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Research article

Daytime Napping Benefits Passing Performance and Scanning Activity in Elite Soccer Players

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Abstract
The present study explored the effect of a daytime napping opportunity on scanning activity, which is an essential component of successful soccer performance. Fourteen male elite collegiate soccer players performed the Trail Making Test (TMT), which was used to assess complex visual attention. In addition, a soccer passing test, modified with reference to the Loughborough Soccer Passing Test, was used to evaluate passing performance as well as scanning activity. A cross-over design was applied to examine nap and no-nap interventions. Participants (N = 14, mean age: 21.6 SD = 0.5 years, height: 1.73 ± 0.06 m, body mass: 67.1 ± 4.5 kg) were randomly allocated to a midday nap (40 minutes) or no-nap group. Subjective sleepiness was measured using the Karolinska Sleepiness Scale, and perceptive fatigue was evaluated by the visual analog scale. There were no significant differences in subjective measurements or TMT between the nap and no-nap groups. However, the performance time for the passing test and scanning activity was significantly shorter ($p < 0.001$) and scanning activity was significantly more frequent in the nap condition than in the no-nap condition ($p < 0.00005$). These results suggest that daytime napping is beneficial for soccer-related cognitive function, represented by visuospatial processing and decision-making, and particularly as a potential countermeasure to mental fatigue. Considering that inadequate sleep and residual fatigue are commonly observed in elite soccer, this finding may have practical implications for the preparation of players.

Key words: Nap, fatigue, sports, soccer, performance, scanning activity.

Introduction

Soccer players are exposed to physiological, metabolic, physical, and psychological stress which can affect performance owing to fatigue caused by training and competition. The physical demands imposed on soccer players have been broadly explored in competitive matches, affecting recovery after training and competition (Bradley and Noakes, 2013). Indeed, participation in a single match can lead to acute and residual fatigue, resulting in a decrease in performance over the 24 - 72 hour period following performance (Ispirlidis et al., 2008). The magnitude of fatigue is influenced by a wide range of factors, including extrinsic factors (i.e., match result, quality of the opponent, match location, playing surface) and/or intrinsic factors (i.e., training status, age, gender, muscle fiber typology), and biological aspects, such as physiological, neuromuscular, technical, biochemical, and perceptual responses (Silva et al., 2018).

Sleep is considered to play an important role in recovery caused by all forms of fatigue, facilitating several essential psychological and physiological functions (Nedelec et al., 2015). Sleep disturbance is prevalent among a broad level of trained athletes from professionals to students, with poor sleep quality, insufficient sleep, and daytime sleepiness commonly observed due to psychological pressure, practice time and duration, competitive time, and frequent travelling (Juliff et al., 2015, Monma et al., 2018). Soccer players are notably subjected to various situations that place them under increased psychological pressure throughout a season, which can disrupt their sleeping patterns. A previous report suggested that reduced sleep quantity and quality and reduced perceived recovery occur notably following night matches in elite players (Fullagar et al., 2016). In addition, collegiate soccer players also exhibit global sleep dysfunction and difficulties with recovery which can result in impaired performance and adverse mental health outcomes (Benjamin et al., 2020). Therefore, recovery strategies based on ensuring adequate sleep hygiene are a vital complement to training and preparation.

Inadequate sleep is reported to negatively affect a variety of soccer-related performance components and can result in an increased risk of injury (Clemente et al., 2021). Performance in match-play requires accelerations, decelerations, jumps, changes of direction, and technical and tactical skills to successfully adapt to a rapidly changing environment and achieve optimal performance (Nedelec et al., 2012). These skills also require specific cognitive and perceptual abilities, such as attention, visuospatial processing, and decision-making (Schumacher et al., 2018). Perceptual and cognitive mechanisms involve processing contextual information in anticipation of movement impacting how soccer-related skills are performed (Gonçalves et al., 2015; Williams and Jackson, 2019). Among the multifaceted skills associated with soccer, "looking around" is pivotal in successful performance, involving superior decision-making. This concept described as "scanning," representing the frequency of information-gathering head–eye movements away from and toward the ball (Jordet et al., 2020). Scanning activity is shown to be associated with faster decisions involving visual perception in soccer performance. (Aksum et al., 2021, McGuckian et al., 2019).

Accumulative evidence has revealed the inverse effect of insufficient sleep on a vast array of cognitive domains mandatory to soccer performance, such as sustained attention (Hudson et al., 2020), decision-making (Vincent et al., 2021) and visuomotor performance (Van Dongen et

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al., 2004). Pallesen et al. demonstrated that a 24-hour period of sleep deprivation has a significant adverse effect on a continuous kicking test, which demands a high level of constant attention (Pallesen et al., 2017). Taken together, it is evident that insufficient sleep affects soccer performance skills, which involve various cognitive and executive components. Nevertheless, the impact of sleep on scanning activity, which may impact visuomotor performance, has not been sufficiently investigated.

One possible strategy for an athlete to increase the duration of their sleep is to spend more time in bed at night. However, it is less likely for an athlete to implement this strategy due to their training and competition schedule. Napping is an alternative countermeasure to prevent lower levels of performance linked to insufficient sleep and the impact upon circadian rhythm (Dutheil et al., 2021). A growing corpus of literature is supporting the beneficial effect of naps on sport performance (Gupta et al., 2021; Lastella et al., 2021; Nishida et al., 2021; Stephenson et al., 2020). Despite the diversity of skills in soccer, such as dexterity, agility, and power, previous studies have demonstrated that a wide range of soccer skills can benefit from daytime napping. Hsouna et al. showed that a 40-minute napping opportunity after an evening-simulated soccer match had positive effects on levels of perceived exertion (Hsouna et al., 2021). Another study found that a 20-minute napping period was useful for providing recovery effect on leg muscle strength in male collegiate soccer players (Ajjimaporn et al., 2020). While daytime napping is shown to have practical and persistent benefits on visual perception, no research has explored the effect of napping on scanning behavior involving visual cognitive processing.

Thus, the purpose of the current study was to examine the impact of daytime napping on the scanning behavior of elite collegiate football players. We conducted (1) the Trail Making Test (TMT) to examine processing speed and executive function and (2) a soccer passing task-modified with reference to the Loughborough Soccer Passing Test. It is hypothesized that a napping opportunity would be beneficial for increasing the frequency of scanning activity, which is used to represent the recovery of physical and cognitive aspects, compared with a no-nap condition.

Methods

Experimental Approach to the Problem

A randomized cross-over design was employed to examine nap and no-nap interventions. The experiment was conducted the day after a competition game, which was held at a regularly scheduled time. Participants documented a three-day baseline habitual sleep/wake schedule, ensuring between 6 to 8 hours of nocturnal sleep in their home environment. Participants refrained from alcohol for 24 h prior to testing and from caffeinated products on the day of the experiment. The experimental interventions were separated by more than one month to prevent habituation.

Figure 1 illustrates the protocol of the present study. Participants were asked not to engage in strenuous exercise prior to the experiment. At 13:40 pm, participants entered a quiet, air-conditioned, dark room with the temperature set at approximately 25.0°C. Participants were encouraged to nap after the lights were turned off at 14:00 and were woken up by an examiner (SO) at 14:40. Individuals undergoing the no-nap condition stayed at the gymnasium and were asked to strictly avoid active movements and oral intake of caffeine products. The Karolinska Sleepiness Scale (KSS) and the visual analog scale (VAS) scores for subjective perceptive fatigue were assessed at 14:40, immediately after the nap opportunity or rest. TMT types A and B were performed at 15:20 pm, followed by a soccer passing test at 15:30. In both the napping and control conditions, participants engaged in habitual activities between completing the KSS and 15:20, like looking at smartphones, and they were only allowed to drink water. They were instructed not to perform any physical activity at that time.

Participants

Participants were recruited from the Waseda University Association Football Club, who participated in the first division of the Japan University Soccer League. This soccer club has also produced several professional players for the Japan Football League. Fourteen male soccer players (age: 21.6 ± 0.5 years, height: 173.4 ± 5.5 cm, body mass: 67.1 ± 4.5 kg) participated in the study during their on-season period. All participants were experienced players at the

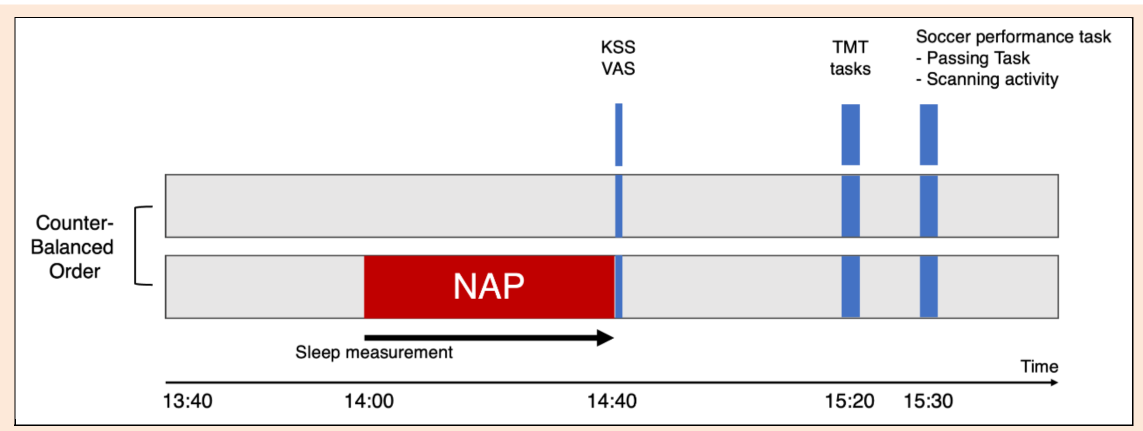

Figure 1. Experimental design. Design of the counterbalanced study, which included midday napping followed by a soccer performance task (passing test) that included subjective sleepiness and perceptive fatigue assessment. While performing the passing task, the scanning activities were monitored and measured by the skilled examiner.
KSS, Karolinska Sleepiness Scale; VAS, Visual Analogue Scale

national championship level in Japan. Regarding player position, five participants were defenders, seven were midfielders, and two were strikers. No goalkeeper was assigned to the experiment. They had no prior history of drug or alcohol abuse, or of neurological, psychiatric, or sleep disorders. Exclusion criteria were (1) use of any medication, (2) a baseline sleep time less than 4 hours or more than 10 hours per night, or (3) the inability to provide written informed consent.

Participants were asked to maintain their regular sleep/wake cycle for the three days preceding the study and to abstain from caffeinated products and alcohol on the day of the experiment. In addition, the day before the napping experiment was scheduled to be a usual training day with no games. The experiment was approved by the Academic Research Ethical Review Committee of Waseda University (IRB #2021-480) and conducted in accordance with the 1964 Declaration of Helsinki. All participants provided informed consent before any procedure took place.

Procedures

Sleep assessment

The level of subjective sleepiness for both groups was rated before the experiment using the KSS, which is scored on a Likert scale. A 0 - 10 VAS was used to assess participants' degree of self-perceptive fatigue (0: no fatigue and 10: worst fatigue possible).

To evaluate sleep the night before the experiment and the intervening napping, a smartphone application (Sleep Meister®, Amuser Labo, Japan) was installed on each participant's smartphone. Sleep Meister® is an alarm application that detects body movement via the accelerometer built into the device. This application is categorized as a commercial use apparatus and has not been validated according to standard polysomnography techniques. Using the Mobile Application Rating Scale (MARS), which has been shown to be suitable for the quality assessment for mobile health applications (Terhorst et al., 2020), Choi et al. rated Sleep Meister® MARS score as 3.6 out of 5, indicating that the application could be adequate and convenient for sleep measurements (Choi et al. 2018). However, smartphone applications cannot be guaranteed to be sufficiently accurate to determine sleep stages; thus, the application was solely used to determine wakefulness or sleep during napping.

Experimental task

TMT

The TMT is a commonly used neuropsychological instrument that measures cognitive flexibility, such as divided attention, visuomotor tracking, and working memory (Reiten and Wolfson, 1993). The TMT is also used to assess cognitive abilities associated with soccer performance (Prien et al., 2020; Vestberg et al., 2017). Previous research demonstrated that elite youth soccer players have better cognitive flexibility than their sub-elite counterparts (Huijgen et al., 2015a), reflecting that TMT correctly indicates higher cognitive abilities specific to elite soccer players. The TMT tests were conducted using the electronic version of the TMT presented on an iPad tablet screen.

The TMT test consists of two independent tasks, TMT-A and TMT-B. The TMT-A requires participants to connect a series of 25 numbers (1, 2, 3…) randomly distributed in space in an ascending order [24]. Participants were instructed to start their trial at the circle marked "Begin" and continue linking numbers until they reach the endpoint (circle marked "End"). In the Japanese version of the TMT-B, which is more complex than TMT-A, letters of the Roman alphabet (A, B, C…) are converted to Kana (Japanese phonograms; "a," "i," "u"…) [25]. Although these two tests are similar in that they combine numbers, the participants must alternately switch between a set of numbers (1–13) and a set of Kana letters ("a" through "shi") in TMT-B, again linking them in ascending order (1/a/2/i…). The participants are also asked to connect the array of circles as fast as possible.

Passing test

Passing performance was evaluated followed by the TMT test. For the passing test, which was a modification of the Loughborough Soccer Passing Test (Ali et al., 2007), participants began with the Japanese Soccer Association Certified Ball No. 5 (22 × 22 × 22 cm; 420 g) placed in the center of a 10-m square (Figure 2). Timing of the test (using a hand-held stopwatch) started as soon as the examiner (SO) called out the color of the target. The participants were informed of the next target.

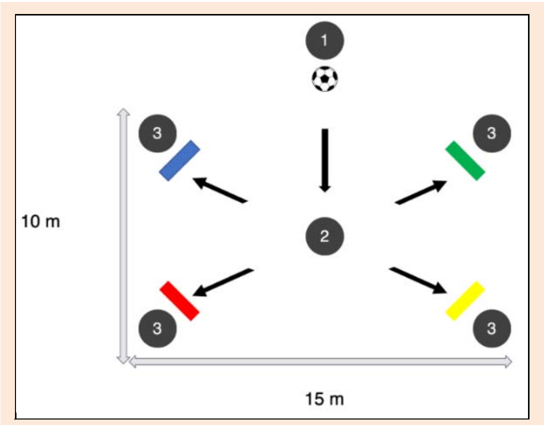

Figure 2. Schematic illustration of the passing test.
1. ❶ passes to ❷.
2. someone in ❸ raises his hand (randomly).
3. ❷ passes to the indicated place.
Participants performed the passing task ten times and measured the required time.

The order of passes was determined by one of four trial orders that were randomly generated by the investigators. The participants were instructed to perform the task within the passing area designated by the square. They were also requested that upon retrieving the previous pass, the ball had to approach within approximately two steps by participants before the next access could be attempted. In addition, participants were informed that for best performance on the present passing test, they would have to perform the test as quickly as possible while making the fewest mistakes. The passing test was performed ten times for each intervention condition. At the end of the tenth pass, the examiner pressed the stopwatch to turn it off. The order of passes was determined by one of four trial orders that were randomly generated by the investigators. The participants were instructed to perform the task within the passing area designated by the square. They were also requested that upon retrieving the previous pass, the ball had to approach within approximately two steps by participants before the next access could be attempted. In addition, participants were informed that for best performance on the present passing test, they would have to perform the test as quickly as possible while making the fewest mistakes. The passing test was performed ten times for each intervention condition. At the end of the tenth pass, the examiner pressed the stopwatch to turn it off.

Performance time, equivalent to the required time to complete the passing test, was calculated for the outcome. The passing test was completed on the grass field of the campus to ensure similar conditions across players. An experienced examiner, (co-author SO) who was a member of the Waseda University Association Football Club and had previously belonged to a youth team of the J-League (Japan Professional Football League), conducted the experiments and measured the time required.

Scanning activity

As shown in Figure 3 and video clip (https://www.jssm.org/video/2023-75.html), the scanning activity was defined as a self-initiated head movement in which the player's face was temporarily directed away from the ball (Jordet, 2005). Scanning activity presumably aims to look for teammates, opponents, the referee, or space relevant to subsequent action with the ball.

Although previous studies registered scan frequencies in 10-second intervals, scanning activity was assessed by counting the number of relevant behaviors. Measured scanning behavior included at least two head turns. The skilled examiner (SO) also counted any scanning activities visually.

Statistical Analysis

The Shapiro - Wilk test was used to check the normality of the data. Descriptive statistics are expressed as the mean and standard deviation. After checking the assumptions of parametric statistics, the dependent variables of performance were compared by paired t-tests to determine the mean difference between the nap and no-nap conditions for each test. A p value of <0.05 (two-tailed) was considered statistically significant. Values are represented as the mean and standard error of means (SEM) unless specified otherwise. The effect size statistic (Cohen's d) was analyzed to determine the magnitude of the effect independent of sample size. Differences were interpreted using Cohen's (d) guidelines as trivial (<0.2), small (0.2 - 0.6), moderate (0.6 - 1.2), large (1.2 - 2.0), very large (2.0 - 4.0), and huge (>4.0). All analyses were performed using SPSS Version 27 (IBM Corporation; Armonk, NY, USA).

Results

Sleep duration and subjective assessment

Nocturnal sleep variables prior to the experiment did not differ significantly between the nap and no-nap groups, indicating similar homeostatic sleep pressure (sleep drive) in both conditions (Table 1). All participants took a nap successfully and the mean napping time was 23.57 ± 8.47 min. The KSS and VAS scores are shown in Table 2. The no-nap group revealed no significant difference in KSS or VAS. The nap group also showed no significant difference in KSS ($t(13) = 0.424$, $p = 0.680$, Cohen's $d = 0.246$). Despite the lack of statistical significance, the VAS score of the nap group tended to be lower ($t(13) = 1.947$, $p = 0.073$, Cohen's $d = 0.46$).

Table 2. Subjective sleepiness and perceptive fatigue in Nap and No-nap condition

	Nap	No nap	p	Cohen's d
KSS	5.21 ± 1.69	5.57 ± 1.45	0.679	0.25
VAS	5.64 ± 1.45	6.64 ± 2.17	0.073	0.46

KSS, Karolinska Sleepiness Scale; VAS, Visual Analogue Scale (self-perceived fatigue). Mean values for the Nap versus No nap values were compared using a paired t-test.

Figure 3. An illustration of the scanning activity. A soccer player looks at the ball and then scans his left (or right) side.

Table 1. Nocturnal sleep variables for the night before the experiments

Variable measured (mean ± SD)	Nap	No-nap	p	Cohen's d
Total time in bed (min)	406.7 ± 71.9	415.2 ± 61.4	0.725	0.12
Total sleep time (min)	371.4 ± 75.0	379.8 ± 70.6	0.714	0.12
Latency to sleep onset (m)	24.7 ± 16.9	24.4 ± 16.3	0.958	0.02
Wake time after sleep onset (m)	35.6 ± 20.9	32.4 ± 17.6	0.591	0.15
Sleep efficiency (%)	91.0 ± 5.0	91.8 ± 4.9	0.591	0.17

No significant difference was observed in the measurement of nocturnal sleep on the day before the experiment. Values are shown as mean ± SD. Mean values for the sleep variables were compared using a paired t- test.

TMT

Figure 4 depicts the TMT-A and TMT-B scores. No significant difference was observed in the required time to complete TMT-A between the nap and no-nap condition (TMT-A, $t(13) = 0.202$, $p = 0.843$, Cohen's $d = 0.04$). Although the average time to complete TMT-B was shorter in the nap group than in the no-nap group, the difference was not significant ($t(13) = 0.891$, $p = 0.389$, Cohen's $d = 0.37$).

Passing test

Figure 5A illustrates the required performance time between nap opportunity and no-nap conditions. The nap group showed a significantly shorter required time compared to that of the no-nap condition ($t(13) = 4.211$, $p < 0.001$, Cohen's $d = 0.77$).

Scanning activity

The comparison of scanning activity between conditions is shown in Figure 5B. The number of scans during the passing test was significantly more frequent in the nap group compared to the group that did not receive a nap opportunity ($t(13) = -4.600$, $p < 0.0005$, Cohen's $d = 0.79$).

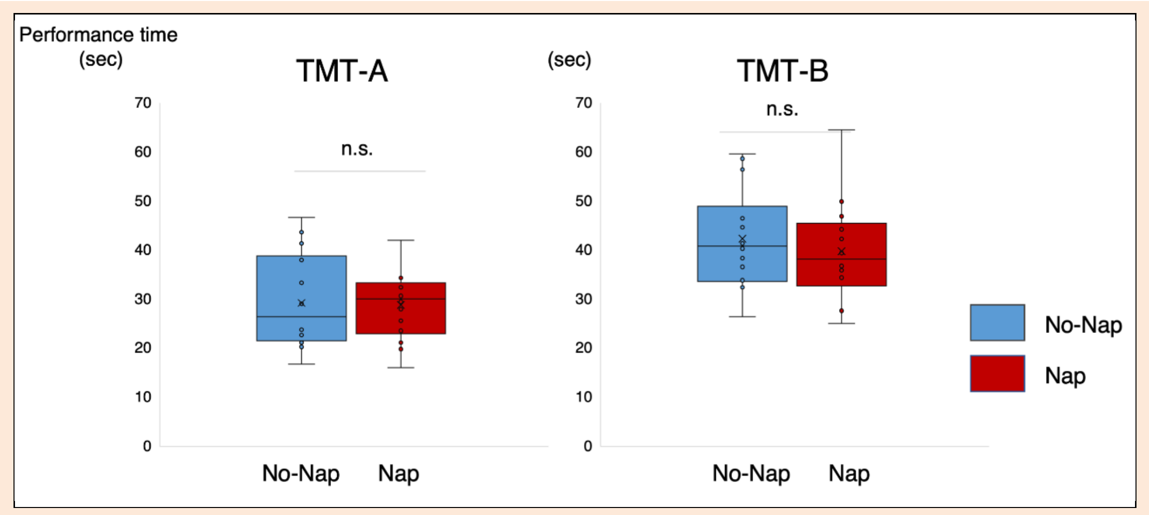

Figure 4. The time required to complete TMT-A and TMT-B following the no-nap and the nap conditions. Error bars mean the standard error of the means.

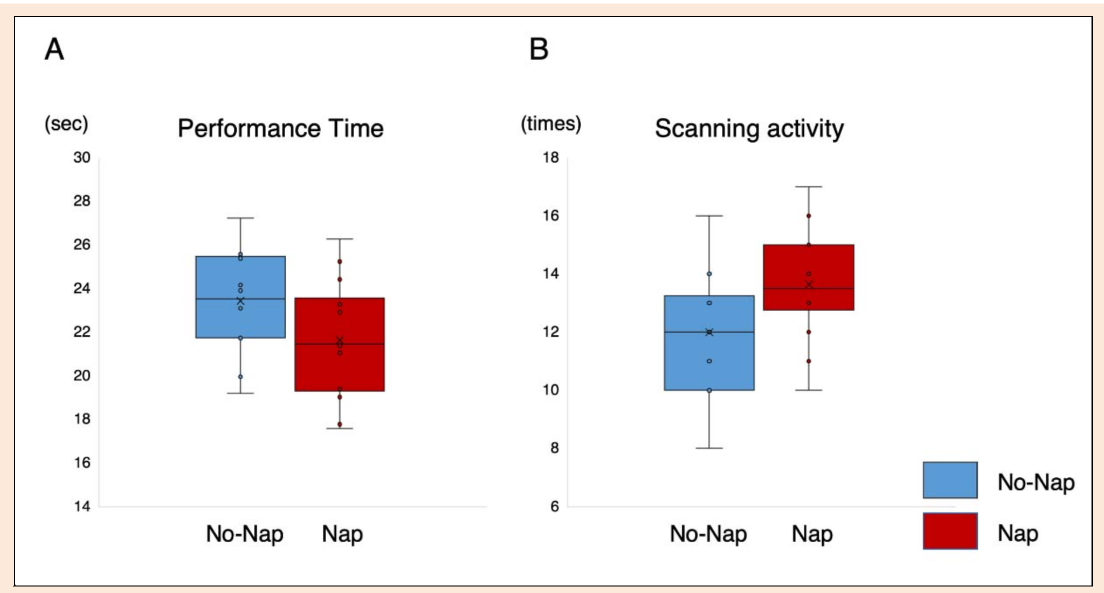

Figure 5. (A) Performance time required to complete the passing test in the no-nap and the nap conditions. (B) the number of times a scanning activity was performed during the passing test in the no-nap and the nap conditions. Error bars means standard error of means.

Discussion

The present study investigated the effects of daytime napping on soccer performance represented by TMT, a soccer passing test, and scanning activity. The results indicated that daytime napping had a beneficial effect on passing times and scanning activity, but there was no significant difference in TMT according to nap condition. Previous studies have examined the effects of napping on soccer performance, the running-based anaerobic sprint test and leg muscle strength (Ajjimaporn et al., 2020), perceptive fatigue, and the 5-m shuttle run performance (Hsouna et al., 2021). To our knowledge, this is the first study to examine the association between napping opportunity and specific soccer performance represented by passing speed and scanning activity.

Passing skill in soccer is characterized as a relatively discrete, closed, and self-paced task, considerably depending on representative control (Basevitch et al., 2015). Steiner et al. postulated that the regular use of perceptual information plays a crucial role in determining passing decisions (Steiner, 2018), assuming that passing performance is dependent on decision-making. Whether decision-making is adversely influenced by sleep loss is debatable. While restricted sleep decreases the working memory capacity, it does not affect sustained attention, response inhibition, or decision-making (Santisteban et al., 2019). Nevertheless, even mild sleep restriction can negatively affect vigilance, reflected by reduced processing capacity for decision-making, resulting in dull motor preparation and execution (Stojanoski et al., 2019). Napping, as a countermeasure for daytime sleepiness and decreased alertness, has been shown to impact conscious behavior, minimizing the reaction time reliant on decision-making (Shaikh and Coulthard, 2019).

The passing test used in this study demanded a high level of continuous attention, as inattention for only a split second may have impaired performance considerably. A previous study demonstrated that sleep deprivation affected the performance of a constant kicking task, which required continuous attention (Pallesen et al., 2017). Additionally, non-REM sleep stage 2, which predominantly occurs in daytime napping, improves attentional selection in time (Cellini et al., 2015). Thus, daytime napping may enhance passing performance, which involves decision-making and continuous attention.

The notable finding of the present study was the increased scanning activity observed in the nap group compared to that of the no-nap group. Conflicting results associated with players' visual perception behaviors, such as scanning, are attributed to differences in laboratory studies rather than in more representative *in situ* studies, validating the appropriate generalization of performance environments (Dicks et al., 2010). While the experimental setting requires less effort to pursue angles to be scanned compared to the effort required during a real game, the skill of passing performance in the laboratory experiment also partially fulfills the original function of scanning activity presented by a real game, underpinned by previous ecologically valid experimental settings (Kredel et al., 2017). Studies conducted in laboratory settings showed that more skilled football players look more frequently at locations compared to less skilled players (Roca et al., 2011). Scanning activity is closely associated with visuospatial processing, which is susceptible to sleepiness or decreased vigilance (Chandrakumar et al., 2020). The napping opportunity helped elevate arousal level, increasing visuospatial executive cognition. Inclusive of the higher cognitive function; the scanning activity is also representative of decision-making. The decision-making process in soccer games is composed of the following processes: (1) visual perception, the ability to capture and interpret information coming into the brain; (2) exploratory behavior, the ability to actively assess situations and gather information; and (3) prediction, the ability to imagine what will happen based on the collected information (Jordet, 2005). Indeed, scanning activity is predominantly involved in exploratory behavior, requiring sustainable attention. Given that daytime napping benefits decision-making and vigilance (Mark Lawrence et al., 2020), a napping opportunity is arguably likely to maintain the frequency of scanning activity.

Contrary to the speed and scanning activity, the TMT score yielded no significant difference between the nap and no-nap groups. The direct effect of sleeping on TMT performance has been scarcely investigated. Although TMT is assumed to relate to soccer performance because it involves cognitive flexibility, the current result indicates that a napping opportunity does not significantly benefit either TMT-A or TMT-B performance for a well-trained soccer player. The current TMT is categorized as a digital neuropsychological test battery and is practical for athletes because the testing is quick, reliable, and can be conducted outside standard settings (Saalfield et al., 2021). Whereas TMT was previously applied to examine the cognitive function of youth elite soccer players (Huijgen et al., 2015b), this research aimed to compare competitive level athletes, not evaluating the actual soccer-related performance encompassing visuospatial processing as well as decision-making. Reflecting on the present result, TMT performance does not accurately reflect the cognitive and executive processing speed or functions, which are implemented in the actual setting of a soccer game. The difference in results between laboratory-setting and actual practical assignments needs to be cautiously interpreted.

Fatigue is conceptualized as a complex state with multiple physiological and psychological origins. Physically demanding activities related to soccer as well as a combination of dehydration, glycogen depletion, and muscle damage lead to post-match fatigue (Nedelec et al., 2012). In addition to physical fatigue, the impact of mental fatigue induced by cognitive demands is likely responsible for the fatigue-related performance decrements observed during and after soccer matches (Smith et al., 2018). Previous evidence demonstrated that highly demanding cognitive tasks yield a negative effect on passing decision-making performance (Gantois et al., 2020). Napping is an effective recovery strategy for mental fatigue. Daaloul et al. used the mental rotation test paradigm to show that a daytime nap restored the decrement in cognitive performance (Daaloul et al., 2019). The present study did not show a significant difference in the rating of self-reported fatigue; the reduction in perceptive mental fatigue through napping could potentially increase the performance of soccer players by improving their performance in passing speed and scanning activity compared to players who do not nap.

Nevertheless, interpretations of the results of the present study should account for several limitations. First, the sample size was small; a larger number sample of participants are required to validate the incremental effect of napping. Second, defenders were dominant in terms of the playing positions in the present experiment. Whether scanning activity can depend on player position remains unknown, and the relationship between the positional role in soccer field and the scanning activity which is shown to benefit from napping, should be evaluated in the future studies. Third, the sleep propensities of napping should ideally have been measured with a device validated by polysomnography. When using wearable devices for sleep evaluation, measures obtained from scientifically validated devices are necessary. Finally, the scanning activity should be evaluated in a soccer game; it has not been verified whether the current results can reflect scanning activity in a competition game. Regardless of these limitations, our results suggest that daytime napping benefits soccer performance, specifically in speed and scanning activity. Further studies on the field condition are warranted to evaluate the effects of naps on cognitive performance to make the results more generalizable.

Conclusion

A midday nap opportunity may be a beneficial strategy for enhancing the passing speed and increasing the scanning activity in elite collegiate soccer players with post-game fatigue compared to players who do not nap. Despite the absence of subjective improvements in sleepiness and self-rating fatigue, napping showed an incrementally positive effect on pivotal behaviors underpinning soccer performance. Considering that inadequate sleep and residual fatigue are commonly observed in elite athletes, this finding may have practical applications for preparing soccer players. Implementing a nap opportunity may help maintain soccer-specific speed and scanning activity. Sleep and fatigue issues are not only related to performance and training, but also to mental health, affecting the overall well-being of soccer players and daytime napping may therefore also play a useful role.

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Key points

- The effect of daytime napping on passing performance, complex visual attention and scanning activity of elite collegiate soccer players were examined.
- The speed of passing and scanning activity was significantly shorter in the nap condition than in the no-nap condition.
- Scanning activity was significantly more frequent in the nap condition than in the no-nap condition.
- Daytime napping is likely to benefit soccer-related cognitive function, represented by visuospatial processing and decision-making.

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