Effect Of Specific Exercises For Developing Selected Physical And Motor Abilities Passing Yo-Yo Test For First Class Refrees Among India

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ABSTRACT:

The study analysis the test-retest reliability from the Yo-Yo IR1, and the ability of the Yo-Yo IR1 to differentiate between elite and non-elite youth soccer referees. A total of 5 youth soccer referees (17-28 years) participated: 2 non-elite referees to examine the test-retest reliability within 1 week, added with 3 elite referees to investigate the construct validity. Also, the physiological responses were highly reproducible in all age groups. Moreover, the Yo-Yo IR1 test had a high-discriminative ability to distinguish between elite and non-elite young soccer referees. Furthermore, age-related standards for the Yo-Yo IR1 established for elite and non-elite groups in this study may be used for comparison of other young soccer referees. The study also analyse the yo-yo test program on first class football referees at Hyderabad.

INTRODUCTION:

The Yo-Yo intermittent recovery test level 1 (YYIR1) has been extensively studied in different populations and age groups. Also, the YYIR1 has been described as a valid tool in adult professional and non-elite youth soccer players, in soccer referees and in youth handball players. In intermittent sports, such as soccer, where high-intensity activities are interspersed with periods of (active) recovery, the YYIR1 may assist as a valuable tool to measure an athlete's intermittent endurance capacity. Moreover, in recent literature, the YYIR1 has often been used in talent identification and development programmes in youth soccer populations.

Measures of reliability are extremely important in sports sciences. A coach needs to know whether an

improvement (in intermittent endurance) is real or due to a large amount of measurement error. For example, Krustrup et al. reported the good test-retest reliability of the YYIR1 (coefficient of variation (CV) of 4.9%) in 13 adult professional soccer players, whilst Thomas et al. found a CV of 8.7% in 18 recreationally active adults. Also, Castagna et. al reported a CV of 3.8% for the YYIR1 in 18 elite youth soccer players (14.4 years) of San Marino. However, the latter study aimed to investigate the direct validity between endurance field tests and match performance, rather than the reliability of the YYIR1.

This study was the first to investigate the reliability of the YYIR1 in a large sample of youth soccer players, aged between 18 and 30 years. However, the authors mentioned possible concerns in interpreting the results regarding the protocol used (2 test sessions), the level of the players (sub- and non-elite), and the relatively high coefficients of variation, typical errors and limits of agreement compared with those reported in adults. Therefore, as a consequence of previous findings

and similar to the previous study, we conducted a reliability study with three test sessions in high-level youth soccer players, aged between 18 and 30 years. Also, since structured talent identification (and development) programmes are now fundamental at the highest (youth) level for the preparation of future (professional) athletes, information about the reliability of evaluation tools is essential. Consequently, the aim of the study was to investigate test reliability of the YYIR1 performance and physiological responses in high-level youth soccer players.

The activity profile and physical demands of ball games such as soccer have been studied extensively over the last decade. It is now well established that these sports are of intermittent nature, with activity changes every 3–5 s, and are physically demanding because of multiple brief, intense actions involving jumps, turns, tackles, highspeed runs, and sprints. Furthermore, heart rate recordings and the collection of muscle and blood samples have shown that the aerobic loading is high throughout basketball

and soccer matches and that the anaerobic energy turnover is very high during periods of the game.

The conclusion regarding a high rate of anaerobic energy turnover during periods of elite soccer games is further supported by the recent finding that international elite soccer players perform twice as much high-intensity running in the most intense 5-min period as the game average (21) and that sprinting ability is temporarily reduced after an intense exercise period. A number of physical tests have been used to evaluate the training status of elite soccer players according to differences in age, playing position, and elite level.

Most of them consist of continuous exercise, and the relevance of these tests in ball games has been questioned. On the other hand, two intermittent field tests, the Yo-Yo intermittent recovery level 1 test (Yo-Yo IR1) and the shuttle sprint test, have been found to be related to the total amount of high-intensity exercise during soccer games. These tests have also been shown to have a high reproducibility and to be sensitive to training adaptations. However, because the Yo-Yo IR1 test consists of

10–20 min of repeated bouts of high-intensity aerobic work, and because the multiple shuttle test consists of six 6- to 7-s sprints interspersed with 20-s rest periods, neither of these tests is optimal for evaluating the ability to perform high-intensity exercise with a large rate of anaerobic energy production in combination with a high aerobic energy turnover.

One intermittent field test that may meet the requirements of simultaneous stimulation of the aerobic and anaerobic energy system is the Yo-Yo intermittent recovery level 2 test (Yo-Yo IR2 test). This test lasts 2–10 min and consists of 20-m shuttle runs at rapidly increasing speeds interspersed with 10-s periods of active recovery. The Yo-Yo IR2 test has been used for testing in a number of sports, such as football, but the test has not yet been investigated in terms of physiological response and reproducibility. Likewise, the test still needs to be examined to determine whether it is a sensitive tool to evaluate the intense intermittent exercise performance of soccer players in different seasonal periods, at different competitive levels, and in different

playing positions. Thus, the aims of the present study were to examine the physiological response and reliability of the Yo-Yo IR2 test and to evaluate its application to elite soccer.

METHODOLOGY

The study analysis Yo-Yo tests performance of 1st level football referees, nor have any studies examined the relationships between the results of different Yo-Yo tests. It is thought that one of the Yo-Yo tests may meet the requirements of simultaneous stimulation of the aerobic and anaerobic energy system. Therefore, the objectives of the current study were threefold a) to determine the relationship between performances in YIRT1, YIRT2 and YET, b) to determine the relationship between Yo-Yo test and WaNT test results, c) to examine the differences in heart rate responses to Yo-Yo tests and TRT in young soccer players. The study was conducted over a 2-week period, during which the players did not participate in any other training or matches. All players were recruited from the same team and had been playing competitively for at least two years.

SELECTION OF SUBJECTS

The participants were five students who attended a public high school. They were selected for the study because the coaching staff had identified them as having the poorest pass-blocking skills from a pool of 15 offensive linemen on the varsity football team. Linemen who had started at least one game during the previous season were excluded from the study, as were two other linemen who had played extensively at the varsity level. Our rationale for this selection process was to evaluate procedures with the least competent and experienced players.

None of the participants had more than 5 years of football playing experience. Matt was a senior, Dan and Logan were juniors, and Steve and Russ were sophomores. The mean age of the participants was 16.2 years (range, 15 to 17 years), with a mean height of 183 cm (range, 174 to 201 cm) and mean body weight of 89 kg (range, 79 to 100 kg). Other than being told that they would be receiving coaching in pass blocking, the participants were not informed about the purpose of the study. The parents of each

participant provided written informed consent.

The offensive line coach implemented the measurement and intervention procedures (described below). He was a bachelors-level teacher with 2 years coaching experience at the high school level. His involvement in the study was voluntary.

Figure 1: Design of the study
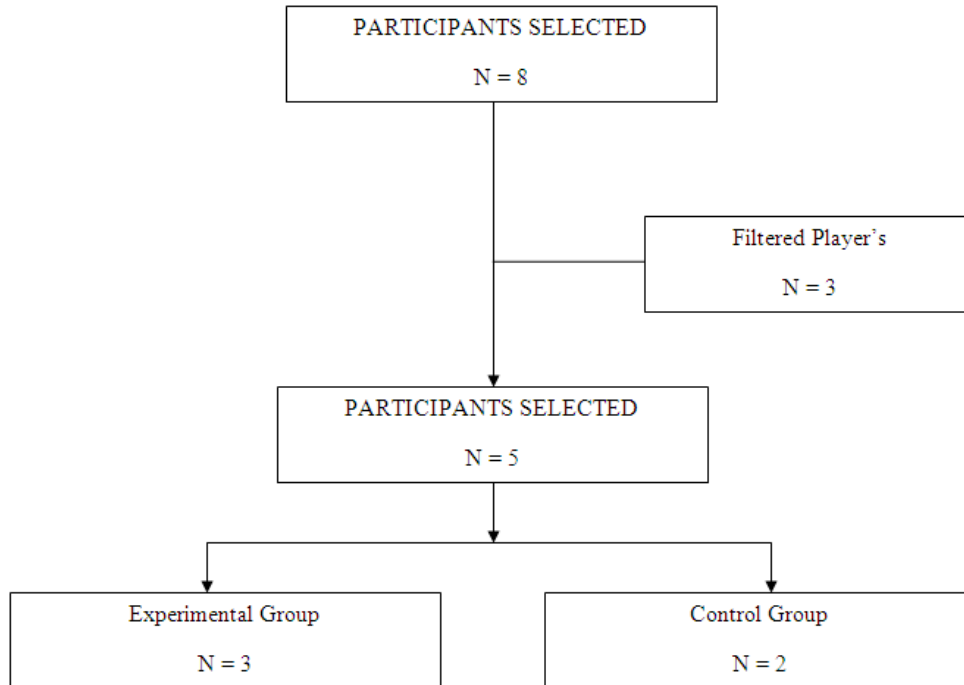
MEASUREMENT

Blocking was defined according to the 10-step task analysis shown in Table 1. Five college offensive line coaches (acquaintances of the senior author) were surveyed before the study to validate the steps selected in the task analysis. Each step was listed in sequence on a recording form. The dependent measure was the percentage of steps executed correctly during a

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practice pass-blocking drill and league football games. Measurement during the pass-blocking drill was conducted at weekly practice sessions. The drill began with a participant assuming a three-point stance (one hand and two feet in contact with the ground) at the 5-yard field stripe. An orange traffic cone was placed approximately 5 yards behind the participant, with one member of the coaching staff standing behind the cone. A defensive lineman in a four-point stance (two hands and two feet in contact with the ground) was positioned approximately 1 yard in front of the participant. In response to the correct offensive cadence, a participant had to block the rushing defensive lineman within a 3-yard lateral boundary, preventing him from touching the orange cone. The pass-blocking drill continued until either 10 s elapsed or the defensive lineman touched the orange cone, whichever came first.

The offensive line coach observed each participant during a single pass-blocking drill, recording a plus or a minus on the task analysis form next to each step that the participant executed correctly and incorrectly, respectively. Before the study, the senior author trained the coach to record data by watching videotaped pass-blocking drills from the previous season's practices. Training continued until the senior author and the coach achieved 90% or greater interobserver agreement for three consecutive drills. Additional training consisted of the senior author and coach observing offensive linemen perform pass-blocking drills during actual practice sessions. This training was completed when we achieved 90% or greater agreement for three consecutive drills.

Observers measured pass blocking during games from videotapes using the previously described task analysis form. A single game was videotaped for Dan and Matt during the first season and for Dan, Steve, and Russ during the second season. The offensive line coach recorded the initial three (Dan, Matt, and Russ) or four (Steve) pass-blocking sequences from the videotapes for each of these participants.

Figure 2: Squads

INTEROBSERVER AGREEMENT

During the study, 50% of the practice pass-blocking drills were videotaped for all participants. We assessed interobserver agreement by having the senior author record pass-blocking execution on the 10-step task analysis form. These results were compared with the real-time data that had been scored by the offensive line coach. An agreement was tallied if both observers rated each step identically (correct execution or incorrect execution). Interobserver agreement was computed by dividing the number of agreements by the number of agreements plus disagreements and converting the ratio to a percentage. Mean agreement was 90% (range, 50% to 100%). We also assessed interobserver agreement during 50% of the videotaped games using the same method of calculation described for the pass-blocking drill. Mean game agreement assessments were 88% (range, 70% to 100%). Note that the two low percentages of 50% and 70% were the only scores below 85% and were associated with one participant (Russ).

PROCEDURES

The five test trials were conducted as separate sessions with 2-day intervals between tests. On day 1, body composition measurements were taken and the participants completed a test session on a treadmill (Cosmed, Gambettola, Italy) to determine maximal oxygen uptake (VO$_2$max); on day 2, the participants completed a battery of tests that examined anaerobic physical performance (WaNT); on days 3, 4, 5 the YIRT1, YIRT2 and YET were performed randomly. The YIRT1, YIRT2, YET trials were conducted on the same facilities (synthetic pitch) and all tests were performed between 10:30 and 12:30. Before the players undertook the tests they were instructed to exert maximal effort and were verbally encouraged to run for as long as possible.

The standardized warm-up for the YIRT1, YIRT2 and YET trials consisted of 3 minutes of running the 20m distance back and forth at a set pace (i.e. 8.0 km/h) with the help of "beep" sounds; for the TRT trials, it consisted of 3 minutes of running on a treadmill at 8 km/h. This was followed by 5 minutes of stretching, focusing on the lower limb muscles. During the TRT, expired gases were analyzed using a breath-by-breath automated gas-analysis system. The flow, volume, and gas analyzer were calibrated before each player's test according to the manufacturer's instructions.

Heart rate data were stored using HR monitors (Polar Electro OY, Kempele, Finland) throughout the tests. The stored data were transferred to computer and filtered by Polar Precision Performance Software™ (PPP4, Finland). The highest HR measurement was recorded as HRmax. The temperature and relative humidity at the test site were consistent throughout the study, ranging between 25.4–27.6 ℃ and 51.3–53.7%, respectively. Each player completed all of the tests within the two-week period.

Yo-Yo Intermittent Tests

The Yo-Yo Intermittent Tests are similar to the Yo-Yo Endurance Test, except in the intermittent tests the participants have a short active break (5 and 10 seconds for the *intermittent endurance* and *intermittent recovery* test, respectively). There are two versions of

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each Yo-Yo Intermittent Test, a beginners Level 1 and advanced level 2.

The Yo-Yo tests can be performed using the Team BeepTest software.

Figure 3: Yo-Yo Intermittent Test

5 m   20 m
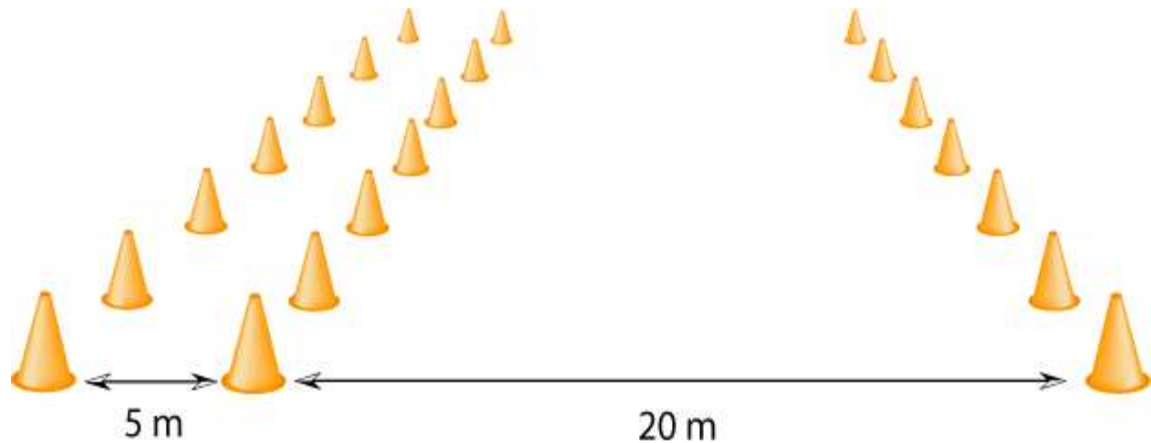
1) **Purpose:** The test evaluates an individual's ability to repeatedly perform intervals over a prolonged period of time, particularly for athletes from sports such as tennis, team handball, basketball and soccer or similar sports.

2) **Procedure:** Use cones to mark out three lines as per the diagram above; 20 meters and 2.5 (endurance test) or 5 meters (recovery test) apart. The subject starts on or behind the middle line, and begins running 20 m when instructed by the cd. This subject turns and returns to the starting point when signaled by the recorded beep. There is a active recovery period (5 and 10 seconds respectively for the endurance and recovery versions of the test) interjected between every 20 meter (out and back) shuttle, during which the subject must walk or jog around the other cone and return to the starting point. A warning is given when the subject does not complete a successful out and back shuttle in the allocated time, the subject is removed the next time they do not complete a successful shuttle.

3) **Variations**: for each of the recovery and endurance intermittent tests there are two levels: level 1 designed for lesser trained individuals and level 2 aimed at well trained and elite athletes and starting at a faster speed. Both test variations have increasing speeds throughout the test. See the Yo-Yo Intermittent Test Table for more details.

4) **Scoring**: The athlete's score is the total distance covered before they were unable to keep up with the recording. The Yo-Yo intermittent test usually takes between 6-20 minutes for level 1 and between 2-10 minutes for level 2. For more details see the speeds and distances for the Yo-Yo Intermittent Recovery Test and Yo-Yo Intermittent Endurance Test. There has been formula published for estimating VO2 max (ml/min/kg) from the Yo-Yo IR1 and IR2 test results:

5) *Yo-Yo IR1 test:VO2max (mL/min/kg) = IR1 distance (m) × 0.0084 + 36.4*

6) *Yo-Yo IR2 test: VO2max (mL/min/kg) = IR2 distance (m) × 0.0136 + 45.3*

7) **Target population:** The yo-yo intermittent test was developed specifically for soccer players, though it is suitable for similar sports teams which are intermittent in nature. The level 1 test is designed for recreational level players, while the level 2 test is for elite soccer players. The test is not suitable for populations in which a maximal exercise test would be contraindicated.

8) **Reliability**: Test reliability would depend on how strictly the test is run, and the previous practice allowed for the subjects.

9) **Advantages**: Large groups can perform this test all at once for minimal costs.

10) **Disadvantages**: Practice and motivation levels can influence the score attained, and the scoring of when a person is out of the test can be subjective. As the test is usually conducted outside, the environmental conditions can also affect the

results. The test cd must be purchased.

Other considerations: This test is a maximal test, which requires a reasonable level of fitness. It is not recommended for recreational athletes or people with health problems, injuries or low fitness levels. You may not have power where you want to conduct this test. If so, you need to ensure that the batteries of the audio player are fully charged.

ANALYSIS OF DATA AND RESULTS OF THE STUDY

Figure 4 shows the percentage of pass-blocking steps executed correctly by each participant during practice drills and games. Mean

correct pass blocking was 40% and 50% for Dan during the baseline and descriptive feedback phases, respectively. His performance improved under the video feedback condition (M = 82%). Targeting Step 7 of the task analysis with the TAG procedure was associated with 100% correct pass blocking during drills. Mean blocking proficiency was 85% in game conditions.

During the baseline at the start of the second season, his mean correct pass blocking returned to low levels (M =45%). Descriptive plus video feedback was effective in improving his pass blocking (M =80%), and this high proficiency was maintained during actual game observations (M =87%).

Table 1: The results of tests

VO$_2$max (ml/kg/min)	YIRT 1 Distance (m)	YIRT 2 Distance (m)	YET Distance (m)	WaNT peak power (watt)	Want average power (watt)
59.95± 1.23	2730.75± 159.38	1208.33± 89.22	2086.67± 128.30	719.12± 79.20	550.93± 37.06

The correlations between performances (in terms of distance covered) in the three tests and the measured VO_2 max obtained from TRT and WaNT test performances for the 12 players. There were weak correlations between performance in the YET and VO_2 max, whereas moderate correlations were found between performance in the YIRT1, the YIRT2 and VO_2 max obtained in the TRT. Moreover, there were moderate significant correlations between performance in the YIRT2 and peak power obtained in the WaNT. In contrast, there were no significant correlations between performance in any of the three tests and average power obtained in the WaNT. Finally, there were moderate negative correlations between performance in the YIRT2 and FI, whereas no correlations were found between performance in the YIRT1 or the YET and FI.

The grand mean YYIR1 performances for the U15, U17 and U19 age groups were 2024 ± 470 m, 2404 ± 347 m, and 2475 ± 347 m, respectively. The ICCs for these age groups were considered *excellent* and varied between 0.87 and 0.95. The TEs (and accompanying CVs) for the YYIR1 differences between test sessions 1 and 2 were 137 m (6.8%), 101 m (4.3%) and 107 m (4.1%); between test sessions 2 and 3 were 149 m (7.1%), 77 m (3.1%) and 74 m (3.0%); and between test sessions 1 and 3 were 147 m (7.5%), 126 m (5.4%) and 172 m (6.9%), for age groups U15, U17 and U19, respectively. The ICCs amongst test sessions for all HRs were considered *excellent* and varied between 0.76 and 0.97, except for the recovery HR after 1 minute, which was considered as *good* (ICC = 0.73).

Mean correct pass blocking was 47% and 50% for Steve during the baseline and descriptive feedback conditions, respectively. Correct performance increased with the provision of video feedback (M = 87%). Effects of the TAG procedure targeting Step 7 of the task analysis are unclear; nevertheless, he achieved 100% correct in three of six pass-blocking drills during the TAG phase. When assessed at the start of the second season, correct pass blocking returned to low levels during baseline (M = 55%). Reimplementing video feedback improved his performance (M = 83%); subsequent in-

game performance was strong (M = 85%).

Table 2: Means (SD) for YYIR1 distance and heart rates for each test moment with pairwise typical errors (TE

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(90% confidence interval)) and coefficients of variation (CV (90% confidence interval), and grand mean intra-class correlation (ICC (90% confidence interval)) between the three test moments

Variable	Age category	n	Week 1 mean (SD)	Week 2 mean (SD)	Week 3 mean (SD)	Grand Mean mean (SD)	TE (abs) 1-2 (90% CI)	CV (%) 1-2 (90% CI)	TE (abs) 2-3 (90% CI)	CV (%) 2-3 (90% CI)	TE (abs) 1-3 (90% CI)	CV (%) 1-3 (90% CI)	ICC (90% CI)
YYIR1 (m)	U15	22	1849 (471)	2162 (523)	2062 (409)	2024 (470)	137 (110-184)	6.8 (5.5-9.2)	149 (119-200)	7.1 (5.6-9.5)	147 (118-198)	7.5 (6.0-10.1)	0.92 (0.85-0.96)
	U17	10	2288 (357)	2496 (322)	2428 (360)	2404 (347)	101 (74-167)	4.3 (3.1-7.0)	77 (56-126)	3.1 (2.3-4.8)	126 (92-207)	5.4 (3.9-8.8)	0.95 (0.87-0.98)
	U19	4	2610 (266)	2660 (314)	2370 (415)	2547 (337)	107 (66-312)	4.1 (2.5-11.8)	74 (46-217)	3.0 (1.8-8.6)	172 (106-500)	6.9 (4.3-20.1)	0.87 (0.41-0.99)

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The 95% ratio LOA between test sessions 1 and 2 were 1.17 */÷ 1.24, 1.09 */÷ 1.13 and 1.02 */÷ 1.11, for age groups U15, U17 and U19, respectively. Similar analyses between test session 2 and 3 revealed 95% LOA of 0.96 */÷ 1.23, 0.97 */÷ 1.09 and 0.88 */÷ 1.12, for age groups U15, U17 and U19, respectively. Finally, the 95% LOA between test sessions 1 and 3 were 1.13 */÷ 1.28, 1.06 */÷ 1.15, and 0.90 */÷ 1.22 for age groups U15, U17 and U19, respectively.

Mean correct pass blocking was 43% for Logan during the baseline phase. His performance improved initially with descriptive feedback but then decreased (M = 62%). Adding video feedback increased correct pass blocking to a mean of 90%. Mean correct pass blocking was 95% with the TAG procedure in place for Step 5 of the task analysis. Mean correct pass blocking was 59% for Matt during the baseline phase. Pass blocking appeared to improve with both descriptive (M = 71%) and video (M = 84%) feedback. Mean blocking proficiency was 83% under game conditions.

Russ demonstrated the most variability in pass-blocking execution during the initial baseline phase, ranging from 20% to 60% (M = 38%). His performance did not improve with descriptive feedback (M = 41%), but did improve with video feedback (M = 66%). Further improvement occurred when the TAG procedure was implemented for Step 5 (M = 80%), Step 6 (M = 82%), and Step 7 (M = 88%) of the task analysis. The second season baseline assessment showed a return to low levels of correct pass blocking (M = 27%). Descriptive and video feedback were associated with improved performance (M = 67%), which was maintained during games (M = 65%). Because performance fell below the performance criterion, additional intervention was implemented (TAG of Step 7), yielding a mean performance of 78%. His correct pass blocking persisted during a second in-game measurement (M = 77%).

At the close of our intervention, each participant was able to pass block consistently within our normative criterion that was established for starting offensive linemen. All participants achieved this criterion during the descriptive and video feedback phase; however, TAG allowed

participants to exceed (Dan, Steve, Logan) or consistently stay within the criterion (Russ). Criterion performance persisted for all of the participants who were assessed during games. Table 2 presents the social validity results. All five participants rated the baseline coaching procedures as poor. They rated descriptive feedback as fair (80%) and good (20%), descriptive feedback plus video feedback as good (20%) and excellent (80%), and TAG as fair (25%), good (50%), and excellent (25%).

CONCLUSION

The research concludes, from the results observed in this study, it is possible to affirm that tactical behavior influences affective decision-making in under-15 soccer players. It was found that differences in performance on the Iowa Gambling Task (IGT) neuropsychological test were linked to the tactical behavior scores of players. Players with high Defensive and Game Tactical Behavior presented better performance on IGT than those with low Defensive and Game Tactical Behavior. Such findings support the statement that affective decision-making is an important measure for predicting the level of tactical behavior to be achieved by young soccer players. Data from this study highlight the importance of developmental factors in soccer players, but there is a need for additional studies that analyze the influence of affective decision-making on the tactical behavior of young soccer players of different age categories and levels of competitiveness.

Therefore, our results suggest that the moderating role of the nature of the creativity task plays an important role in the interaction between divergent thinking and working memory, as it is evident in current creativity research. "In sum, the mediating effect of working memory on creativity depends on the type of task to be performed." In this respect, the present findings are well aligned with current theorizing on the role of working memory capacity in problem solving, concluding that successful problem solving depends on the needs of the situation. While an increasing number of correlational studies and laboratory-based experiments have started investigating creativity and working memory, there are only few studies which take task

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complexity and domain-specific knowledge in regard to the task into consideration.

The present research provides a first attempt of filling this gap in the literature. However, the present research is not without limitations. Although, we provide evidence that domain-general working memory capacity was not related with domain-specific creativity amongst experienced soccer players, we did not experimentally manipulate domain-specific experience by either varying the task demands or the experience level of the participants. As we were interested in answering the question whether an athlete's domain-specific creativity is restricted by their domain-general cognitive abilities (i.e., working memory capacity), it is currently not clear whether less experienced athletes or children would have benefitted on the creativity task from having a greater working memory capacity. Further in consideration of the findings of Ricks et al. (2007) who showed that expertise in combination with high working memory capacity can hinder creative performance, top-level soccer players (as compared to the amateur to semi-professional participants) might have been influenced by their working memory capacity on the creativity task. Therefore, future research and theorizing on the role of working memory in creative behavior needs to distinguish between different types of creative performance while considering the role of domain-specific experience in the creativity task. A fruitful approach in this endeavor would be to manipulate task demands (requiring domain-specific knowledge or not) while having various participant groups varying in domain-specific experience and working memory capacity. Given the importance of creative moments, products, and processes in a variety of contexts, such as economy, medicine, science, or sports, the present research contributes to a growing body of literature that sheds light on the underlying cognitive mechanisms associated with creative thought and behavior. Specifically, we demonstrated that working memory capacity was not a limiting factor on creative decision making amongst skilled performers.

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