Physical activity on mental wellbeing in senior English Premier League soccer players during the COVID-19 pandemic and the lockdown

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ABSTRACT
The COVID-19 pandemic and the subsequent lockdown created new stressors that could potentially attenuate mental wellbeing (MW) in athletes, who are already susceptible to poor MW. This study aims to describe fluctuations to MW during “lockdown” and subsequent “return to sport” protocols, in comparison to the normal “in-season” in professional soccer. Twenty-five English Premier League (EPL) soccer players completed the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) every two weeks, during the 2019/2020 season, and every week during “lockdown” and “return to training” for 28 weeks. The duration of each physical activity (PA) session completed was recorded. No significant differences were found for MW between time points (In-season, lockdown, return to training and the restart) (51.5 ± 5.6 vs. 50.7 ± 4.8 vs. 50.8 ± 5.7 vs. 50.7 ± 5.6 (p > 0.05)) respectively. Individually, differences were identified; in-season weekly session duration (243 ± 38 min) was higher than during lockdown (180 ± 62 min) (p < 0.05). During lockdown, weekly MW scores were related to the previous 7-day number of sessions (r = 0.151) and active min (r = 0.142) (p < 0.05). Furthermore, participants that exercised >250 min in lockdown, had higher MW scores (52.46 ± 4.65) than <250 min (50.35 ± 6.55) (p < 0.05). MW responses to lockdown were best understood on an individual basis. Additionally, PA only had a measurable effect on MW when >250 min. Further, stressors imposed upon players during an EPL season, are potentially greater than those inflicted by the lockdown. Implications for monitoring MW in EPL soccer players and the potential inclusion of an in-season break are discussed. Highlights
• Mental Wellbeing Responses, as measured by the Warwick-Edinburgh Mental Wellbeing scale did not change significantly at a group level across the four phases of the season. However, on an individual level changes were evident.
• There was a decline in the trend of wellbeing scores during in-season, return to training and the restart, but an increase in wellbeing scores during lockdown.
• Physical Activity had a measurable effect on wellbeing, when physical activity was >250 min during lockdown.
• These findings highlight the need for individual monitoring of wellbeing and longitudinal monitoring in sport to identify decline in wellbeing and implement intervention. In addition, the prescription of physical activity >250 min per week during lockdown in trained athletes may promote positive mental health.

Introduction
Mental health (MH) symptoms and disorders in athletes exceed those in the general population (Reardon et al., 2019). When compared to the general population, elite rugby players were reported to have a 5.5% lower mental wellbeing (MW) score (Fat, Scholes, Boniface, Mindell, & Stewart-Brown, 2017; Nicholls, Madigan, Fairs, & Bailey, 2020). Further, the prevalence of MH disorders might be greater in soccer than alternative sports (Gouttebarge, Frings-Dresen, & Sluiter, 2015). Within 262 soccer players, 37% reported MH disorders over a 12-month period (Kilic et al., 2018). In 660 male soccer players, 9% reported adverse alcohol, 38% anxiety and depression and 58% adverse nutrition (Gouttebarge et al., 2019). Vulnerability to poor MH may be related to both sporting and non-sporting factors (Rice et al., 2016). A professional sports career is characterized by over 640 distinct stressors that could potentially augment poor MH (Arnold & Fletcher, 2012). Elite Premier League (EPL) soccer players are exposed to
excessive training loads (TL) and fixture congestion therefore exacerbating physical demands (Rice et al., 2016; Carling, McCall, LeGall, & Dupont, 2015). This creates a physical activity (PA) paradox, whereby the usual health benefits of PA are absent, and may compromise MW through overtraining, injury and burnout (Peluso & Andrade, 2005). Injuries have been reported to negatively impact athlete MW, a result of absence from sport, threatening athletic identity (Abbott et al., 2019). Further, sleep deprivation as a consequence of travel and evening matches, career transitions, performance difficulty and media scrutiny could all attenuate MW (Nedelec, Dawson, & Dupont, 2019; Rice et al., 2016). Alternatively, non-sporting factors such as negative life events (Gouttebarge, Aoki, Verhagen, & Kerkhoffs, 2017), may potentially attenuate MW. It is therefore imperative health and wellbeing are monitored to help identification of decline, and support early intervention. The “Warwick-Edinburgh Mental Wellbeing Scale” (WEMWBS) (Stewart-Brown et al., 2009), has been utilized and demonstrated as a simple and cost-effective way to monitor for potential MH disturbances in professional male soccer players (Abbott et al., 2019). This study highlighted that injury and contextual match factors, such as non-match selection accounted for 50% of the variability in MW.

The COVID-19 pandemic, and implementation of lockdowns, caused the suspension of all professional sporting events, including the EPL (13th March 2020). This created new stressors on athletes, exacerbating their susceptibility to poor MH (Reardon et al., 2020). Athletes’ usual routines and competition schedules were terminated and reduced all in-person communication with players and coaches in which athletic identity is fundamentally derived (Jukic et al., 2020). The pandemic also led to a reduction in PA. In 692 elite and semi-elite South African athletes, 75% reduced their TL and intensity and 50% were depressed and lacked motivation to train (Pillay et al., 2020). This significantly changed athletes’ livelihoods and identities, which can proliferate vulnerability to poor MW (Reardon et al., 2020). In contrast, it has been argued the pandemic has provided an opportunity to augment MW, in the form of increasing non-athletic identity (Reardon et al., 2020). Further, athletes could spend increased time with their immediate family, which is somewhat challenging in-season. Additionally, the prolonged recovery from sport-related stressors, such as training and competition, could have allowed a complete physiological and mental reset (Jukic et al., 2020). Support practitioners have attempted to maintain positive wellbeing throughout this period. Examples of strategies include individualized training programmes, and regular team sessions utilizing online communication tools. Research suggests that 25% of athletes engaged in digitally directed programmes from sporting personnel (Pillay et al., 2020). Upon return to sport (RTS), additional stressors were placed upon athletes. A sudden increase in TL and congested fixture periods potentially exacerbated the risk of injury (Reardon et al., 2020). Further, the RTS protocols took place during the lockdown, meaning the risk of players contracting COVID-19 was elevated, potentially placing greater risk upon their families (Reardon et al., 2020). Nevertheless, research suggested that 50% of athletes were comfortable to RTS when advised (Pillay et al., 2020)

Currently, the majority of research investigating the effect of lockdown upon MH focused upon clinical populations (Paules, Marston, & Fauci, 2020), rather than athletic populations. In student-athletes, reduced PA during the lockdown reduced sleep quality, quantity and increased depressive symptoms (NCAA, 2021). Moreover, depression and anxiety symptoms were lower in athletes than their novice counterparts (Senisik, Denerel, Koyagasioglu, & Tunc, 2020).

Considering the recent research focusing upon the COVID-19 pandemic, specifically the reduction in PA during lockdown, and increased depressive symptoms in student-athletes (NCAA, 2021), and the uncertainty surrounding the RTS (Pillay et al., 2020). The current study aimed to explore the influence of the pandemic on MW during the “lockdown” and “RTS” protocols in contrast to the “normal” in-season, in EPL soccer players. This provides an opportunity to understand responses to MW during the COVID-19 pandemic in elite athletes and allow novel comparisons between the psychological stressors of the EPL, and their subsequent absence.

Methods

Participants

Twenty-five first-team professional male soccer players from an EPL club participated in this study (height: 183.3 ± 8.7 cm; weight: 81.15 ± 8.58 kg; age: 27.2 ± 4.0 yr). All participants competed in the 2019–2020 season and completed routine training sessions, matches and training prescribed during the lockdown. Full approval was received from the local ethics review board and participants provided informed written consent.

Experimental procedure

The participants completed a questionnaire to assess MW across the different phases of the season (Figure
This was completed on a bi-weekly basis during the normal in-season, between 9:00 and 9:30 am, and on the second day following a match. This day was selected as it was considered the optimum time to reduce the impact of the preceding or the following match, given the fixture congestion experiencing in the EPL. This model was replicated during the restart. During the lock-down and RTT, participants were sent a digital questionnaire to complete on a Monday morning once a week. Each match, training session type and duration were recorded. The specific sessions recorded during lockdown are demonstrated in Figure 3.

MW questionnaire

MW was assessed using the “Warwick-Edinburgh Mental Wellbeing Scale” (WEMWBS) (Stewart-Brown et al., 2009). The WEMWBS has been utilized to monitor MW in athletic populations (Nicholls et al., 2020; Abbott et al., 2019). The WEMWBS is a validated reliable measure of MW in the general population (Tennant et al., 2007), and acceptable reliability has been indicated within male athletes ($\alpha = 0.94$) (Rice et al., 2020). The WEMWBS had good levels of reliability with our sample as the Cronbach alpha in the present study was 0.89. The questionnaire is comprised of a 14-item self-report scale that assesses positive thoughts and feelings. Responses are made relative to the previous two weeks in-season, and previous week during lockdown and RTT. Each statement is scored on a 1–5 Likert Scale (1 = “none of the time”, 5 = “all of the time”). A global score ranging between 14 and 70 is then calculated by adding up item scores. The higher the score, the higher the level of MW.

Data analysis

Data analysis was completed via SPSS (SPSS Version 26.0). Normal distribution was considered if the Shapiro-Wilks test was $p > 0.05$. A one-way repeated measures analysis of variance (ANOVA) was utilized to assess changes in MW at the group level across the different phases of the season, in-season (12 weeks), lockdown (9 weeks), RTT (3 weeks) and restart (4 weeks). A paired samples t-test was utilized to determine the difference in weekly active min during lockdown and normal in-season. Pearson correlations were utilized to determine the relationship between MW, and the previous week number of sessions completed, and active min. An independent samples t-test was utilized to determine the difference between MW, when PA was $>250$ and $<250$ min. Cohen’s $d$ effect sizes were used to determine the strength of the differences obtained within the t-test (0.1 = small, 0.3 = medium and 0.5 = large) (Cohen, 1988). Each participant’s within-subject variability was analysed using the predicted linear trend, based on the in-season MW values, and then identifying the subsequent weeks scores fell outside the

**Figure 1.** The average group modelled in-season trend vs. subsequent lockdown, return to training and restart periods. Values and error bars beyond the dashed lines represent a true change that is above 90% likelihood.
typical range. These findings were interpreted using mechanistic magnitude-based inferences (Hopkins, Marshall, Batterham, & Hanin, 2009). The uncertainty in the effect was expressed as 90% confidence limits and with likelihoods that the true value of the effect represented substantial or trivial changes expressed as possibly (25–75%), likely (75–95%), very likely (95–99.5%) and most likely (>99.5%) (Hopkins et al., 2009). The smallest worthwhile change was determined by $0.2 \times$ within-subject standard deviation. Statistical significance was determined at $(p < 0.05)$.

### Results

Group level MW responses across the season phases are presented, followed by the individual level MW responses. The weekly breakdown of PA during lockdown is then presented in Figure 3, succeeded by the subsequent relationships between PA and MW during lockdown, and the in-season.

#### Group analysis

A one-way repeated measures ANOVA revealed no main effect for time ($F(3,72) = 0.628, p = 0.599, \eta^2_{\text{partial}} = 0.025$), and therefore no changes in MW between, in-season, lockdown, RTT and the restart ($51.52 \pm 5.64$ vs. $50.74 \pm 4.84$ vs. $50.79 \pm 5.68$ vs. $50.70 \pm 5.61$) respectively. Trends across the phases, revealed a trivial drop in MW scores during the in-season of 0.26 every two weeks, and during the lockdown an increase of 0.16 every week. Followed by a decrease in MW scores during RTT of 0.58 every week, and during the restart of 0.55 every two weeks. The modelled in-season trend analysis, demonstrated in Figure 1, revealed 90% likely true increases in MW occurred during the fifth, sixth and ninth week of the lockdown, first and second week of RTT and the first two weeks during the restart.

#### Individual analysis

The modelled in-season trend analysis on an individual level when compared to lockdown, RTT and the restart that were 90% likely true are demonstrated in Table 1. During lockdown, MW increased in 8 out of 25 participants, decreased in 6 out of 25 participants and remained constant in 11 out of 25 participants. During RTT, MW increased in 6 out of 25 participants, decreased in 5 out of 25 participants and remained constant in 14 out of 25 participants. Lastly, during the restart, MW increased in 6 out of 25 participants, decreased in 4 out of 25 participants and remained constant in 15 out of 25 participants. Examples of individual participant’s data are shown in Figure 2.

### Lockdown and PA

Each participant completed on average 7 sessions per week, covering an average load of 21.1 km on the bike, and 12.8 km running (demonstrated in Figure 3). In-season weekly session duration (243 ± 23 min) was higher than the lockdown (180 ± 62 min) ($t(24) = 4.403, p = .000, \eta^2_{\text{partial}} = 0.87$). The percent of running sessions from the start to the end of the lockdown increased from 20% to 50%. Weekly MW and the number of sessions completed during the lockdown revealed a small correlation ($r(189) = 0.151, p = 0.037$). Weekly MW and active min completed during lockdown revealed a small correlation ($r(189) = 0.142, p = 0.050$). Additionally, participants that exercised >250 min in lockdown had higher MW scores ($52.46 \pm 4.65$) than <250 min ($50.35 \pm 6.55$) ($t(129) = 2.488, p = 0.014, d = 0.35$). Levene’s test for equality of variances showed a difference in the amount of variance in MW when participants exercised >250 min, compared to those <250 min ($F = 6.116, p = .014$). MW scores associated with >250 active min were not correlated ($r(139) = 0.136, p = 0.108$). MW scores associated with >250 active min were not correlated ($r(48) = -0.250, p = 0.080$).

### In-season and PA

MW and previous 7-day active min, excluding the lockdown and when a player was injured revealed a small correlation ($r(330) = 0.130, p = 0.017, d = 0.02$). Further, participants that exercised >250 min in-season had no difference in MW ($51.62 \pm 6.22$) than <250 min ($50.72 \pm 6.33$) ($T(320) = 1.310, p = 0.191, d = 0.14$).

### Discussion

Findings of the study revealed MW did not change significantly across the season, in contrary to previous research, which reported that higher depressive symptoms were revealed in student-athletes during the lockdown (NCAA, 2021). Interestingly, trivial changes were evident, revealing a decline in MW during the in-season, RTT and the restart, yet an increase during the lockdown. On an individual level, some participants MW increased, decreased or remained constant from in-season to lockdown (demonstrated in Table 1). Whilst no direct comparisons exist examining changes in MW from in-season to lockdown, tentative arguments can be created using current research, specifically regarding the upward trend in MW during the lockdown. Athletes were
Table 1. The individual responses to the modelled in-season trend vs. lockdown, return to training and restart periods.

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Note: A change with the chances >90% is very likely or decisive and is indicated with a ↑, <-> and ↓. An increase in MW during the retrospective phases in comparison to the modelled in-season trend is demonstrated with a ↑ symbol. A decrease in MW during the retrospective phases in comparison to the modelled in-season trend is demonstrated with a ↓ symbol. A significant maintenance in MW during the retrospective phases in comparison to the modelled trend are demonstrated with a <-> symbol. A ¬ symbol represents any changes with a chance of <90% likelihood.
reported to have lower anxiety and depression symptoms than their non-athletic counterparts during the lockdown (Senisik et al., 2020). As the ability to cope is skill dependant (expert vs. novice), athletes could potentially be more resistant to unpredictable events (di Fronso et al., 2020). Moreover, elite athletes ascertain how to deal with possible sport-related stressors, which could be transferred to alternative life domains (di Fronso et al., 2020; Pensgaard & Duda, 2003).

**MW and PA**

Lower PA occurred during lockdown contrary to the in-season. MW and active min were related during both the in-season and lockdown phases. However, only during lockdown did undertaking >250 active min per week reveal a significantly higher MW than <250 min. The in-season active min average is (243 ± 23 min). Therefore, it could be argued that there is a protective effect of exercising >250 min per week during lockdown, which is close to that of normal in-season. This could partly explain the individual variability in MW responses during the lockdown, with those that maintained their PA levels, having an increased or maintained MW. The notion that regular PA reduces anxiety and depression symptoms has been extensively reviewed (Rebar et al., 2015). In contrast, reduced PA could increase body fat content, attenuate muscle mass and potentially lead to

*Figure 2.* Individual participants modelled in-season trends and subsequent MW scores during lockdown, return to training and in-season. Values and error bars beyond the dashed lines represent a change that is above 90% likely true. Graph (A) demonstrates an example participant whose MW scores were maintained. Graph (B) demonstrates an example participant whose MW scores were decreased. Graph (C) demonstrates an example participant whose MW scores were increased.
depression and insomnia (Chen et al., 2020; Halabchi, Ahmadinejad, & Selk-Ghaffari, 2020).

During the lockdown, maintenance of PA may counteract the physical and emotional exhaustion associated with isolation, as a result of antidepressant properties (Sors et al., 2020; Peluso & Andrade, 2005). Thus, the training programmes prescribed could have had positive implications on athlete’s fitness and physical performance and can partly explain the stable MW reported in this study compared to non-athletic populations. During the lockdown, elite soccer players trained more hours at higher intensities than their amateur and novice counterparts (Mon-Lopez, Garcia-Aliaga, Bartolome, & Solana, 2020). Student athletes’ mental distress has been associated with a lack of resources and available training facilities (Mon-Lopez et al., 2020; Bullard, 2020). Thus, the “privileged” position of the current participants, with regards to training programmes, provision to equipment and guidance from support staff, may have helped to maintain MW. Organized compulsory indoor group-based sessions via online platforms allowed “physical distancing” to be replaced with “social distancing” (Van Bavel et al., 2020). Previous research suggests that athletic identities became stronger during the lockdown, which was attributed to social support from teammates, and strengthened “social identity” and “exclusivity” (Graupensberger, Benson, Kilmer, & Evans, 2020; Costa et al., 2020). However, it should be considered that higher athletic identities have been associated with an increased tendency to ruminate and catastrophize (Costa et al., 2020). Considering in the current study, players participated in prescribed sessions, and therefore the restoration of “normal training” and the amount of PA undertaken could have been a moderating factor to attenuate the tendency to ruminate and catastrophize, and thus MW was maintained in the current study.

If elite sport was suspended again, routine training programmes consisting of >250 active min and maintaining social connections should be encouraged. Within a sporting context, if an individual is injured and absent from sport, strategies need to be implemented to sustain MW.

Finally, during the in-season, MW correlated with active mins, contrary to findings that TL does not predict MW in academy soccer players (Abbott et al., 2019). Therefore, PA levels could be as important during in-season. However, as MW was no different when PA levels were >250 and <250 active mins, it is yet to be known a threshold of PA during a typical in-season is yet to be identified, and therefore an area for future research.

**MW and in-season**

Findings of a declining trend in MW in-season, and the predicted in-season trend supported a further potential decline in MW. Without the lockdown where MW increases, the continuation of the competitive season could have resulted in a further decline in MW. This is particularly important given the impact MW has upon injury risk and performance (Reardon et al., 2019; Watson, Brickson, Brooks, & Dunn, 2016). These results suggest EPL soccer stressors are greater than those imposed by the pandemic and providing further

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**Figure 3**. The weekly breakdown of the average number and types of sessions completed during the lockdown and the subsequent weekly MW score.
The importance of longitudinally tracking MW (Abbott et al., 2019). The implementation of a mid-season break to alleviate these stressors could contribute to augmenting MW during a season. Nevertheless, the MW decrement during the restart could be due to the uncertainty surrounding RTS, and the exposure of COVID-19 to athletes and their family, rather than sport related stressors. Although, athletes were willing to compete behind closed doors, with male athletes more accepting than females (Pillay et al., 2020). Moreover, upon RTS the confidence in ability and skillfulness could have been reduced during the COVID-19 lockdown. Both confidence in ability and skill execution have been described as important factors facilitating successful RTS (Conti et al., 2019). Thus, the MW decrement upon the restart could have been a result of both COVID-19 related and EPL stressors. Importantly across the study, the group average range was between 48.55 and 52.75, which is higher than the suggested cut-off for depression (44.50; Bianca, 2012) and comparative with the general population norm (50.20, Health Survey England, 2016). Interestingly, during lockdown, the group average MW scores ranged between 49.76 and 52.57, which is higher than those reported by injured academy soccer players (43.60; Abbott et al., 2019). However, caution should be taken when making this assumption as academy youth players have a greater risk of poor MH (Junge & Feddermann-Demont, 2016). The exact sport-related stressors that could attenuate MW in EPL senior soccer players is unknown, and an area for future research.

**MW and individual differences**

During the lockdown MW scores ranged between 32 and 69, suggesting some individuals had scores lower than the depression cut-off (Bianca, 2012). This provides a further rationale that MW should be considered on an individual and group level. Other than PA, other factors that could explain the individual responses in MW were not measured. In some individuals, increased MW during the lockdown could be rationalized by the increased ability to spend more time with family, particularly for homegrown players. Yet for others, their family may live overseas, resulting in increased time apart. For these individuals, they may be increased concerned for their families, in countries whereby the pandemic was particularly worse than the UK. Moreover, elite soccer players reported an increase in sleep hours during the lockdown, which could have had a potential impact upon MW (Mon-Lopez et al., 2020). Life events were also not recorded and thus fluctuations in MW could have been the result of an independent event to COVID-19.

**Further limitations**

Current findings may not be attributable to individual sports, as the investigation utilized team sports athletes. Caution should also be applied when transferring results to females. Despite no differences between genders reported when looking at anxiety and depression symptoms during lockdown (Senisik et al., 2020), mental distress has been found to affect women approximately twice as much as men (Salk, Hyde, & Abramson, 2017).

**Conclusion**

At a group level, but not individual level, MW remained consistent from a normal in-season period to lockdown, and RTS protocols. Thus, these findings highlight the importance of individual differences in order to understand the demands of professional sport on athletes’ MW. Elite athletes may also be better able to cope with stressors and that this protected their MW during a break from competition such as that experienced during COVID-19 lockdown. They also highlight that PA above 250 min per week, even in a well-trained population is important for it having a positive influence on MW. From a practical perspective these findings encourage longitudinal monitoring and strategies to be implemented to prevent further in season declines in MW, such as a “mid-season” break and the maintenance of PA.

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