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SHORT COMMUNICATION

Recovery-stress balance in professional and U-21 soccer: differences between starters and substitutes

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Abstract

Soccer players at the U-21 level are in the challenging process of transitioning to the professional level. Accordingly, we examined whether U-21 soccer players would show a similar recovery-stress balance profile as professional soccer players. Furthermore, we explored differences in recovery-stress balance by playing status (i.e., starter or substitute). Twenty-nine players from a League One (UK) soccer club (15 professional players and 14 U-21 players) participated in the study. The players completed a demographic form and the Recovery-Stress Questionnaire for Athletes (RESTQ-Sport). A series of 2 (team: professional or U-21) × 2 (player status: starter or substitute) ANOVAs were performed on all sub-dimensions of the RESTQ-Sport. Starters showed significantly higher levels of general well-being, being in shape, and self-efficacy. Furthermore, analysis of the interaction terms suggested that players who were professional and substitutes showed the least healthy recovery-stress balance profile among all groups of players. Accordingly, coaches and applied sport psychologists should pay special attention to the recovery-stress balance of substitute players who might be at a higher risk of overtraining and burnout.

Keywords Recovery-stress balance · RESTQ-Sport · Soccer · Overtraining · Burnout · Mental fatigue

Introduction

There is a longstanding consensus that athletes need to develop recovery strategies to overcome training and competition demands [1]. In theory, the linkage between recovery and stress demands has been explained by the "Scissors-Model" framework [2]. According to this framework, an increase in stress demands must be followed by an increase in recovery activity. If an athlete does not properly recover from the demands of training and competition, stress may accumulate and overtraining and burnout may occur. In other words, to stay healthy and perform optimally, athletes must match their stress demands with meaningful passive and active recovery activities.

Relevant to the present study, recovery-stress balance has also been related to performance in soccer. Specifically, previous research has highlighted that high stress demands accompanied by insufficient recovery put high-performing soccer players at an elevated risk of overreaching and overtraining [3]. Furthermore, inappropriate recovery-stress balance is related to physical injury in soccer. Specifically, previous research based on the Recovery-Stress Questionnaire for Sport (RESTQ-Sport) revealed that scores on fatigue, disturbed breaks, injury and sleep quality predicted injury occurrence among professional soccer players [4]. Accordingly, the monitoring of stress and recovery factors is essential to prevent overuse injuries in soccer.

Rigorous competition and training demands begin at an early age for those dreaming of a successful sports career in general, and soccer in particular. Thus, young athletes transitioning to professional sport are at particular risk of overtraining and burnout, as they possess less developed coping skills in comparison to adults [5]. However, to the best of our knowledge, there is no research examining differences in recovery-stress balance among professional and youth academy soccer players. Accordingly, we examined differences in recovery-stress factors among professional and U-21 soccer players who were part of a League One professional club in the north of England. We hypothesized (H1) that professional players would show a healthier recovery-stress balance than U-21 players, as they possess more experience and likely more coping skills. We were also interested in examining differences in recovery-stress balance between

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starters and substitute players. We expected (H2) that players' status in the team (i.e., starter or substitute) would influence recovery-stress scores, as substitute players are less clear about their contribution to the team and are afraid of deselection, and thus are at a higher risk for burnout [5].

Methods

Participants

The sample of participants consisted of professional and U-21 soccer players from a League One club (3rd division in England after the Premier League and the Championship) in the north of England. Both group of players practiced five days a week and were physically fit to play soccer at an elite level. Access to the athletes for data collection was made possible through rapport built with the coaching staff. Accordingly, our sampling strategy and concurrent power estimate relied on the central limit theorem tenets, which purport that approximately 30 observations should suffice for the use of inferential statistics. A total of 29 participants were involved in the study: 15 professional players and 14 players from the U-21 team. From these players, 86.2% ($n=26$) were British and the remaining 13.8% ($n=3$) were international players fluent in English. On average the professional players were between 18 and 36 years ($M=22.47$; SD = 5.23), and the youth players were between 16 and 18 years ($M=17.21$; SD = 0.70). The majority of the participants identified themselves as starting players (55.2%; $n=16$), with the remaining players being substitutes (44.8%; $n=13$). Ethical approval was granted by the authors' ethical review committee.

Measures

Demographic form. A demographic form was used to gather data on normative factors, namely age, status in the team (i.e., starter or substitute), field position, and nationality.

RESTQ-Sport [2]. The RESTQ-Sport-76 instrument was developed to assess recovery and stress states in athletes. The questionnaire consists of 76 items that represent different sub-dimensions which were grouped under four dimensions: general stress (i.e., general stress, emotional stress, social stress, conflicts/pressure, fatigue, lack of energy, physical complaints); general recovery (i.e., success, social recovery, physical recovery, general well-being, sleep quality); sport-specific stress (i.e., disturbed breaks, emotional exhaustion, injury); and sport-specific recovery (i.e., being in shape, personal accomplishment, self-efficacy, self-regulation). General stress items included statements such as "I felt down". General recovery included items like "I had a satisfying sleep". Sport-specific stress included items such as "Too much was demanded of me during the breaks", while sport-specific recovery was measured by statements such as "I recovered well physically". The questionnaire items were measured using a 7-point Likert scale: 0 = never, 1 = seldom, 2 = sometimes, 3 = often, 4 = more often, 5 = very often, 6 = always. In the current study, Cronbach α-coefficient ranged from 0.57 to 0.85, and the entire scale's α-reliability was 0.89. Emotional exhaustion was the only sub-dimension with low internal consistency (i.e., $\alpha=0.57$), and thereby was excluded from further analysis.

Procedures

The second author arranged a meeting with the professional and U-21 teams' staff at their soccer ground. During the week of data collection, which occurred at the mid-point of the season, the teams had engaged in a total of three training sessions that week and were due to play the upcoming weekend. Data collection commenced after a training session. Upon agreement from the coaching staff, the players were briefed on the overarching purposes of the study and invited to partake. Prior to participation, all players signed an informed consent sheet. Following the completion of the consent form, the participants received the questionnaire pack, which contained the demographic survey and the RESTQ-Sport. The participants were assured that their questionnaires would be kept confidential and were asked to be truthful and serious in their responses. Coaches did not remain in the room during data collection, which occurred in a quiet environment (i.e., meeting room), to safeguard the privacy and comfort of the participants. Data collection for the professional and U-21 players occurred on two different dates within the same week, according to the availability of the players.

Data analysis

All statistical analyses were conducted using the IBM SPSS software version 22. Specifically, a series of 2 (team: professional or U-21) × 2 (player status: starter or substitute) ANOVAs were performed on all sub-dimensions of the RESTQ-Sport. Follow-up pairwise *t*-test comparisons, with Bonferroni adjusted *p* values and 95% confidence interval (CI) magnitude effect size analysis, were conducted to examine the significant interaction terms.

Results

Mean, standard deviation, and inferential statistic values for all analyses are provided in Table 1.

Table 1 Mean, standard deviation, and inferential statistic values for all analyses

Stress/recovery scale	Professional				U-21				ANOVA *F*		
	Starters		Substitutes		Starters		Substitutes				
	M	SD	*M*	SD	*M*	SD	*M*	SD	U-21 or professional team	Starter or substitute player	Interaction
General stress											
1. General stress	0.50	0.44	0.79	0.68	0.53	0.78	0.58	0.49	0.14	0.53	0.25
2. Emotional stress	1.00	0.76	1.14	0.47	1.00	0.67	1.28	0.39	0.09	0.86	0.09
3. Social stress	1.13	0.67	1.38	1.10	1.29	1.25	1.06	0.71	0.05	0.001	0.45
4. Conflicts/pressure	1.63	1.31	1.86	1.20	1.58	1.29	1.89	0.62	0.00	0.38	0.01
5. Fatigue	1.22	1.24	2.07	1.21	1.59	0.63	1.88	0.26	0.06	2.54	0.65
6. Lack of energy	1.19	0.92	0.57	0.84	0.63	0.44	1.25	0.27	0.05	0.00	5.77*
7. Physical complaints	1.31	1.22	0.93	0.53	0.75	0.46	0.75	0.52	1.63	0.44	0.44
General recovery											
8. Success	3.56	1.33	3.14	0.72	3.47	1.45	3.58	0.56	0.17	0.13	0.40
9. Social recovery	4.08	1.49	3.29	0.71	3.79	0.80	3.56	0.91	0.001	1.76	0.52
10. Physical recovery	4.63	0.63	3.10	0.46	3.63	0.97	4.06	0.93	0.01	3.63	11.53**
11. General well-being	4.63	0.78	3.29	0.67	4.22	0.70	4.29	0.66	1.28	5.72*	7.11*
12. Sleep quality	4.50	1.31	3.71	1.06	4.47	0.69	4.67	0.66	1.57	0.64	1.79
Sport-specific stress											
13. Disturbed breaks	0.78	0.87	0.61	0.50	0.44	0.51	0.88	0.77	0.02	0.27	1.44
14. Emotional exhaustion[a]											
15. Injury	2.25	1.34	2.21	1.22	2.00	1.49	2.75	0.61	0.09	0.59	0.71
Sport-specific recovery											
16. Being in shape	4.71	0.74	3.43	0.66	4.63	0.77	4.33	0.97	1.98	7.24*	2.86
17. Personal accomplishment	3.88	1.55	3.00	1.04	2.50	1.31	3.92	1.16	0.22	0.31	5.58*
18. Self-efficacy	4.75	0.40	3.39	0.88	3.91	0.91	4.08	0.66	0.08	4.55*	7.69**
19. Self-regulation	5.42	0.53	3.86	1.43	4.67	1.41	4.72	1.02	0.02	3.03	3.50

* $p <$ .05

** $p <$ .01

Differences between professional and U-21 players

No significant main effect was observed between professional and U-21 players, and thus H1 was not verified.

Differences between starters and substitutes

H2 was supported as significant main effects between starters and substitutes for three of the RESTQ-Sport subscales were observed, with starters showing higher values for General Well-Being ($p < 0.01$; Cohen's $d = 0.90$, $CI_{0.95} = 0.13, 1.67$), Being in Shape ($p < 0.01$; Cohen's $d = 1.00$, $CI_{0.95} = 0.23, 1.78$), and Self-Efficacy ($p < 0.05$; Cohen's $d = 0.83$, $CI_{0.95} = 0.07, 1.53$).

Interaction effects

There were significant interactions between team-level (professional or U-21) and player status (starters or substitutes) on Lack of Energy, Physical Recovery, General Well-Being, Personal Accomplishment and Self-Efficacy. However, after post-hoc follow-up analysis the interactive effects of Personal Accomplishment were no longer found to be significant. Noteworthy, the analysis of all significant interactive terms revealed a three-fold pattern, as detailed next.

Professional & Starters × U-21 & Starters. Players who were professionals and starters showed a higher level of Self-Efficacy ($p < 0.01$; Cohen's $d = 1.19$, $CI_{0.95} = 0.13, 2.26$) than players who were U-21 and starters.

Professional & Starters × Professional & Substitutes. Players who were professional and starters showed a healthier recovery-stress balance than players who were U-21 and starters. Specifically, players who were professional and starters reported higher levels of Physical Recovery ($p < 0.01$; Cohen's $d = 2.74$, $CI_{0.95} = 1.33, 4.15$), General Well-Being ($p < 0.01$; Cohen's $d = 1.83$, $CI_{0.95} = 0.62, 3.04$), and Self-Efficacy ($p < 0.01$; Cohen's $d = 2.04$, $CI_{0.95} = 0.79, 3.29$) than players who were professional and substitutes.

U21 & Substitutes × *Professional & Substitutes*. Players who were U-21 and substitutes showed a healthier recovery-stress balance than players who were professional and substitutes; specifically, U-21 substitutes reported higher levels of Physical Recovery ($p < 0.05$; Cohen's $d = 1.35$, $CI_{0.95} = 0.14$, 2.55) and General Well-Being ($p < 0.01$; Cohen's $d = 1.50$, $CI_{0.95} = 0.27$, 2.74) than professional substitutes. However, players who were U-21 and substitutes showed higher levels of Lack of Energy than U-21 starters ($p < 0.05$; Cohen's $d = -1.64$, $CI_{0.95} = -2.86, -0.42$). Noteworthy, the items for Lack of Energy all allude to mental fatigue (e.g., "I was unable to concentrate well." "I put off making decisions"), as discussed next.

Discussion

The main effects and interaction effects between team (professional and U-21) and player status (starters or substitutes) revealed different profiles of recovery-stress balance within the studied sample.

Differences between professional and U-21 players

The lack of statistically significant differences between the professional and U-21 players might be related to the fact that players on the U-21 squad were at the last stage of sport development. That is, sportswomen/men are expected to be "ready" to compete at the professional level at young adulthood.

Differences between starters and substitute players

Starters showed higher scores for General Well-Being, Being in Shape, and Self-Efficacy, in comparison to substitute players. Substitutes have less match time on the pitch in comparison to starting players, and thus it is natural that starters reported being fitter than substitutes. Conversely, players with higher Self-Efficacy, who believe they can accomplish their goals, might exert more effort in practice than non-starters and consequently reach higher fitness levels. Noteworthy, playing time is also a plausible explanation for why substitute players reported lower levels of General Well-Being and Self-Efficacy. Substitute players may experience financial pressures (e.g., fear of having their contract terminated at the end of the season), and thus may find it more difficult to mindfully engage in passive, active, and pro-active recovery activities [5]. An alternative explanation to our findings is that an unhealthy recovery-stress balance might be the cause rather than the consequence of athletes' player status. Further research with a large sample and the use of structural equation modelling is warranted to explore this alternative possibility.

Interaction effects

Players who were professional and starters showed the healthiest recovery-stress balance overall. They reported feeling more confident (higher Self-Efficacy) than both U-21 starters and professional substitutes, and more physically rested (higher Physical Recovery) and in a better mood (higher General Well-Being) than professional substitutes. Indeed, athletes at higher levels of competition tend to show healthier recovery-stress balance than their less accomplished or less experienced counterparts [1, 2].

Among the substitute players, U-21 players showed a healthier recovery-stress balance than players who were professional substitutes, as they reported higher levels of Physical Recovery and General Well-Being. The higher physical workload proper to professional play likely explains these differences. However, players who were U-21 and substitutes showed higher scores on Lack of Energy, a sub-scale of the RESTQ that seems to measure mental fatigue as aforementioned, than professional substitutes. Youth substitute players might be more mentally fatigued because they might lack the coping skills to deal with organisational stress proper to competitive settings [5].

Limitations and future research

This study was cross-sectional in nature and based on a convenience sample. Therefore, the findings reported herein might be transferable to other professional and academy teams, but not generalizable per se. A weakness of this study pertains to the single survey assessment of the RESTQ-Sport. Of note, our initial goal was to conduct a longitudinal mixed-method study in an attempt to advance the research on recovery-stress balance. However, coach turnover required that we change our expectations. During the season, and in the middle of the data collection process, a new coaching staff for the professional team was hired and the incoming head coach was unwilling to allow us to continue collecting data. Access to professional athletes is a recognized challenge in the study of sports, particularly during the in-season competitive phase [3]. Nonetheless, this real-world situation highlights the importance of studying how coach turnover might impact recovery-stress balance.

Future research using the new version of the RESTQ-Sport should include structural equation modelling exploring measurement invariance among athletes with unique backgrounds and characteristics (e.g., starters and substitutes; gender effects). Qualitative methods of inquiry are also encouraged as unique differences in the recovery-stress balance profile of professional and academy players, as well as starters and substitutes, may only come to light under the lenses of ethnographic qualitative approaches.

Conclusions and applied implications

Contrary to H1, no significant differences were observed between professional and U-21 players regarding recovery-stress balance. Congruent with H2, significant differences between starting and substitute players were found in the areas of General Well-Being, Being in Shape and Self-Efficacy. Furthermore, players who were professional and starters showed the healthiest recovery-stress balance profile, whereas players who were professional and substitutes showed the least healthy recovery-stress balance profile among all groups of players. Importantly, players who were U-21 and substitutes showed the highest values of Lack of Energy among all groups of players, suggesting they were at greater risk of mental fatigue.

In light of these findings, practitioners should devote special attention to substitute players in team sports, particularly in professional settings, as these players might be more likely to show an unhealthy recovery-stress balance profile, which in turn may progress to overtraining and eventually burnout. In youth academy settings, practitioners should pay close attention to substitute players who might be at greater risk of mental fatigue than starting players.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval The study has received ethical approval.

Informed consent The participants signed an informed consent before taking part in the data collection.

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