2010). PF not only requires resilience, but the application of PF in challenging circumstances fosters the development of resilience. There is a strong link between positive, approach-coping behaviours of stressful situations during competition, and goals linked to learning and mastery; in contrast, performance-focused goals lead to avoidance-coping behaviour (Theodosiou et al., 2018). Emotionally Intelligent coaches influence their athletes to focus on the process of goal attainment – learning and

mastery – rather than through a narrow focus on performance and goal attainment in isolation (Gullick, 2021). Coaches and athletes will benefit from collaborating in the goal-setting process and adjusting focus when failures occur, to promote healthy, adaptive appraisals and realignment of goals which increases both PF and resilience. Self-reflection and meta-cognitive thinking during training helps athletes observe and control their thoughts and behaviours, which develops the emotion regulation skills required to perform in competition (Theodosiou et al., 2018). Positive coping experiences in stressful circumstances promote challenge appraisals over threat appraisals (Lazarus & Folkman, 1987). Athletes benefit when coaches promote adoption of challenge states (Hase et al., 2019).

Establishing, maintaining, and modifying task and situational constraints is a core responsibility of the effective coach. Creating environments to enhance athletes' learning and development is the primary role of the coach as a designer of learning (Renshaw et al., 2015). It is incumbent on coaches to create training environments rich with the emotions anticipated in competition, to adequately prepare athletes both physically and emotionally for the demands of competition and performance (Headrick et al., 2014). The coach plays a central role in preparing athletes for the emotional challenges anticipated in competition, and thus, in facilitating the pursuit and attainment of their goals. Understanding and utilising the PPFISport would be a significant step towards increasing coach and parent awareness to allow them to effectively support the development of the requisite mental skills in athletes. Coaches that develop the awareness and skills to appropriately adapt their coaching practice will be able to provide their athletes with a more adequate psychological toolkit from which to navigate the demands of elite-level competition, and ultimately, the vicissitudes of life beyond sport.

Rethinking mental toughness in sport

Athletes, coaches, and applied sports psychologists consistently refer to mental toughness as one of the most important psychological characteristics that influences outcomes and success in elite sport (Weinberg & Gould, 2003; Gould et al., 2002). Despite underpinning performance outcomes, the concept of mental toughness remains one of the least understood terms used in applied sport psychology (Jones et al., 2002; Liew et al., 2019). While interpretations of mental toughness remain highly subjective, it is broadly used to reflect the ability of an individual to cope effectively with the demands of training and competition, to remain focused on relevant tasks and maintain resilience (Liew et al., 2019). The PPFI-Sport illuminates a nuanced understanding of the mental skills required to cope with stress to reach performance goals. The PPFI-Sport allows athletes and coaches to understand the strategies recruited by athletes when facing difficulties, setbacks and challenges, and facilitates a deeper understanding of the approaches required to endure stress and regulate emotion to achieve desired outcomes. The PPFI-Sport addresses much of the subjectivity and ambiguity that surround terms such as mental toughness in sport.

Limitations

Generalisability

The PPFI-Sport warrants further investigation as an appropriate measure of PF across a range of sports and with a variety of athlete populations. Despite the unique requirements of different sports – the physical skills required to compete successfully in, for example, swimming, cricket, fencing and Australian Rules football vary greatly – there are common psychological characteristics essential for successful performance at elite level of competition (Bailey et al., 2010). There is substantial empirical evidence that psychological factors are consistent predictors of success, regardless of domain (Orlick & Partington, 1998; Smith & Christensen, 1995). The PPFI-Sport will be an important tool across sports to assess the mental skills of athletes, to connect emotion regulation and adaptability to stressors to their

pursuit of meaningful goals. The sample used in this study was confined to a team sport (Australian Rules football) and from one club that operates at a level considered a transition point in the athlete pathway between competitive and elite high performance. The validation of the PPF1-Sport in this study lays the foundation for more robust analysis of its generalisability across athlete populations from different sports and cultural contexts.

Methodological limitations

Cross-sectional design does not provide a complete picture of the ebbs and flows of an athlete's journey across a program, competition, season, or even career. Insights that longitudinal studies provide would allow for a more comprehensive assessment of the differing demands, stressors and challenges faced at specific points in, for example, a full season of Australian football. The challenges for an athlete in pre-season may well be different from in-season, and altogether dissimilar to the environment during a high-pressure finals campaign. Major tournament cycles in other sports present similar opportunities for longitudinal assessments to understand perspectives across the life-cycle of high-performance sporting programs. Finally, the cross-sectional design does not allow for test-retest reliability. Longitudinal research is necessary to establish whether these findings generalise across sports, in different cultural and performance contexts, and at all levels of participation (Bailey et al., 2010).

The self-report nature of this study provides further limitations. Self-report surveys can give rise to unrepresentative and unreliable data, particularly in male participants where surveys involve issues around perceived "mental toughness", with a tendency to avoid reporting accurately due to stigma concerns (Poucher et al, 2021). Anonymous peer- or coach-assessment of goals would also increase the reliability and usefulness of the data. Future research may ask if the goals that are being pursued are realistic and align with coach and peer expectations, and may then be analysed retrospectively against performance

outcomes. Identifying the cognitive underpinnings of PF and the associated physiological responses to stress, in conjunction with the PFFI-Sport and personality trait measures, would allow for a more comprehensive and individualised conceptualisation of emotion regulation and stress response, and a broader understanding of the role of self-report measures in supporting this conceptualisation.

Participation in the study was voluntary, and therefore did not capture a complete representation of the playing group. Future studies could be run in direct collaboration with larger bodies such as leagues or associations, and a broader campaign to promote the benefits of such research may increase voluntary participation. Specific times set aside to complete such testing may increase recruitment. Opt-in surveys in competitive, high-performance sporting environments may receive a disproportionate rate of involvement from athletes wanting to be seen to be doing everything they can to enhance chances of selection. Despite no data being shared with coaching staff or selectors, players that felt more secure with their place in a particular squad and do not see any benefit in volunteering their time may be underrepresented. With 105 participants from an estimated 330 athletes at the club, it is not known if the findings accurately represent the complete playing group.

Due to a limited sample size, there was insufficient power to detect possible differences between male and female athletes. The sample included more female players that have played at higher levels (senior state league and/or senior state team representation) than males, due to more senior female players voluntarily participating in the study. Future research is warranted to explore the influence of demographic variables on PF and the experience of athletes pursuing meaningful goals.

Future directions

The stress response, emotion regulation and integrating the Biopsychosocial model

There are considerable future possibilities to advance the theory of PF in sport using the PFFI-Sport in conjunction with physiological and personality measures. Meta-analyses suggest that elite athletes possess superior cognitive function (Scharfen & Memmert, 2019). Understanding the interplay of cognitive function with the PFFI-Sport would allow a more comprehensive understanding of the merging of physiological, emotional and cognitive factors that underpin athletic performance. Attempting to consolidate the physiological, emotional and cognitive aspects into a holistic understanding of athletic performance aligns closely with the BPSM and warrants investigation. In addition to understanding appraisals of stress and threat, there is a need to measure the cognitive substrates that underpin performance. Athletes must pay attention to the environment around them, yet threat appraisals impact cognitive performance. The interplay between internal and external factors renders prediction of individual responses to given challenges or threats insurmountably difficult. The difficulty in applying the systems that gain information from multiple anatomical compartments (i.e. brain, muscles and cardiovascular system) to elite sporting environments has prevented significant investigation (Hutchinson, 2018).

Chalabev et al. (2009) showed that physiological markers of challenge and threat appraisals can be anticipated by adoption of approach- or avoidance-orientations to performance. In training elite athletes, there is a need for standardised psychometric measures that capture both the cognitive appraisal of stress and subsequently links this to cognitive performance markers that are proven to be impacted by the autonomic arousal experienced by the individual. Attention and processing speed are key components of cognitive performance that impact the effectiveness of an athletes' response to stress and capacity to effectively regulate emotion (Scharfen & Memmert, 2019; Voss et al., 2010). Capturing the underlying relationships between self-report and psychometric instruments will allow coaching staff to action changes in mental skills training to support athletes to perform at their best.

Increasing awareness of emotion regulation and the stress response

In adolescent and particularly student athletes, effective stress management is important for successful sporting performance and higher quality of life (Surujlal et al., 2013). The adverse effects of stressful life events on present and future emotional functioning are mitigated by robust emotion regulation and adaptive appraisals, characteristics of strong PF. Developing regulatory adaptability is advantageous for the individual, as if one coping strategy is not working or not available, they have the capacity to access alternative strategies (Bonanno & Burton, 2013). This translates strongly to sporting contexts, where constraints (task, environmental or individual) arise and change throughout competition, requiring acute adaptations. Developing PF provides the framework from within which athletes can successfully navigate intense competition-related stress. Team cohesion, success and wellbeing may benefit from increased awareness of individual and collective emotion regulation strategies. Awareness of emotion regulation strategies will allow athletes and coaches to develop their own self-regulation skills and highlight where emotion regulation may benefit the team (Tamminen et al., 2021).

Goal setting

While goal type (open vs specific) was not associated with a significant difference in Total PPF1-Sport Score, assessing goal type and its impact on PF may require the more granular, nuanced view of PF afforded by the subscale measures of the three-factor model (Kashdan et al., 2020). Further, more detailed analysis of the chosen goal is required to understand the context, suitability, and level of attainment (retrospectively) that different types of goals play in goal attainment and application of PF. Longitudinal studies would reveal the fluctuations of a typical sporting season or program. Assessing PF and goal pursuit at various points during a season (pre-competition, in competition, post-competition) and a career (emergence, peak performance, transition out of high performance) will be crucial to

understand how PF impacts and underpins performance throughout the athlete pathway. The significance of major setbacks including injury, non-selection, or poor performance also requires further analysis.

This PPFi-Sport asks athletes to consider how central to their life their chosen goal was. Understanding the relationship between centrality to life and different types and levels of athletes (i.e. amateur, semi-professional or full-time professional; competitive, sub-elite or elite) would provide greater insights into how this impacts their appraisals of stress. This study asked participants their work and study load outside of sport, however this data was not used in the analysis. Such considerations will be important for future research, to understand where the athlete places their sporting goals in the context of their life.

Cultural considerations

Culture plays a role in predicting appraisals, coping skills (Puente-díaz & Anshel, 2010) and emotion regulation (Ford & Gross, 2019). A key intention of this study was to establish the utility and validity of the PPFi-Sport in Australian athletes. Other measures of PF have been tested with European samples (for example, the MPFI in Italy (Landi et al., 2021) and the PFSS in Sweden (Johles et al., 2020)), however the PPFi had previously been validated in only US samples. While satisfactory CFA results suggested cross-cultural validity of the three-factor solution of the PPFi (Kashan et al., 2020), Item 16 highlighted a potential cultural difference that may require adjustment in Australian settings. Item 16 (the second item of the Harnessing subscale) asks participants, “I find worrying helpful to solving goal-related problems.” The results suggest that athletes did not view worrying as useful in goal pursuit. This may be due to language differences in the use of the term “worry” in Australia, or from a lack of understanding of how worrying can be beneficial. Worry is strongly associated with anxiety disorders, and consistently associated with anxiety in adolescence (Rabner et al., 2016). Such connotations may be more readily referenced than

potential benefits when considering the practical uses of worrying in pursuing sporting goals. Worrying can be useful; upregulating worry can enhance performance on cognitively demanding tasks, especially for individuals with high Negative Emotionality (Tamir, 2005), however, the athletes in this study displayed low Negative Emotionality (see Appendix E).

Further validation of the PPFi-Sport is required in both Australian and international samples. Future studies would benefit from assessing participants' familiarity with the concepts of PF and, more broadly, emotion regulation, stress response and goal setting. Understanding the psychological literacy of the sample would provide greater context to subsequent findings: are athletes that are aware of the potential benefits of worrying more likely to harness it than athletes who only know of its negative impacts, or is aversion to worrying a trait unique to Australian athletes?

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Appendix A

Personalized Psychological Flexibility Index for Sport (PPFI-Sport) (adapted from Kashdan et al., 2020)

Personalized Psychological Flexibility Index for Sport (PPFI-Sport)

This survey measures how athletes pursue goals in the presence of unwanted thoughts and feelings. Athletes are first asked to identify a benchmark sporting competition they are currently preparing for in the coming year.

Instructions: *Take a few moments to consider a goal that you are pursuing with your football. Be as specific as possible - provide a description AND a timeframe/specific date.*

- My goal is: _____

For each statement below, select the rating that best describes YOUR thoughts and feelings about this goal. In response to the questions, there will be a temptation to portray yourself in an overly favourable manner. Please resist this temptation, and answer each question as honestly as possible. With your honesty, we can better understand the experiences of athletes striving towards meaningful goals. Remember, your responses are anonymous.

Response Scale: 1=Strongly Disagree, 2=Disagree, 3=Somewhat Disagree, 4=Neither Agree or Disagree, 5=Somewhat Agree, 6=Agree, 7=Strongly Agree

Items:

1. This goal is central to my life.
2. I find this goal challenging.
3. I feel stressed pursuing this goal.
4. I experience negative emotions while pursuing this goal (such as anxiety, frustration, guilt, anger, disappointment).
5. I avoid the most difficult goal-related tasks.^{av} -
6. I put off pursuing this goal when I could be doing a more enjoyable task.^{av} -
7. When I feel stressed pursuing this goal, I give up.^{av} -
8. I get so caught up in thoughts and feelings that I am unable to pursue this goal.^{av} -
9. When I feel discouraged, I let my commitment for this goal slide.^{av} -
10. I accept the setbacks while pursuing this goal.^{ac}

11. While pursuing this goal, I try to accept my negative thoughts and feelings rather than resist them.^{ac}
12. I am willing to experience negative thoughts and emotions related to this goal.^{ac}
13. I accept things I cannot change about this goal.^{ac}
14. While pursuing this goal, I can observe unpleasant feelings without being drawn into them.^{ac}
15. When faced with obstacles related to this goal, my frustration serves to energize me.^h
16. I find worrying helpful to solving goal-related problems.^h
17. When people distract me from this goal, I use any anger that arises to stay focused.^h
18. I get motivated by guilt when I fail to meet my own expectations pursuing this goal.^h
19. I find unpleasant emotions useful for reaching this goal.^h

Scoring: ^{av} = from 5-item Avoidance subscale, ^{ac} = from 5-item Acceptance subscale, ^h = from 5-item Harnessing subscale. In the Avoidance subscale of the Personalized Psychological Flexibility Scale, items were reverse scored when considering the Total PPFISport Score, such that higher scores indicated less avoidance.

Appendix B

The Big Five Inventory--2 Short Form (BFI-2-S)

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *likes to spend time with others*? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

1	2	3	4	5
Disagree strongly	Disagree a little	Neutral; no opinion	Agree a little	Agree strongly

I am someone who...

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. ___ Tends to be quiet. 2. ___ Is compassionate, has a soft heart. 3. ___ Tends to be disorganized. 4. ___ Worries a lot. 5. ___ Is fascinated by art, music, or literature. 6. ___ Is dominant, acts as a leader. 7. ___ Is sometimes rude to others. 8. ___ Has difficulty getting started on tasks. 9. ___ Tends to feel depressed, blue. 10. ___ Has little interest in abstract ideas. 11. ___ Is full of energy. 12. ___ Assumes the best about people. 13. ___ Is reliable, can always be counted on. 14. ___ Is emotionally stable, not easily upset. 15. ___ Is original, comes up with new ideas. | <ul style="list-style-type: none"> 16. ___ Is outgoing, sociable. 17. ___ Can be cold and uncaring. 18. ___ Keeps things neat and tidy. 19. ___ Is relaxed, handles stress well. 20. ___ Has few artistic interests. 21. ___ Prefers to have others take charge. 22. ___ Is respectful, treats others with respect. 23. ___ Is persistent, works until the task is finished. 24. ___ Feels secure, comfortable with self. 25. ___ Is complex, a deep thinker. 26. ___ Is less active than other people. 27. ___ Tends to find fault with others. 28. ___ Can be somewhat careless. 29. ___ Is temperamental, gets emotional easily. 30. ___ Has little creativity. |
|---|---|

Please check: Did you write a number in front of each statement?
BFI-2 items copyright 2015 by Oliver P. John and Christopher J. Soto.

Scoring Key

Item numbers for scoring the BFI-2-S domain and facet scales are listed below. Reverse-keyed items are denoted by "R." Due to the limited reliability of the two-item facet scales, we only recommend using them in samples with approximately 400 or more observations. For more information about the BFI-2, visit the Colby Personality Lab website (<http://www.colby.edu/psych/personality-lab/>).

Domain Scales

- Extraversion: 1R, 6, 11, 16, 21R, 26R
- Agreeableness: 2, 7R, 12, 17R, 22, 27R
- Conscientiousness: 3R, 8R, 13, 18, 23, 28R
- Negative Emotionality: 4, 9, 14R, 19R, 24R, 29
- Open-Mindedness: 5, 10R, 15, 20R, 25, 30R

Facet Scales

- Sociability: 1R, 16
- Assertiveness: 6, 21R
- Energy Level: 11, 26R
- Compassion: 2, 17R
- Respectfulness: 7R, 22
- Trust: 12, 27R
- Organization: 3R, 18
- Productiveness: 8R, 23
- Responsibility: 13, 28R
- Anxiety: 4, 19R
- Depression: 9, 24R
- Emotional Volatility: 14R, 29
- Aesthetic Sensitivity: 5, 20R
- Intellectual Curiosity: 10R, 25
- Creative Imagination: 15, 30R

Citations for the BFI-2 and BFI-2-S

Soto, C. J., & John, O. P. (2017). The next Big Five Inventory (BFI-2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. *Journal of Personality and Social Psychology, 113*, 117-143.

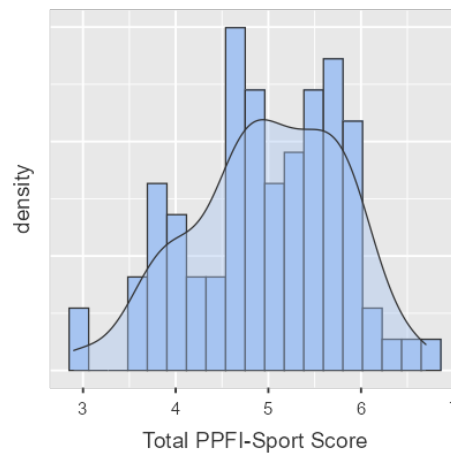
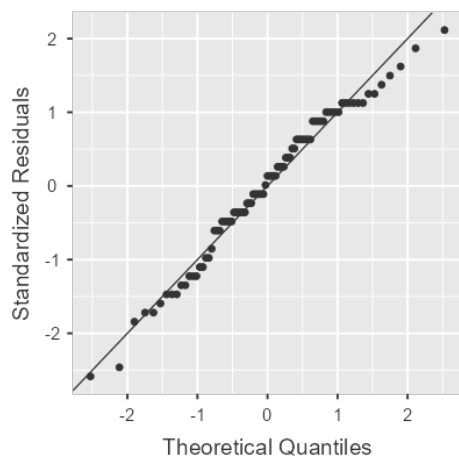
Soto, C. J., & John, O. P. (2017). Short and extra-short forms of the Big Five Inventory--2: The BFI-2-S and BFI-2-XS. *Journal of Research in Personality, 68*, 69-81.

Appendix C

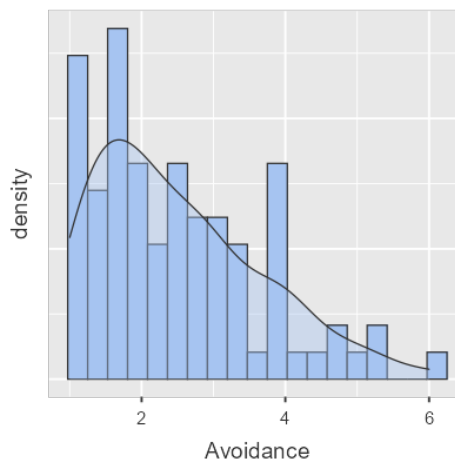
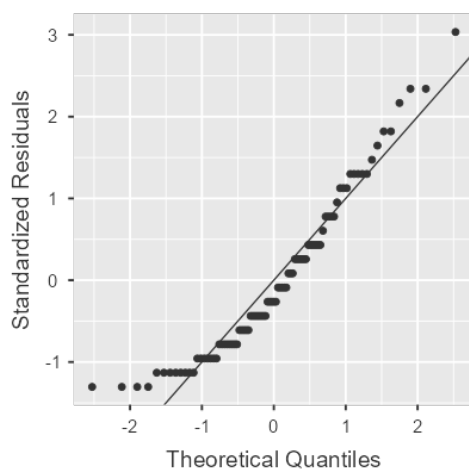
Distributions, tests for normality, Q-Q plots, histograms and densities for Total PFFI-Sport and subscale scores

	N	Mean	SD	Skewness		Kurtosis		Shapiro-Wilk	
				Skewness	SE	Kurtosis	SE	W	p
Avoidance	87	2.50	1.15	0.83	0.26	0.10	0.51	0.93	<.001
Acceptance	87	5.32	0.91	-0.77	0.26	1.10	0.51	0.96	0.009
Harnessing	87	4.14	1.05	-0.27	0.26	-0.43	0.51	0.98	0.215
Total PFFI-Sport Score	87	4.99	0.81	-0.36	0.26	-0.34	0.51	0.98	0.185

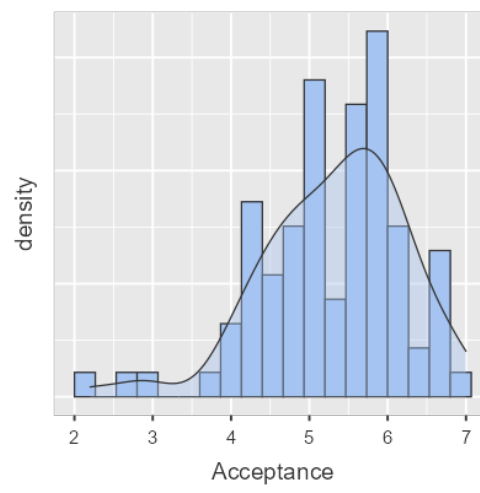
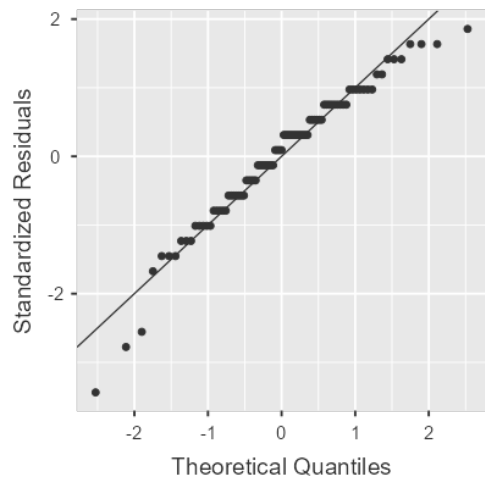
Total PFFI-Sport Score



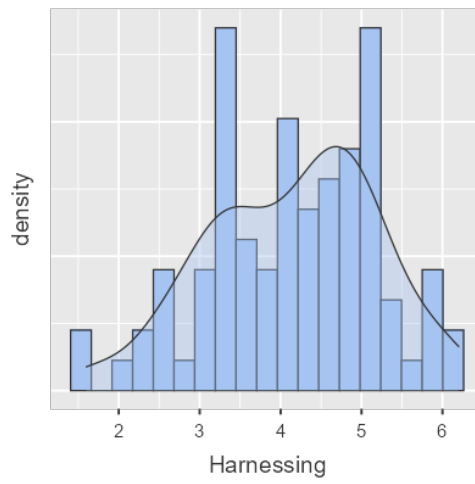
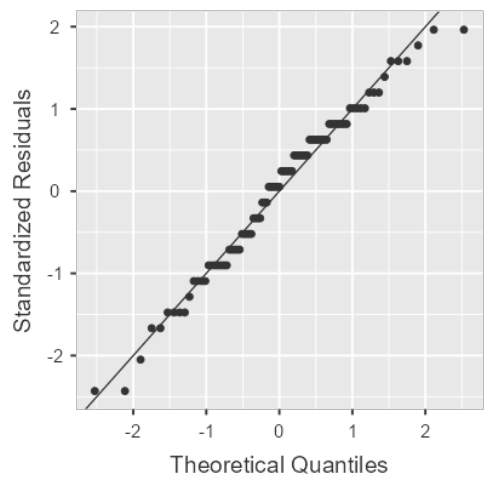
Avoidance



Acceptance



Harnessing

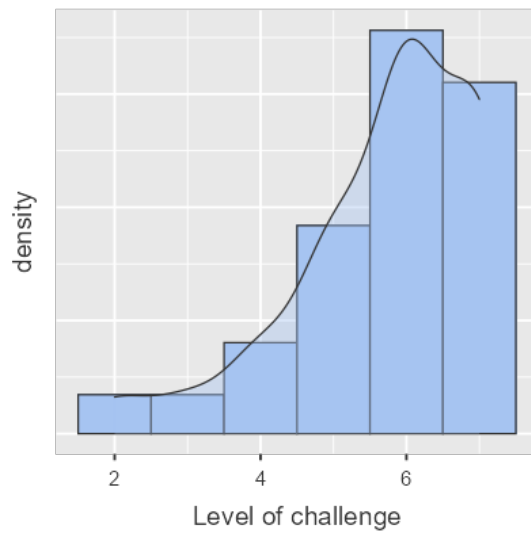
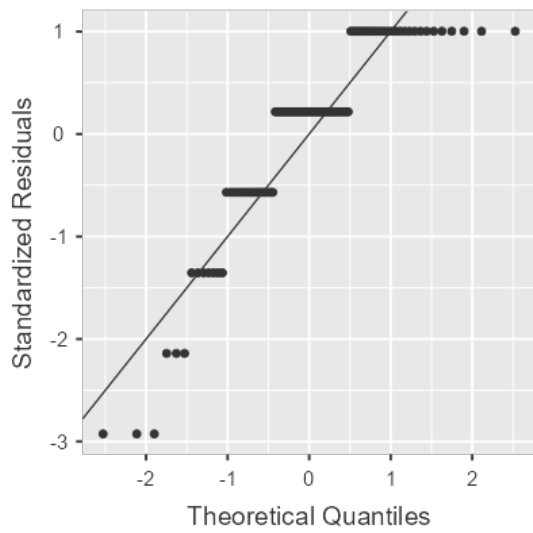


Appendix D

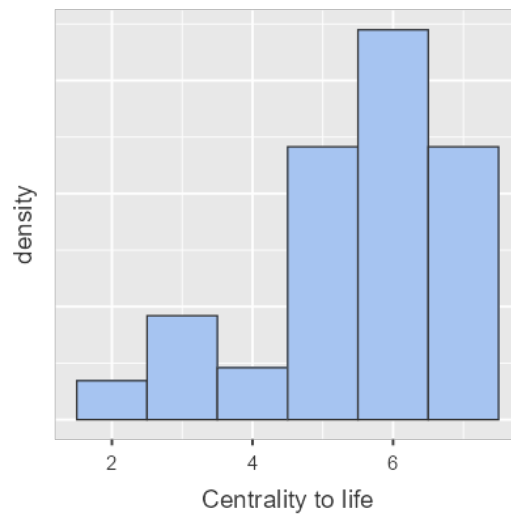
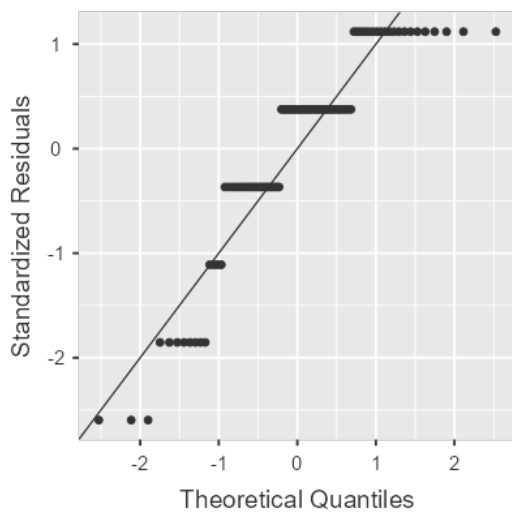
Distributions, tests for normality, Q-Q plots, histograms and densities for goal-setting measures

	N	SD	Skewness		Kurtosis		Shapiro-Wilk	
			Skewness	SE	Kurtosis	SE	W	p
Centrality to life	87	1.35	-0.94	0.26	0.27	0.51	0.86	<.001
Level of challenge	87	1.27	-1.16	0.26	1.07	0.51	0.84	<.001

Level of challenge



Centrality to life

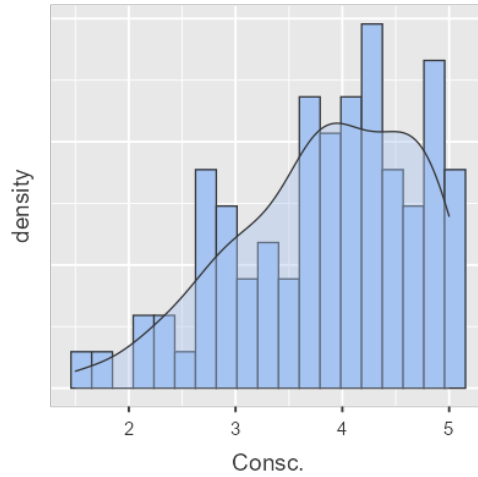
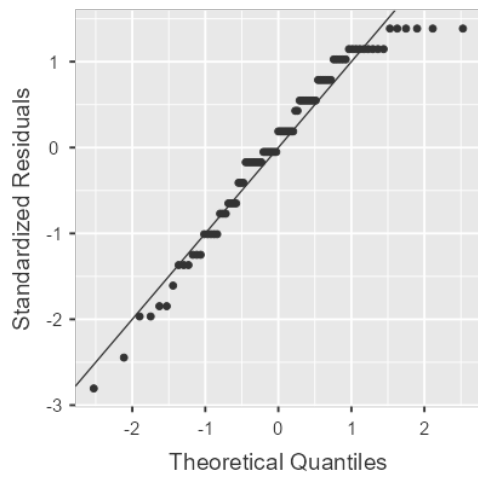


Appendix E

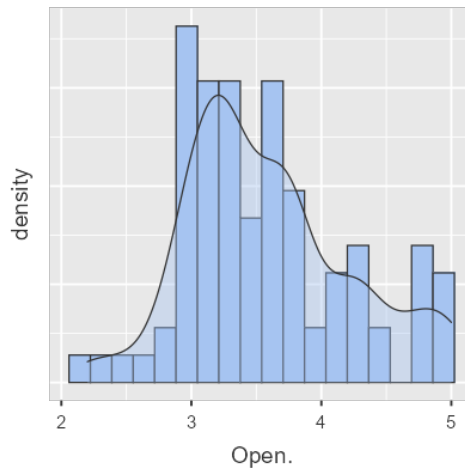
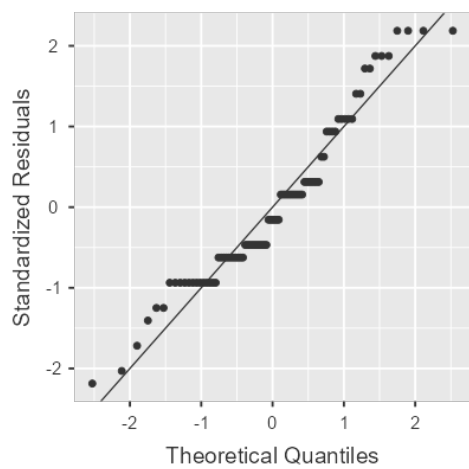
Distributions, tests for normality, Q-Q plots, histograms and densities for Big Five Domain Scales (Conscientiousness Open-mindedness and Negative Emotionality)

	N	SD	Skewness		Kurtosis		Shapiro-Wilk	
			Skewness	SE	Kurtosis	SE	W	p
Consc.	87	0.84	-0.60	0.26	-0.25	0.51	0.95	0.002
Open.	87	0.64	0.51	0.26	-0.19	0.51	0.95	0.002
Neg. Emot.	87	0.73	0.43	0.26	-0.50	0.51	0.97	0.023

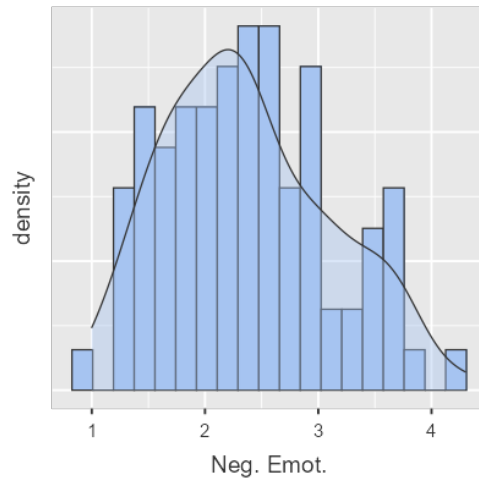
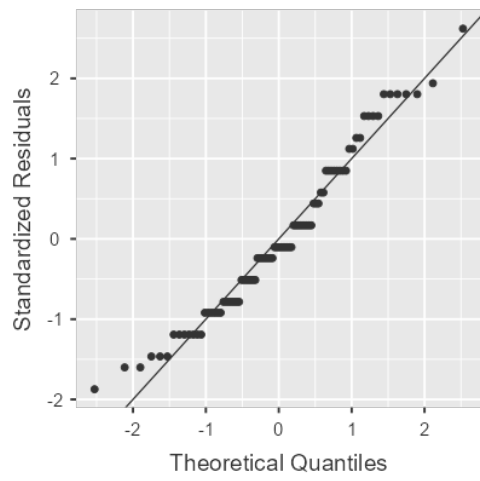
Conscientiousness



Open-mindedness



Negative Emotionality



Appendix F

Participant Information Sheet

PARTICIPANT INFORMATION SHEET

PROJECT TITLE: Personalized Psychological Flexibility Index for Sport (PPFI-Sport) in a sample of Australian Rules footballers

HUMAN RESEARCH ETHICS COMMITTEE APPROVAL NUMBER: H-2021-44

PRINCIPAL INVESTIGATOR: A/P Carolyn Semmler | **STUDENT RESEARCHER:** Thomas Rutherford | Honours, Psychology

Dear Participant, you are invited to participate in the research project described below:

What is the project about?

People take different approaches when pursuing goals that are important to them, and some people will endure more stress and discomfort to achieve a goal than others. When faced with challenges or discomfort while pursuing a goal that is important to us, the concept of Psychological Flexibility (PF) outlines three types of behaviours – avoidance, acceptance, or harnessing. The PPFI-Sport survey that you will complete (19 questions) allows us to understand the ways in which you behave when faced with difficulties while you are working towards an important goal. This aims to assess how flexible your mental approach is towards an upcoming goal that you are striving towards – which may be a particular match, finals, making the starting team, a draft combine, a fitness testing goal, or a longer-term goal (anything that you would consider to be a “benchmark event”). You will then complete the Big-Five Inventory (30 questions) which establishes personality traits, which we will use to assess how these traits relate to the way in which athletes deal with challenges and setbacks.

Who is undertaking the project?

This project is being conducted by the Applied Cognition and Experimental Psychology Lab and in particular Thomas Rutherford. This research will form the basis for Thomas’ thesis in the degree of Honours Degree of Bachelor of Psychological Science at the University of Adelaide under the supervision of A/P Carolyn Semmler.

Why am I being invited to participate?

The study aims to assess elite and sub-elite male and female athletes aged 15 and above.

What am I being invited to do?

You are being invited to complete the Personalized Psychological Flexibility Index for Sport (PPFI-Sport) which is 19 questions, each answered on a 1-to-7 scale. There is also the BFI-2-S questionnaire which is around your personality traits – 30 questions, each answered on a 1-to-5 scale. In total, there are 49 multiple-choice questions. You can complete these in your own time, on a computer or mobile device.

How much time will my involvement in the project take?

The questionnaire is anticipated to take between 5-10 minutes.

Are there any risks associated with participating in this project?

There is very low risk associated with this project. There is no bearing given to the results or participating in the study at all – this data is not shared with any of the coaches or staff.

What are the potential benefits of the research project?

The research into Psychological Flexibility is in its infancy and there has only been a handful of peer-reviewed studies published looking at PF in athletes. This project would add to this fledgling field of research and create new insights into how athletes may exhibit PF distinct from the general population. It will also aim to validate the PPF1-Sport measurement tool which, if validated, would provide sporting clubs such as the Norwood Football Club, an accessible and easy-to-use tool to assess how individual athletes deal with challenges. This may inform preparation, training, coaching and development specific to an individual's psychological profile. It may also help identify areas where training to increase psychological flexibility may improve athlete performance and wellbeing.

Can I withdraw from the project?

Participation in this project is completely voluntary. If you agree to participate, you can withdraw from the study at any time up until you finish the survey (at which point, your results are submitted and anonymized, and therefore cannot be removed).

What will happen to my information?

Your privacy and confidentiality will be protected as each participant will be allocated a unique identification number which will be used to manage their data. You will remain anonymous and only be identified from their unique identification number. Any reports, publications and presentations of results will be in terms of aggregated results. Your information will only be used as described in this participant information sheet and it will only be disclosed according to the consent provided, except as required by law.

Who do I contact if I have questions about the project?

Thomas Rutherford or Carolyn Semmler Ph: +*** ** | Email: *** **

What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Sub-Committee at the University of Adelaide (approval number HR2021-44). This research project will be conducted according to the NHMRC National Statement on Ethical Conduct in Human Research 2007 (Updated 2018). If you have questions or problems associated with the practical aspects of your participation in the project, or wish to raise a concern or complaint about the project, please consult the Principal Investigator. If you wish to speak with an independent person regarding a complaint, concern, the University's policy on research involving human participants, or your rights as a participant, please contact the HREC Secretariat: Phone: +61 8 8313 4936 | Email: paul.delfabbro@adelaide.edu.au. Complaints/concerns will be treated in confidence and fully investigated. You will be informed of the outcome.

If I want to participate, what do I do?

Follow the link provided: https://adelaideunisop.syd1.qualtrics.com/jfe/form/SV_42elrF5boEIkKDY

Yours sincerely, Thomas Rutherford and Carolyn Semmler