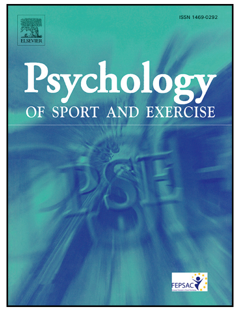

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Rachel B. Sheehan, Matthew P. Herring, Mark J. Campbell

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Title Page

Longitudinal relations of mental health and motivation among elite student-athletes across a condensed season: Plausible influence of academic and athletic schedule

Rachel B. Sheehan[1]*, Matthew P. Herring[1,2], Mark J. Campbell[1]

1 Department of Physical Education and Sport Sciences, University of Limerick, Ireland.

2 Health Research Institute, University of Limerick, Ireland

*Correspondence: Rachel B. Sheehan, Department of Physical Education and Sport Sciences, University of Limerick, Ireland; phone: +353-87-9141972; email: rachel.sheehan@ul.ie

Abstract:

Objectives: This study characterised mental health, motivation, and their interrelations among 38 elite student-athletes over a 13-week season, while monitoring and considering the influence of their athletic and academic schedules.

Design: Longitudinal

Method: Electronically-administered questionnaires measured total mood disturbance and depressive symptoms (weekly), sleep quality and trait anxiety (monthly), and motivation, basic needs satisfaction and motivational climate (weeks one and 13).

Results: Thirty-seven percent of athletes reported scores indicative of mild-to-moderate depression, 32% were poor sleepers, and 8% were high trait anxious. These outcomes significantly improved over time, whereas the motivation-related variables remained stable. The athletes were predominantly intrinsically motivated, and reported high satisfaction of basic psychological needs. Task climate exceeded its ego counterpart. There were no significant sex-related differences for any mental health outcome at week one; however, autonomy and relatedness were significantly higher among females.

Conclusions: Collectively, these findings suggest that psychological monitoring of student-athletes, particularly over intense athletic and academic periods, is a powerful tool for identifying potential mental health and/or motivation-related issues that may influence performance and well-being.

Introduction

Mainstream and academic interest in athlete mental health has continued to grow, both because more athletes have anecdotally reported psychological struggles, and because there is increasing awareness of the potential psychological risks associated with athletic participation (e.g., Doherty, Hannigan, & Campbell, 2016). Despite the well-established benefits of physical activity for mental health (Office of Disease Prevention and Health Promotion, 2008), sport involvement does not guarantee protection from mental health issues. High-level athletes experience extreme training loads, saturated competition schedules, and heightened pressure both on and off the field (Rice et al., 2016). Notably, university students are also vulnerable to mental health difficulties, with the transition away from home, lack of traditional social support, and increasing academic stress being examples of contributing factors (Castillo & Schwartz, 2013). With this in mind, the demands may be even more intense for student-athletes, given the fact that athletic and academic workloads must be balanced (Brown et al., 2015).

Available evidence supports a link between mental health and motivation (Stenling, Lindwall, & Hassmén, 2015). Myriad theories, antecedents, and consequences have been investigated to elucidate the internal and external reasons for why people initiate and sustain effort (Ryan & Deci, 2007). The evidence regarding the motivation of competitive athletes is somewhat mixed; some studies report predominantly intrinsic motivation (Halldorsson, Helgason, & Thorlindsson, 2012), and others report extrinsic motivation (Chantal, Guay, Dobreva-Martinova, & Vallerand, 1996). Compared to full-time athletes, sport-related motivation may be particularly high among student-athletes to manage the dual roles they must balance in university (Gaston-Gayles, 2005), though the motivation profiles of student-athletes, and the potential influence of mental health on motivation, are not well known.

Mental Health

University student-athletes may be at-risk for impaired mental health, including disturbed mood, depression, anxiety, and poor sleep quality, due to their demanding lifestyles (Brown, Goehlert, Director, Graphics, & Seifert, 2014). Indeed, the well-established link between subjective well-being and an athlete's training response (Saw, Main, & Gastin, 2015) highlights the importance of monitoring athlete mental health. Perhaps equally important are the associations between performance, and mood (Beedie, Terry, & Lane, 2000), depression (Newman, Howells, & Fletcher, 2016), sleep (Gupta, Morgan, & Gilchrist, 2016), and anxiety (Woodman & Hardy, 2003). Notably, there is also an abundance of evidence regarding the protective effects of engaging in sport (e.g., reduced stress and distress, lower depression, increased life satisfaction and vitality; Eime, Young, Harvey, Charity, & Payne, 2013) and exercise (e.g., reduced all-cause mortality, cardiovascular disease and type II diabetes; Office of Disease Prevention and Health Promotion, 2008), potentially offsetting some of the challenges encountered by student-athletes.

Motivation

Self Determination Theory (SDT) addresses the types, antecedents, and outcomes of motivation (Deci & Ryan, 2000), and is the most influential theory in the area of competitive sport motivation (Clancy, Herring, MacIntyre, & Campbell, 2016). It posits that self-determined motivation (intrinsic motivation, and some forms of extrinsic motivation) is associated with adaptive (positive) outcomes, whereas non-self-determined motivation (remaining forms of extrinsic motivation, and amotivation) is associated with maladaptive (negative) outcomes (Deci & Ryan, 2000). Intrinsic motivation involves doing an action for the inherent pleasure, satisfaction or challenge, whereas extrinsic motivation involves doing an action in order to obtain a separable outcome. According to SDT, people behave in ways that satisfy their basic psychological needs for competence (belief you can successfully accomplish a task), autonomy (choosing actions that align with your values), and relatedness (having a connectedness with others; Deci & Ryan, 2000), which are associated with adaptive outcomes (e.g., well-being; Reinboth & Duda, 2006). Motivation is also influenced by social-environmental factors (Ames, 1992), such that a task motivational climate (which focuses on the process and self-comparison) is associated with competence, intrinsic motivation, and performance, and an ego motivational climate (which focuses on the outcome and normative comparison) is associated with extrinsic motivation, amotivation, and antisocial attitudes (Harwood, Keegan, Smith, & Raine, 2015).

The Current Study

University student-athletes face significant challenges due to the academic and athletic demands they must balance (Kaiseler, Poolton, Backhouse, & Stanger, 2017). The burden on elite student-athletes within the national sport of Gaelic games in Ireland is magnified because there is often an expectation for these athletes to play for their university, their club, and their county (region), with the staggered nature of the seasons resulting in little, if any, time off (Turner & Moore, 2016). Athletes frequently play two codes of Gaelic games (e.g., Gaelic football and hurling), with overlapping seasons due to the lack of an official off-season resulting in potentially six teams demanding the services of a single athlete (Turner & Moore, 2016). Although Gaelic games are technically amateur sports, they have reached a professional level in terms of resources, commitment, and expectations. Furthermore, they are accompanied by an intense community and national pride. As such, research in Gaelic games may have implications for other competitive sports, particularly those with a strong university (e.g., basketball in the United States) or community (e.g., football in the United Kingdom) presence, or those with brief competition periods (e.g., tennis and lacrosse in the United States, and cricket and basketball in the United Kingdom). Given the congested, multi-team athletic schedule many Gaelic games student-athletes face, coupled with the necessity to prioritise and meet academic goals, it is unsurprising that 52.5% of hurlers and 51.9% of Gaelic footballers aged 16 years and above drop out of sport, with 17-19 years olds being most at risk (Lunn, Kelly, & Fitzpatrick, 2013). Notably, this demanding context likely exists in other sports, and may also have implications for mental health and motivation, particularly given recent supportive evidence of the relationship between these factors among team-sport athletes (Sheehan, Herring, & Campbell, 2018).

Previous findings regarding student-athlete mental health and motivation are not definitive. Student-athletes may be susceptible to poor mental health (Brown et al., 2014), though highly motivated in order to manage their dual roles (Gaston-Gayles, 2005). Research has also shown that motivation and mental health are related, with motivation-related variables affecting later mental health (e.g., Stenling et al., 2015). To the authors' knowledge, however, no other study has longitudinally investigated mental health, motivation, and their interrelations, while simultaneously monitoring and considering the influence of athletic and academic schedules, among elite Gaelic games student-athletes over a condensed season. Therefore, the key objectives of this study were to characterise the mental health and motivation profiles of an elite student-athlete sample across a 13-week season, and to explore the influence of academic and athletic schedules on these profiles. The authors hypothesised that (i) scores for intrinsic motivation and task climate would exceed extrinsic motivation/amotivation and ego climate, respectively, and that motivation-related variables would remain relatively stable over time; and, (ii) student-athletes would report high satisfaction (e.g., scores above the midpoint) of their basic needs. Given the mixed findings in the literature regarding athlete mental health, investigations of mood, depressive symptoms, sleep quality, and trait anxiety, along with their associations with motivation-related variables, were exploratory.

Methods

Participants and Procedure

The University Ethics Committee approved the current study protocol, and all participants provided written informed consent prior to participation. Given 13 time points and a correlation of 0.5 between repeated measures, an a priori power analysis indicated that 14 participants would be needed to have 95% power for detecting a medium sized effect (g = 0.3) when using the traditional .05 criterion of statistical significance (Faul, Erdfelder, Lang, & Buchner, 2007). Four teams within one university were recruited for this study in order to represent the four codes of Gaelic games (football, ladies football, hurling, camogie). However, one team (camogie) could not participate, resulting in 45 student-athletes (three teams of 15 athletes) being included. Following attrition, the final sample size consisted of 38 student-athletes across four academic years (males = 20, females = 18; mean age = 19.97±1.60 years; mean Gaelic games experience = 13.81±2.87 years), which, given the power analysis, was deemed more than adequate for the main objectives of this study. The sample was 100% Caucasian, and represented non-scholarship student-athletes only due to the absence of scholarships for Gaelic games. Based on eliteness calculations (Swann, Moran, & Piggott, 2014), the teams were categorised as "semi-elite," meaning their level of participation is below the top standard in their sport. Though many individual student-athletes also compete at the highest standard in Gaelic games, the calculations took place at the team level.

Seven questionnaires were electronically administered over the condensed university season, from December 1st to February 23rd, which coincided with end-of-semester exams and Christmas break (Table 1). Based on the established recall period for the four mental health inventories, total mood disturbance (TMD) and depressive symptoms were measured weekly, and sleep quality and trait anxiety were measured monthly. Previous research has measured motivation ten weeks apart at its most frequent (Stenling, Ivarsson, Hassmén, & Lindwall, 2016), though intervals of six months and beyond are more common (Vink, Raudsepp, & Kais, 2015). To this end, the three motivation-related variables were measured at baseline, and after 13 weeks. The questionnaires were combined into a single packet and completed unsupervised on the same day each week. That is, student-athletes were given a 24-hour window during which to complete the packet at their own convenience, which aided in recruitment and compliance. Questionnaire completion required 5-10 minutes most weeks, increasing to approximately 18 minutes at weeks one and 13. Missing data were imputed using Last Value Carried Forward imputation (Twisk & de Vente, 2002).

INSERT TABLE 1

Measures

Mental Health

TMD was measured using the Profile of Mood States – Brief (POMS-B; McNair, Lorr, & Droppleman, 1971). The POMS-B consists of 30 adjectives describing how the respondent may be feeling right at this moment for five negative (tension, depression, anger, fatigue, and confusion) and one positive mood state (vigour), with scores ranging from -20 to 100 (higher scores indicate more disturbed mood). The subscales of the POMS-B have demonstrated acceptable reliability (.71-.88; Yeun & Shin-Park, 2006).

Depressive symptom severity was assessed using the 16-item Quick Inventory of Depressive Symptomatology – Self Report (QIDS-SR; Rush et al., 2003). Respondents were asked to rate symptoms corresponding to nine core dimensions of depression from the prior seven days. Depressive symptom severity was classified as: none (0-5), mild (6-10), moderate (11-15), severe (16-20), and very severe (21 and over). A high reliability coefficient (.86) has been reported for the QIDS-SR (Rush et al., 2003).

Sleep quality was measured using the 19-item Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds III, Monk, Berman, & Kupfer, 1989). The PSQI generates seven component scores that quantify overall sleep quality for the preceding month (good quality = 0-5; poor quality = >5): subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The component scores of the PSQI have a reliability coefficient of .83 (Buysse et al., 1989).

Anxiety symptoms were measured using the State-Trait Anxiety Inventory – Y2 (STAI-Y2; Spielberger, Gorsuch, & Lushene, 1983). Respondents rated how they generally feel in response to 20 items. Scores greater than one-standard deviation above the age-related norm (≥50) were classified as high trait anxious (Spielberger et al., 1983). A reliability coefficient of .90 has been reported for the STAI-Y2 (Spielberger et al., 1983).

Motivation

Motivation was measured using the 18-item Sport Motivation Scale II (SMS-II; Pelletier, Rocchi, Vallerand, Deci, & Ryan, 2013). The SMS-II asks athletes "why do you practice your sport?" and provides scores for intrinsic motivation, extrinsic motivation, and amotivation. The subscales have reliability coefficients ranging from .73 to .86 (Pelletier et al., 2013).

Athletes' perceptions of competence, autonomy, and relatedness were measured using the Basic Need Satisfaction in Sport Scale (BNSSS; Ng, Lonsdale, & Hodge, 2011). This 20-item scale asks athletes how they feel when participating in their main sport, provides a seven-point Likert scale for responses, and has reliability coefficients of .61-.82 for the five subscales (Ng et al., 2011).

Athletes' perceptions of the motivational climate typically experienced on their teams were assessed using the 33-item Perceived Motivational Climate in Sport Questionnaire II (PMCSQ-II; Newton, Duda, & Yin, 2000). The PMCSQ-II uses the stem "On this team…" and provides scores for perceived task- and ego-involving climates. Reliability coefficients of .88 and .87 have been reported for task and ego climates, respectively (Newton et al., 2000).

Data Analysis

Descriptive statistics, prevalence, and Pearson's correlation coefficients were calculated. Paired t-tests and repeated measures ANOVAs examined differences in each outcome over time. Hedges' g effect sizes and associated 95% confidence intervals (95% CI) were calculated to quantify the magnitude of change in each variable across the 13 weeks. For each measure, the change in score from week one to 13 was divided by the pooled week one standard deviation, and effect sizes were calculated such that an improvement (e.g., reduction in depressive symptoms) resulted in a positive effect size (Hedges & Olkin, 1985). Independent t-tests examined sex-related differences in each outcome at weeks one and 13. Chi-squared tests assessed sex-related differences in depression, poor sleep quality, and high trait anxious status. In addition to the large sample size and length of data collection increasing the precision of analyses, Bonferroni correction of the significance level was used to control for Type I errors when making multiple between-groups comparisons and correlations (Vincent & Weir, 1999).

Results

Descriptive Statistics

Table 2 presents descriptive statistics for the mental health and motivation-related variables at weeks one and 13, and Hedges' g effect sizes and associated 95% CI for change across time. See Supplementary Table 1 for weekly data.

INSERT TABLE 2

Total mood disturbance ($F(3, 35) = 5.81$, $p \leq 0.002$), depressive symptoms ($F(3, 35) = 22.04$, $p < 0.0001$), and sleep quality ($F(3, 35) = 8.86$, $p < 0.0001$) significantly improved over the 13 weeks. The magnitude of change was large for TMD ($g = 0.72$) and depressive symptoms ($g = 1.10$), and moderate for sleep quality ($g = 0.40$). There were no sex-related differences in mental health status.

There were no significant changes in any motivation-related outcome from week one to 13. Mean intrinsic motivation was significantly higher than extrinsic motivation ($t(37) = 4.780$, $p < 0.0001$) and amotivation ($t(37) = 16.842$, $p < 0.0001$). Task climate was significantly higher than ego climate ($t(37) = 13.551$, $p < 0.0001$). Autonomy ($t(36)= - 2.10$, $p \leq 0.043$) and relatedness ($t(36) = -2.67$, $p \leq 0.011$) were significantly higher among females than males at week one, and there were no significant sex-related differences at week 13.

Prevalence

The number of athletes with scores indicative of depression, poor sleep quality, and high trait anxious status are provided in Table 3. Thirty-seven percent of the athletes reported scores indicative of mild-to-moderate depression at week one, which decreased to 11% at week 13. Seventy-nine percent of athletes who initially reported scores indicative of depression did not report such scores 13 weeks later. Three athletes' status remained unchanged over the season, and one athlete reported scores indicative of mild depression only at week 13. At week one, the mean PSQI score was above the cut-off score for poor sleep, with 32% of the athletes categorised as poor sleepers; this decreased to 26% at week 13. One-quarter of athletes who were categorised as poor sleepers at baseline changed to good sleepers 13 weeks later; three-quarters reported poor sleep quality at both time points, and one athlete reported poor sleep quality only at week 13.

INSERT TABLE 3

Correlations

Supplementary Table 2 illustrates significant correlations between mental health variables and motivation-related variables at and between weeks one and 13. When adjusted for potential Type I error of multiple testing, significant moderate-to-large, negative correlations were found between anxiety symptoms and relatedness (week one, $r = -0.474$, $p \leq 0.003$), and task climate (week one, $r = -0.480$, $p \leq 0.002$; week 13, $r = -0.488$, $p \leq 0.002$). Anxiety symptoms were positively correlated with ego climate (week one, $r = 0.452$, $p \leq 0.004$; week 13, $r = 0.520$, $p \leq 0.001$). At week 13, significant moderate-to-large, negative correlations were found between anxiety symptoms and intrinsic motivation ($r = -0.478$, $p \leq 0.002$), extrinsic motivation ($r = -0.458$, $p \leq 0.004$), competence ($r = -0.671$, $p < 0.0001$), and autonomy ($r = -0.601$, $p < 0.0001$). Positive, moderate-to-large correlations were found between week one ego climate and week 13 TMD ($r = 0.542$, $p < 0.0001$), and anxiety ($r = 0.559$, < 0.0001).

Discussion

Consistent with study hypotheses, the current findings supported adaptive motivational patterns among elite student-athletes over a 13-week season. Intrinsic motivation slightly exceeded extrinsic motivation, which in turn greatly exceeded amotivation. In addition, athletes reported high satisfaction of basic needs, and task climate exceeded ego climate. Despite the well-established benefits of intrinsic motivation over extrinsic motivation (Deci & Ryan, 2000), the blend in the current study appears to be typical among competitive athletes because of the simultaneous emphases on enjoyment/challenge and competition/winning (Clancy et al., 2016). Exploratory analyses indicated that this elite student-athlete sample was not immune to mental health impairments. Almost 40% of the sample reported scores indicative of mild-to-moderate depression at week one, and approximately one-third were poor sleepers. However, across the season, there were significant improvements in TMD, depressive symptoms, and sleep quality, and non-significant improvements in anxiety symptoms. Overall, the potential athletic, academic, and social challenges of a condensed season did not undermine the athletes' motivation or mental health, which bodes well for other university sports with accelerated schedules. In fact, sport involvement seemed to provide a buffer for the student-athletes, such that the progressing season actually improved mental health, even in the face of potential life stressors.

To place these preliminary findings in context, the present sample's mean *TMD* was lower than that for other Irish team sport athletes (Sheehan et al., 2018), and for similarly-aged Americans (Yeun & Shin-Park, 2006). Although there was a large, significant decrease (improvement) in TMD over time, there were five weeks during which TMD increased. The first instance was when exams began, and the third instance was when semester re-started after Christmas, which is consistent with previous research on the acute effect of academic time on mood (Greene & Maggs, 2017). The second instance followed a friendly game for two of the teams, and the fourth and fifth instances were following season-ending games for two of the teams, which can potentially be attributed to game outcome (Jones & Sheffield, 2007). Given the link between mood and performance (Beedie et al., 2000), among other critical sport outcomes, it is important for athletes and coaches to be aware of potential mood fluctuations in response to academic commitments and game outcome, particularly among student-athletes who compete for multiple teams. Such knowledge may allow athletes and coaches to engage in and promote mood-regulating strategies (e.g., use relaxation techniques; Stevens & Lane, 2001).

Thirty-seven percent of athletes had mild-to-moderate *depressive symptoms* at week one. This prevalence is lower than the 45% of Irish athletes reported by Sheehan et al. (2018), but higher than that reported for similar samples of Australian (Gulliver, Griffiths, Mackinnon, Batterham, & Stanimirovic, 2015) and American (Wolanin, Hong, Marks, Panchoo, & Gross, 2016) athletes. This variability in the reporting of depressive symptoms is also evident among non-athlete samples, where both higher (Mergen et al., 2011) and lower (Gonzalez, Boals, Jenkins, Schuler, & Taylor, 2013) scores than the current study have been reported for American university students. However, there was a large, significant decrease in depressive symptoms across the 13 weeks, reinforced by a reduced prevalence of mild-to-moderate depression of 11% at week 13. This echoes previous evidence of the beneficial effects of sport participation (Office of Disease Prevention and Health Promotion, 2008). Scores increased (worsened) at weeks six, nine, 11, and 12, however. Week six took place immediately following a friendly game for two of the teams, with the three other weeks coinciding with the return of the spring semester. As with mood, game outcome (Jones & Sheffield, 2007) and academic time (Greene & Maggs, 2017) may have contributed to these fluctuations. It is also possible that athletes engage in negative behaviours following a loss, such as excessive alcohol consumption as a means of coping (Martens, Cox, Beck, & Heppner, 2003), which impact reporting of depressive symptoms.

Almost one-third of athletes were categorised as poor sleepers at week one, with the sample mean exceeding the cut-off score (five) for poor *sleep quality*. This prevalence is lower than that previously reported among Irish team sport athletes (Sheehan et al., 2018) and New Zealand athletes (Swinbourne, Gill, Vaile, & Smart, 2016). Furthermore, over 65% of American university students were found to be poor sleepers (Lund, Reider, Whiting, & Prichard, 2010). The current sample mean was lower than those reported in each of the athlete studies above, though higher than for healthy non-athletes (Backhaus, Junghanns, Broocks, Riemann, & Hohagen, 2002). Though a prevalence of 30% is quite high, the current sample seems to have been better sleepers than previous reported samples. As with depressive symptoms, there was a significant improvement in sleep quality across the 13 weeks. Though university students tend to have high levels of sleep disturbance (Gupta et al., 2016), almost half of the data collection in the current study comprised Christmas break. Thus, this period without academic commitments may have contributed to improved sleep quality due to sleep extension (Mah, Mah, Kezirian, & Dement, 2011). The initial decrease (improvement) in PSQI scores between weeks one and five, however, was followed by an increase (worsening) at weeks nine and 13. The return to university at week nine may have contributed to this, as students may have had to adjust to early rises for class (Lund et al., 2010), and commit time to coursework (Greene & Maggs, 2017).

Three male athletes (less than 8% of the sample) were highly trait anxious at week one. However, the sample mean was below the cut-off score for high *trait anxiety*. This prevalence and average is lower than that previously reported among Irish athletes (Sheehan et al., 2018). Likewise, the average score is lower than that reported for Middle Eastern free diving student-athletes and non-athletes (Alkan & Akış, 2013), and for Japanese rhythmic gymnastics student-athletes and non-athletes (Akai, Ishizaki, Matsuoka, & Homma, 2010). Anxiety symptoms did not significantly change across the monitoring period, consistent with the low and constant prevalence reported among British university student-athletes (van de Pol, Kavussanu, & Kompier, 2015), which is potentially due to the relative stability of trait anxiety scores across time (Spielberger et al., 1983). Overall, trait anxiety appeared to be the least problematic mental health outcome measured for the current sample.

Scores for intrinsic motivation exceeded their less self-determined counterparts, indicating adaptive motivational patterns. At week one, the current sample means for intrinsic and extrinsic motivation were higher than previously reported by Sheehan et al. (2018). Notably, the scores do not indicate that intrinsic motivation dominates for the current sample; there are high levels of both, with amotivation being low. This supports previous findings regarding the presence of intrinsic and extrinsic motivations among successful teams (Blegen, Stenson, Micek, & Matthews, 2012). That is, a complementary emphasis on enjoyment/challenge and victory/competition underpins many athletes' motivation for sport. The associations between baseline amotivation and week 13 TMD and sleep quality are consistent with previous evidence of the maladaptive effects of non-self-determined motivation (Deci & Ryan, 2000). The association between amotivation and sleep quality was only evident across time points, indicating that non-self-determined motivation may impair future sleep, with no acute effects. The finding that motivation did not significantly change is counter to some previous studies showing an increase in motivation over time (Stenling et al., 2016). This variation, however, was among individual-sport athletes, potentially suggesting that the presence of teammates may stabilise athletes' reasons for engaging in sport. Overall, these Gaelic games athletes were characterised by self-determined motivation, which may have contributed to their improved mental health across the season (Milyavskaya & Koestner, 2011).

The BNSSS scores indicate high satisfaction of the three basic needs, all of which exceeded those previously reported among a similar Irish sample (Sheehan et al., 2018). Mean scores for competence and autonomy also exceeded those reported for a sample of New Zealand athletes, though relatedness was lower (Ng et al., 2011). This finding may be attributed to the transience of university Gaelic games, in that athletes usually play with other teams and, therefore, teammates for a longer period. The expectation that elite Gaelic games athletes play with numerous teams may have contributed to their high competence scores, as such in-demand athletes likely feel very proficient at their sport. The finding that autonomy and relatedness scores were significantly higher for females at week one suggests they value free choice and a sense of connectedness more so than males. This may be attributed to the fact that ladies Gaelic games have fewer support staff, which may foster increased independence and camaraderie among the athletes. Previous research, however, has found higher relatedness scores for male than female American student-athletes (Stults-Kolehmainen, Gilson, & Abolt, 2013). Overall, the high and unchanging perception of basic needs satisfaction is adaptive in the current study.

The current sample reported significantly higher scores for task climate than ego climate, indicating they perceive their coaches to have a largely positive influence on their motivation. These scores are consistent with those reported by Sheehan et al. (2018). Scottish elite athletes also reported higher scores for task than ego climate (Allen, Taylor, Dimeo, Dixon, & Robinson, 2015), though the ego climate scores were significantly higher than those for the current sample. In contrast, Poux and Fry (2015) reported moderate levels of both task and ego climate among American team-sport athletes, which reinforces the finding that an ego climate may not be maladaptive when accompanied by task-involving cues (Ommundsen & Roberts, 1999). The significant associations between baseline ego climate and the four mental health variables 13 weeks later echo previous reports of the maladaptive consequences of such a climate (Harwood et al., 2015). In this case, the low ego climate score at baseline may account for the fact that the mental health scores improved over time. Overall, the athletes perceived their coaches to act in a consistent manner over time, creating an adaptive motivational environment.

Implications

The study provides several practical lessons for optimising the mental health and motivation of student-athletes. Firstly, coaches could consider conducting in-situ psychological monitoring to ensure that student-athletes are prepared for the athletic and academic demands of university. Despite the overall trends towards improved mental health in the current study, there were weekly fluctuations in the data that are best captured using continuous application-based monitoring (e.g., Google Forms, Metrifit). Regular monitoring would potentially encourage help-seeking behaviour, and allow at-risk student-athletes to be flagged for support. Secondly, pre-season workshops could be organised to enhance mental health literacy in athletic departments. Despite awareness of its importance, sleep quality appears to be poor among many student-athletes. Thus, the third recommendation is for relevant stakeholders (e.g., Student Sport Ireland) to create a guide for sleep hygiene for both athlete and coaches to implement. Fourthly, university coaches could open communication channels with coaches outside the university to ensure that student-athletes with commitments to more than one team are not overly burdened. Finally, coach-centred workshops could be organised in order to increase knowledge regarding motivation, particularly the motivational climate. This would equip coaches with the means to encourage adaptive motivational patterns, which may have subsequent positive effects on mental health.

Limitations

Although the current study makes a unique contribution to the sport psychology literature by integrating mental health and motivation-related variables over time among an understudied sample, it has limitations. Firstly, a larger sample size could have been recruited; therefore, the findings might not be representative of all Gaelic games student-athletes. Secondly, Gaelic games are unique to Ireland, making the findings less generalisable to other sports and nations. Furthermore, the findings may not be representative of individual sport athletes. Nevertheless, the student-athlete dual role is common in other countries, which enhances the utility of the current findings in further understanding student-athletes in the United States, the United Kingdom, and elsewhere. Thirdly, it was not possible to account for athletic commitments outside the university Gaelic games schedule. In future, it would be useful to account for club and county Gaelic games teams and alternative sports (e.g., basketball) in order to obtain further insights into this congested competition period.

Fourthly, self-report measures may be subject to bias; therefore, objective assessments by a clinician and qualitative interviews could be used in future to further substantiate the mental health and motivation findings, respectively.

Conclusion

Student-athletes who play Gaelic games experience an intense competition period during the winter, which is similar to the accelerated schedules of many other university sports. As well as completing an entire university athletic season in just over three months, they must juggle classes and exams, and compete for their club/county. This somewhat overloaded 13-week period is potentially further complicated by the social demands that accompany the Christmas season. Overall, depressive symptoms and poor sleep quality appear to affect the student-athletes, with moderately high prevalence rates for both. Fortunately, three of the mental health outcomes significantly improved over time, with the fourth (trait anxiety) being at low levels at week one. These trends indicate that sport involvement imparted mental health benefits on the athletes. Furthermore, the athletes displayed predominantly adaptive motivational patterns. Consistent perceptions of a task climate and high satisfaction of basic needs likely contributed to and maintained the athletes' self-determined motivation, which comprised elements of intrinsic and extrinsic motivation. Notably, this blend appears to be typical of many competitive athletes who seek to balance their love of sport and desire to win. Baseline amotivation and ego climate, though both at low levels, were associated with poor mental health 13 weeks later, which indicates that motivation-related variables affect later mental health. These findings reinforce the utility of monitoring psychological variables among athletes, particularly those who are balancing athletic and academic commitments over a short timeframe.

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Table 1. Testing, academic and athletic schedule for hurling, freshman hurling, and ladies football teams.

December							
Week	Mon	Tues	Wed	Thur	Fri	Sat	Sun
1		1***	2	3	4 Semester ends	5 Exams start	6
2	7	8*	9	10	11	12	13
3	14	15*	16	17	18 Exams end	19	20
4	21	22*	23	24	25	26	27
5	28	29**	30	31			
January							
					1	2 1st friendly game (H, FrH)	3
6	4	5*	6	7	8	9	10
7	11	12*	13	14	15	16 1st friendly game (LFB)	17
8	18	19*	20	21	22	23	24
9	25 Semester starts	26**	27	28	29	30	31
February							
10	1	2*	3	4	5	6	7
11	8	9*	10	11	12	13	14
12	15	16*	17	18 FrH finished	19	20	21
13	22	23***	24	25	26	27 H finished	28

*POMS-B, QIDS-SR16; **POMS-B, QIDS-SR16, PSQI, STAI-Y2; *** POMS-B, QIDS-SR16, PSQI, STAI-Y2, SMS-II, BNSSS, PMCSQ-II; H = hurling; FrH = fresher hurling; LFB = ladies football; LFB finished on 12/3

Table 2. Mean (standard deviation) for mental health and motivation-related variables (overall and broken down by sex) at weeks one and 13, plus Hedges' g effect sizes (95% CI) for change over time.

	Week 1			Week 13			Hedges' g
	Total	Male	Female	Total	Male	Female	Total
TMD	6.47 (9.95)	4.80 (8.23)	8.33 (11.52)	-0.63 (9.48)	-1.80 (9.28)	0.67 (9.80)	0.72 (0.26, 1.18)
Dep	4.76 (2.63)	5.15 (2.83)	4.33 (2.38)	2.13 (2.00)	1.55 (1.47)	2.78 (2.34)	1.10 (0.62, 1.58)
SlQ	5.05 (2.24)	4.95 (2.31)	5.17 (2.23)	4.11 (2.43)	3.80 (1.99)	4.44 (2.85)	0.40 (-0.05, 0.85)
Anx	36.34 (6.94)	37.85 (8.19)	34.67 (4.92)	34.37 (8.98)	33.25 (8.40)	35.61 (9.68)	0.24 (-0.21, 0.69)
IM	5.11 (1.28)	5.08 (1.37)	5.15 (1.21)	4.97 (1.47)	4.82 (1.49)	5.15 (1.46)	0.10 (-0.35, 0.55)
EM	4.34 (1.16)	4.18 (1.09)	4.52 (1.25)	4.09 (0.99)	4.08 (1.05)	4.11 (0.95)	0.23 (-0.22, 0.67)
AM	1.28 (0.57)	1.18 (0.28)	1.39 (0.77)	1.39 (0.56)	1.38 (0.50)	1.39 (0.64)	-0.19 (-0.63, 0.26)
Com	5.86 (1.05)	5.67 (1.34)	6.08 (0.57)	5.67 (1.12)	5.68 (1.02)	5.67 (1.24)	0.17 (-0.27, 0.62)
Aut	5.73 (0.93)	5.44 (1.12)	6.05 (0.53)	5.57 (0.98)	5.46 (1.05)	5.68 (0.91)	0.17 (-0.28, 0.61)
Rel	5.97 (1.12)	5.54 (1.32)	6.44 (0.58)	5.75 (1.16)	5.46 (1.34)	6.07 (0.87)	0.19 (-0.26, 0.64)
TC	4.26 (0.40)	4.19 (0.43)	4.33 (0.36)	4.28 (0.53)	4.17 (0.59)	4.40 (0.43)	-0.04 (-0.49, 0.40)
EC	2.38 (0.63)	2.38 (0.57)	2.38 (0.70)	2.25 (0.65)	2.31 (0.58)	2.19 (0.74)	0.19 (-0.25, 0.64)

TMD = total mood disturbance; Dep = depressive symptoms; SlQ = sleep quality; Anx = trait anxiety; IM = intrinsic motivation; EM = extrinsic motivation; AM = amotivation; Com = competence, Aut = autonomy, Rel = relatedness; T/E C = task/ego climate

Table 3. Number (percentage) meeting cut-off score (overall and broken down by sex) for depressive symptoms, sleep quality, and trait anxiety for weeks one and 13.

Caseness cut-off	Week 1			Week 13		
	Overall	Males	Females	Overall	Males	Females
No Dep	24 (63.2)	10 (50)	14 (77.8)	34 (89.5)	20 (100)	14 (78)
Mild Dep	12 (31.5)	9 (45)	3 (16.7)	4 (10.5)	0 (0)	4 (22)
Moderate Dep	2 (5.3)	1 (5)	1 (5.5)	0 (0)	0 (0)	0 (0)
Good SlQ	26 (68.4)	14 (70)	12 (66.7)	28 (73.7)	15 (75)	13 (72)
Poor SlQ	12 (31.5)	6 (30)	6 (33.3)	10 (26.3)	5 (25)	5 (28)
Normal Anx	35 (92.1)	17 (85)	18 (100)	34 (89.5)	18 (90)	16 (89)
High Anx	3 (7.9)	3 (15)	0 (0)	4 (10.5)	2 (10)	2 (11)

Dep = depressive symptoms; SlQ = sleep quality; Anx = trait anxiety

Supplementary Table 1. Mean (standard deviation) for mental health variables for each week. A decrease in score indicates an improvement.

	Possible range	1	2	3	4	5	Avg W2-5	6	7	8	9	Avg W6-9	10	11	12	13	Avg W10-13
TMD	-20-100	6.47 (9.95)	7.16 (12.90)	4.00 (12.20)	3.08 (13.41)	1.21 (13.44)	3.86 (10.62)	2.26 (11.85)	-1.13 (9.00)	-2.13 (8.09)	-0.26 (10.45)	-0.28 (7.51)	-0.61 (9.46)	-1.97 (10.72)	-1.05 (11.64)	-0.63 (9.48)	-1.07 (9.19)
Dep	0-27	4.76 (2.63)	4.11 (2.76)	3.55 (3.15)	3.45 (3.15)	3.11 (2.77)	3.55 (2.47)	3.32 (3.00)	3.11 (2.73)	2.39 (1.64)	2.42 (2.00)	2.81 (1.96)	1.89 (1.74)	2.21 (2.23)	2.34 (2.39)	2.13 (2.00)	2.17 (1.77)
SlQ	0-21	5.05 (2.24)	-	-	-	3.18 (2.84)	-	-	-	-	4.08 (2.66)	-	-	-	-	4.11 (2.43)	-
Anx	20-80	36.34 (6.94)	-	-	-	34.68 (7.40)	-	-	-	-	34.50 (7.76)	-	-	-	-	34.37 (8.98)	-

TMD = total mood disturbance; Dep = depressive symptoms; SlQ = sleep quality; Anx = trait anxiety

Supplementary Table 2. Correlations for study variables at weeks one and 13.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
TMD1																							
QIDS1	.375*																						
PSQI1	.451**	.480**																					
STAI1	.403*	.436*	0.124																				
IM1	0.042	-0.005	0.114	-0.384*																			
EM1	0.034	0.02	0.171	-0.303	.670**																		
AM1	.369*	0.276	0.201	0.163	-0.004	0.212																	
Com1	-0.092	-0.11	0.028	-.434*	.527**	.528**	-0.043																
Aut1	0.068	-0.066	-0.049	-.434*	.574**	.535**	0.032	.827**															
Rel1	0.12	-0.036	0.123	-.474**	.536**	.515**	0.071	.796**	.834**														
TC1	-0.018	-0.261	-0.017	-.480**	.591**	.518**	0.05	.627**	.612**	.547**													
EC1	.407*	.400*	0.207	.452**	-0.078	-0.096	.422*	-0.272	-0.271	-0.241	-.361*												
TMD13	.577**	.509**	0.313	.358*	-0.087	-0.038	.329*	-0.018	-0.045	0.001	-0.087	.542**											
QIDS13	.323*	.459**	.354*	0.199	-0.094	-0.055	0.316	-0.06	-0.064	0.108	-0.218	.358*	.590**										
PSQI13	.508**	.603**	.601**	0.25	0.118	0.064	.332*	-0.079	-0.067	0.108	-0.061	.399*	.705**	.582**									
STAI13	.502**	.413*	0.188	.455**	-0.225	-0.13	0.319	-0.07	-0.177	-0.094	-0.205	.559**	.699**	.385*	.517**								
IM13	-0.131	-0.088	-0.107	-0.058	.454**	0.248	-0.088	-0.011	0.215	0.115	0.219	-0.142	-0.211	-0.042	-0.052	-.478**							
EM13	0.034	-0.056	0.189	-0.152	.586**	.537**	0.077	.341*	.431*	.464**	.419*	-0.114	-0.232	-0.002	0.011	-.458**	.714**						
AM13	0.31	0.082	0.055	0.152	-0.121	-0.12	.339*	-0.076	-0.056	-0.117	0.054	0.194	0.103	-0.078	0.055	0.317	-.352*	-0.257					
Com1	-	-	-	-0.301	.483*	0.227	-	.352*	.404*	.337*	0.312	-	-	-	-	-	.686*	.660*	-				

3	0.272	0.237	0.032		*		0.053					.325*	.409*	0.157	0.217	.671**	*	*	.409*				
Aut13	-0.086	-0.236	-0.089	-0.286	.554**	0.267	-0.102	0.284	.487**	.426*	.358*	-0.171	-.334*	-0.072	-0.163	-.601**	.759**	.760**	-.413*	.817**			
Rel13	-0.03	-0.246	-0.113	-0.256	.364*	0.159	-0.026	0.219	.415*	.501**	0.276	-0.167	-0.191	0.131	-0.009	-.441*	.641**	.720**	-.354*	.617**	.836**		
TC13	-0.131	-.338*	-0.291	-0.282	.338*	0.17	0.081	0.099	.375*	0.295	.456**	-0.26	-0.242	-0.153	-0.104	-.488**	.754**	.593**	-0.272	.650**	.744**	.754**	
EC13	.376*	0.233	.324*	0.27	0.069	0.054	0.14	-0.06	-0.215	-0.134	-0.282	.738**	.404*	0.218	0.312	.520**	-0.286	-0.116	0.159	-.371*	-0.257	-0.269	-.486**

**p < 0.004, *p < 0.05; TMD = total mood disturbance; Dep = depressive symptoms; SlQ = sleep quality; Anx = trait anxiety; IM = intrinsic motivation; EM = extrinsic motivation; AM = amotivation; Com = competence, Aut = autonomy, Rel = relatedness; T/E C = task/ego climate

Highlights

- Student-athletes experience intense athletic and academic demands in-season.
- Depressive symptoms and poor sleep quality affect Gaelic games student-athletes.
- Despite excessive demands, mental health improves over condensed seasons.
- Gaelic games student-athletes have predominantly adaptive motivational patterns.
- Psychological monitoring is useful over intense athletic and academic periods.