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Research Paper

Lower social skills, mental discomfort, and physical discomfort associated with worse sleep quality may impair self-estimation of soccer performance in university soccer club athletes

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Abstract

Low sleep hygiene accompanied with evening-type lifestyles negatively affects not only their objective sports performance but also self-estimated performance. Self-confidence in sports performance affects athletes' motivation and objective performance. This study aimed to examine which of diurnal rhythm, sleep habits, mental and physical discomfort, and social skills impact the self-estimated soccer performance of university students measured using the recently revised scale with four components: physical potential, mental potential, soccer technique, and soccer game strategies.

An integrated questionnaire included a 16-item revised scale for assessing self-estimated soccer performance, questions relating to sleep habits, mental discomfort and physical discomfort, the 7-item Diurnal Type Scale, and Kikuchi's Scale of Social Skills. It was administered to 111 soccer club members at a state university in December 2015, and 106 valid answers were analysed. Significant positive correlations were observed between self-estimated soccer performance and social skills. In the students who had several mental discomfort and physical discomfort, low sleep quality was related to low self-estimated soccer performance. Improved social skills and an adequate lifestyle management, such as keeping a suitable diurnal rhythm and good sleep hygiene, were associated with fewer mental and physical complaints and may improve the self-estimation of soccer performance and motivation in university soccer athletes.

Key words: Soccer performance, self-estimation of performance, social skill, lifestyle, university athletes

INTRODUCTION

Maintenance of sleep hygiene and a suitable circadian rhythm are important to sustain a good physical and mental condition. Among sports athletes in today's so-called '24-hr society', student athletes are particularly supposed to adopt 'evening-type habits', which can lead them to maintain low sleep hygiene (Nakade et al. 2015) and mental health (Nakade et al. 2015; Harada et al. 2012). Such impairments may negatively affect not only their objective sports performance but also their self-confidence regarding performance (i.e. self-estimation of sports performance).

Regarding objective performance, some studies have reported that sleep hygiene affected athletes' sports performance and health (Thum et al. 2015; Marie et al. 2014). Moreover, an unsuitable diurnal rhythm can also impair objective sports performance. Facer-Childs and

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Brandstaetter (2015) found that peak performance times in athletes differed between human 'larks' and 'owls', also known as chronotypes (similar to differences in circadian phases). When practising before the morning lecture, it is possible that evening-type students may not be utilising their peak performance time to train, unlike morning-type students. Thus, a lifestyle that includes maintenance of sleep hygiene and circadian rhythm synchronisation is important to promote sports performance.

Self-estimation in players' sports performance is important for objective performance too, because self-confidence in players' sports performance seems to be quite important in affecting their motivation (Ito 1987). Regarding players' self-estimation of soccer performance, we previously showed that morning-type soccer athletes showed better subjective soccer performances evaluated with a formerly used scale on soccer performance than evening-type athletes (Kawada et al. 2016). This scale included only three of the following four components: physical potential, mental potential, soccer technique, and soccer game strategies.

Furthermore, it has been reported that social skills (e.g. basic, advanced, emotional regulation, dealing with an attack, controlling stress, and planning) are important in team sports (Sugiyama 2004). Basic skills include fundamental interpersonal skills such as self-introduction and continuation of conversation. Advanced skills include more advanced interpersonal skills such as requests and apologies. Skills of emotional regulation include emotion processing skills such as self-control and emotional expression. Skill of dealing with an attack includes techniques for troubleshooting and assisting others. Skills of controlling stress refer to using strategies such as handling conflicting information and responding to collective pressure. Planning skills imply strategies such as identifying problems and setting goals. Suda (2011) also reported that higher perceived sports competence was associated with higher social skills in college students. In another intervention study aiming to improve the life rhythm of student soccer players, we observed an improvement in sleep hygiene, mental health (frequency of anger and irritation) (Wada et al. 2013), social skills scores (Takeuchi, unpublished data), and self-estimated soccer performance when they became more morning-type, but relationships between self-rated performance and factors such as social skills were not examined in the study. Therefore, an improvement in life rhythm may be associated with better self-estimated soccer performance through the improvement of social skills.

Recently, a revised scale with four components: physical potential, mental potential, soccer technique, and soccer game strategies to assess self-estimated soccer performance was developed, and its validity and consistency were tested and confirmed (Kawada et al. 2018). In this study, we investigated the influence of the following factors on the self-estimated soccer performance of university students measured using Kawada's (2018) revised scale: circadian typology, sleep habits, mental and physical discomfort, and social skills.

METHODS

Sample

A total of 111 male soccer club players in a university located in Kochi prefecture participated in this study in December 2015. Participants completed a revised questionnaire for the self-estimation of soccer performance (Kawada et al 2018) (Table 1) as well as an integrated questionnaire (Harada et al. 1998).

Instruments

The revised version of the questionnaire on self-estimation of soccer performance consisted of 16 items (Table 1). Total scores ranged from 16 (best performance) to 96 (lowest performance). Kawada et al. (2018) reported a value of Cronbach's alpha of 0.81 for the questionnaire, and item discrimination ability was confirmed with the results of Good-Poor analysis. According to factor analysis, the questionnaire consisted of the following four factors: (1) fundamental technical ability (open-closed skills); (2) movement ability, comprising physical ability, agility, and judgement of the environment; (3) strategy ability, comprising communication ability and judgement in the game; and (4) toughness as a mental ability.

The integrated questionnaire consisted of the Diurnal Type Scale (DTS, Torsvall and Åkerstedt 1980) (Table 2), 15 questions on sleep habits (Harada et al.

Table 1. Questionnaire to assess self-estimation of soccer performance (16 items).

Questions	(Performance has been better)		←←←←	→→→→	(Performance has been lower)	
1. Assessment of the present situation	1	2	3	4	5	6
2. Visual field of play	1	2	3	4	5	6
3. Movement of feet	1	2	3	4	5	6
4. Rudimentary mistakes	1	2	3	4	5	6
5. First touch	1	2	3	4	5	6
6. Irritation on playing	1	2	3	4	5	6
7. Running out of stamina	1	2	3	4	5	6
8. Injury while playing	1	2	3	4	5	6
9. Body balance	1	2	3	4	5	6
10. Precision of long kick	1	2	3	4	5	6
11. Motivation for practice	1	2	3	4	5	6
12. Understanding the game strategy	1	2	3	4	5	6
13. Precision of combination play	1	2	3	4	5	6
14. Precision when playing with competitive players	1	2	3	4	5	6
15. Consciousness of space	1	2	3	4	5	6
16. Prediction ability for dangerous situations	1	2	3	4	5	6

Item scoring: 1: perfectly implemented (maximum); 2: implemented; 3: relatively implemented; 4: relatively not implemented; 5: not implemented; 6: not implemented at all (minimum). Total score ranges from 16 (best self-estimated performance) to 96 (lowest self-estimated performance)

Table 2. Diurnal Type Scale (Torsvall and Åkerstedt 1980).

1) When would you prefer to wake up (provided you have a full day's study-8h) if you were totally free to arrange your time?
(4) before 06:30, (3) 06:30-07:29, (2) 07:30-08:29, (1) 08:30 or later

2) When would you prefer to go to bed (provided you have a full day's study-8h) if you were totally free to arrange your time?
(4) before 21:00, (3) 21:00-21:59, (2) 22:00-22:59, (1) 23:00 or later

3) If you always had to go to bed at 21:00, what would it be like to fall asleep then?
(4) easy – would fall asleep practically at once,
(3) rather easy – would lie awake for a short while,
(2) rather difficult – would lie awake for some time,
(1) very difficult – would lie awake for a long time

4) If you always had to rise at 06:00, what would it be like to wake up then ?
(4) easy – no problem at all,
(3) a little unpleasant but not a big problem,
(2) rather difficult and unpleasant,
(1) very difficult and unpleasant

5) When do you usually begin to feel the first signs of tiredness and need for sleep ?
(4) before 21:00, (3) 21:00-21:59, (2) 22:00-22:59, (1) 23:00 or later

6) How long does it usually take before you 'recover your faculties' in the morning after rising from a night's sleep?
(4) 1-10 min., (3) 11-20 min., (2) 21-40 min., (1) more than 40 min.

7) Please indicate to what extent you are a morning- or evening-active individual.
(4) pronounced morning active (morning alert and evening tired),
(3) to some extent morning active,
(2) to some extent evening active,
(1) pronounced evening active (morning tired and evening alert)

1998), Kikuchi's Scale of Social Skills (KiSS-18) (Kikuchi 2004), and questions on mental and physical discomfort (malaise). DTS scores were calculated as the total of the points given to all 7 items questions. For evaluating the sleep quality, an index of usual sleep quality was calculated from three items (difficulty in falling asleep, psychological feeling on waking up, and depth of sleep) of 15 questions on sleep habits (Table 3), which were scored from 3 (best) to 15 (worst). The index was calculated as the total points of three items. Each of the three items was subjectively rated using a 5-point scale. KiSS-18 was developed based on the prosocial skills for adolescents by Goldstein et al. (1980) and comprises 18 items to assess social skills in adolescents, with higher scores indicating better social skills. Items cover basic skills, advanced skills, skills of emotional regulation, skill of dealing with an attack, skills to control stress, and planning skills (Katayama et al. 2003). Based on previous studies on physical/mental discomfort among student athletes (Matsumoto et al. 2010; Kato et al. 2014), we selected 20 mental and physical discomfort indicators (Table 4).

Altogether, 111 total players answered the questionnaire, and the response rate was 100%. We analysed the answers of 106 participants (10 starting members of official games and 96 other members) who all answered questions related to age, self-estimated soccer performance, sleep habits, diurnal type, and mental and physical discomfort. The average age was 20. 4 years (ranging from 18 to 24 years).

Data analysis

Participants were divided into two groups (i.e. low and high scorers) with respect to number of mental discomfort and physical discomfort indicators. Regarding mental discomfort and physical discomfort, the two groups comprised players with three or more discomfort indicators and those with two or fewer such indicators. The Lilliefors test was used for the normality test. A linear regression was used to evaluate each effect of the DTS scores, KiSS-18 scores, and index of sleep quality on self-estimated soccer performance. The self-estimated soccer performance scores were compared between the groups using t-tests. Simultaneously, equal variance was confirmed using Levene's test. In addition, these groups were used to evaluate the effect of sleep quality, disorders, and social skills on self-estimated soccer performance using a general linear model. Spearman's

Table 3. Excerpt of questionnaire on sleep habits about usual sleep quality (Harada et al. 1998).

1) How easily do you usually fall asleep? (Please evaluate ease across 5 levels)
(Easy) 1------ 2 ------ 3 ------ 4 ------ 5 (Difficult)
(Easy: I never have difficulty falling asleep, Difficult: I always have difficulty falling asleep)

2) How easily do you usually wake up in morning? (Please evaluate ease across 5 levels)
(Easy) 1------ 2 ------ 3 ------ 4 ------ 5 (Difficult)
(Easy: I never have difficulty waking up, Difficult: I always have difficulty waking up)

3) Is your sleep deep or shallow? (Please evaluate depth across 5 levels)
(Deep) 1------ 2 ------ 3 ------ 4 ----- 5 (Shallow)

Table 4. Mental discomfort and physical discomfort indicators assessed.

A. Frequently irritated	K. Arthralgia
B. Easily tense	L. Feeling sluggish
C. Decreased level of concentration	M. Get tired easily
D. Nervous	N. Easily experience stress
E. Forgetful	O. Sensitive to cold
F. Leg cramps	P. Catch cold easily
G. Muscle spasms	Q. Headaches
H. Weakened muscles	R. Usually constipated
I. Occasional muscle cramps	S. Usually have diarrhoea
J. Stiff shoulders	T. Not feeling well just after waking up in the morning

The answer to each question was 'yes' or 'no'.

correlation analysis was performed to test the relationship of pairs of ordinal variables. We used IBM SPSS Statistics version 24 for statistical analyses.

RESULTS

The normality of the score distribution on self-estimated soccer performance was established (Lilliefors test, p=0.200), and score of KiSS-18 (p=0.200), but was not established on the DTS scores (p<0.001) and index of usual sleep quality (p = 0. 002). The scores of self-estimated soccer performance shown by the starting members (mean ± SD = 43. 1 ± 10. 9) were significantly lower (meaning better performance) than that of the other members (54.6±8.6) (t=3.94, degrees of freedom [df]= 106, p<0.006).

Table 5 indicates results of linear regression to evaluate each of DTS scores, KiSS-18 scores, and index of usual sleep quality on scores of self-estimated soccer performance. All these effects were significant as indicated by analysis of variance. However, R^2 of DTS scores (0.071) and index of usual sleep quality (0.051) were less than 0. 10. KiSS-18 had the highest standardisation factor (-0.480) with a R^2 of 0.231.

There was a significant and positive correlation between the number of mental discomfort and physical discomfort indicators and the scores of self-estimated soccer performance (higher numbers of indicators were associated with lower self-estimated performance) (r_s = 0.352, p<0.001) (Figure 1). The players with three or more discomfort indicators (46. 2%) showed higher scores of self-estimated soccer performance (i.e. lower self-estimated performance) (56.4±9.7) than those with two or fewer discomfort indicators (53.8%, 51.2±8.5) (t= 2.91, df=106, p=0.004).

There was a significant and negative correlation between social skill scores and scores of self-estimated soccer performance (lower social skills are associated with lower self-estimated performance) (r = 0. 480, p < 0. 001) (Figure 2, Table 6). There was a stronger correlation between self-estimated soccer performance scores and scores on skills of emotional regulation relative to the other components of social skills (r_s = 0. 384, p< 0. 001) (Table 6). The group with higher social skills (49.1%) showed better self-estimated soccer performance (i.e. lower self-estimation scores) (49.5±7.9) than those with lower social skills (50.1%) (57.5±9.1) (t=4.8, d=104, p < 0. 001). There were significant correlations between diurnal type, number of mental and physical discomfort, sleep quality, and social skills (Table 7).

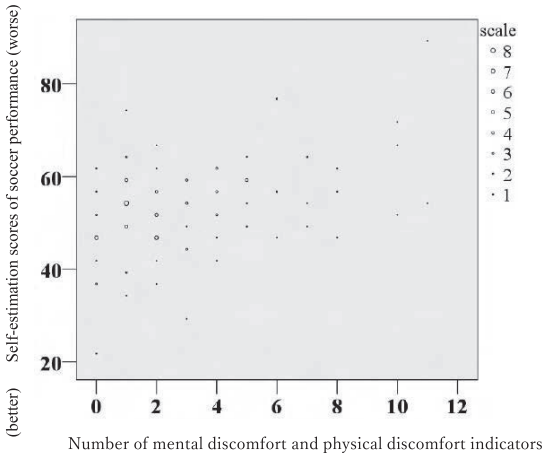

Fig. 1. Relationship between scores of self-estimated soccer performance scale and number of mental discomfort and physical discomfort indicators. Soccer club members who had fewer disorders showed better self-estimated soccer performance.
(scale: circle size indicates number of respondents.)

Table 5. Linear regression of the relationship between scores of self-estimated soccer performance and DTS scores, KiSS-18 scores, and index of usual sleep quality.

	R^2	Analysis of variance		Inclination			
		F-value	p	Non-standardised factor	Standardised factor	t-value	p
DTS scores	0.071	7.94	0.006	-0.775	0.275	-2.82	0.006
KiSS-18 scores	0.231	31.18	<0.001	-0.495	-0.480	-5.58	<0.001
Index of usual sleep quality	0.051	5.10	0.020	0.943	0.226	2.37	0.020

* DTS: Diurnal type scale scores, KiSS-18: Kikuchi's Scale of Social Skills

Table 6. Correlation between scores of self-estimated soccer performance, social skill, and six sub-scales of KiSS-18 (basic skills, advance skills, skills of emotional regulation, skills of dealing with an attack, skills of controlling stress, and planning skills).

Total score of social skills	Components of social skills					
	Basic skills	Advance skills	Skills of emotional regulation	Skills of dealing with an attack	Skills of controlling stress	Planning skills
(-.480**)	*-.414***	*-.244**	*-.384***	-.392**	-.374**	*-.230**

* p<0.05, ** p<0.01, ( ): Pearson's correlation coefficient

Table 7. Spearman's correlation between Diurnal Type Scale scores, index of usual sleep quality, number of mental discomfort and physical discomfort indicators, and social skill scores (KiSS-18).

	Diurnal Type Scale scores	Index of usual sleep quality	Number of mental and physical discomfort indicators
Index of usual sleep quality	-0.359**		
Number of mental discomfort and physical discomfort indicators	-0.205*	0.361**	
Social skill scores (KiSS-18)	0.247*	-0.241*	-0.329**

* p<0.05, ** p<0.01

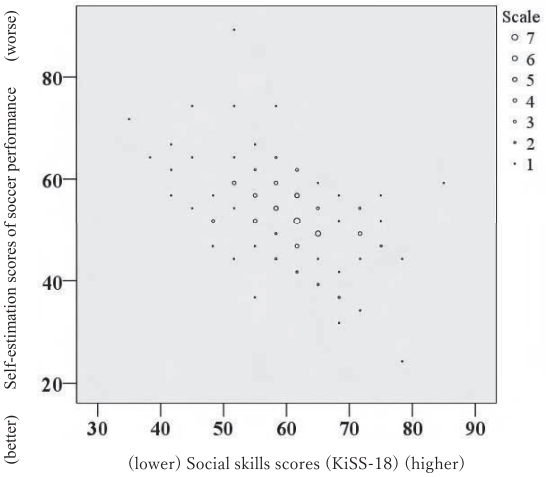

Fig. 2. Relationship between scores of self-estimated soccer performance and social skills scores. Soccer club members who had higher skills showed better self-estimated soccer performance.
(scale: circle size indicates number of respondents)

DISCUSSION

In this study, there was no strong effect of circadian typology (i.e. diurnal type) and sleep quality on self-estimation of soccer performance, while self-estimation of soccer performance was significantly associated with mental and physical discomfort. Circadian typology and sleep quality may not influence sports performance directly. However, there was a relationship between circadian typology, sleep quality, and number of mental discomfort and physical discomfort (Table 7).

Exposure to blue light at night (Roecklein et al. 2013) and night meals (Hutchison and Keilbronn 2016) could delay the circadian rhythm phase in humans. This evening-type lifestyle may induce an 'inner de-synchronisation' of the main clock that regulates the alternating rhythms of the sympathetic and parasympathetic nervous systems conforming to the autonomic nervous system, as well as the slave clock that controls the sleep-wake cycle in humans (Honma and Honma 1988). This inner de-synchronisation related to evening-type lifestyles seems to induce a 'social jet-lag' (Espitia-Bautista 2017) that could cause mental and physical discomfort as well as poorer sleep hygiene (Touitou 2013; Harada and Takeuchi 2001; Driller et al. 2017).

A significant positive correlation has been shown in this study between self-estimated soccer performance and social skills, including emotional-regulation and stress-coping skills. Moreover, in this study, self-estimation of soccer performance included an item about mental toughness, which is similar to emotional regulation (Kawada et al. 2018). Thus, emotional regulation may be the link between self-estimated soccer performance and social skills.

Moreover, Motomura et al. (2013) reported that low-quality sleep elicits a negative emotional reaction by

reducing emotion regulation (i.e. diminished amygdala-anterior cingulate functional connectivity). In addition, Brand et al. (2014) showed a relationship between mental toughness and sleep efficiency in student athletes.

In this study, there was a significant correlation between social skill scores and index of usual sleep quality (Table 6). Emotional regulation as a component of social skills associated with better sleep hygiene may thus improve self-estimated soccer performance.

Thus, improved lifestyle management abilities in student athletes, such as appropriate lifestyle habits (e.g. non-evening-type lifestyle), resulted in better sleep hygiene and higher social skills, which could improve their self-estimated soccer performance and make them competitive by improving their self-confidence.

However, this study was subject to certain limitations. It was not possible to draw conclusions about causality from the results, as this was a cross-sectional study. For example, it was considered that student athletes with lower social skills had a lower ability of coping with stress, resulting in increased mental discomfort and physical discomfort. Additionally, it was observed that low self-confidence in their sports performance may lead to low mental health and sleep quality. Future research should involve interventional studies to examine the effects of social skills and sleep hygiene on self-estimated and objective soccer performance.

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