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A Comparison of Socioenvironmental Modifications to a Strongman Training Design on Rugby Athlete Motivation and Performance

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ABSTRACT

Athletes need to be highly motivated to train at the required frequency, intensity, and volume to enable favourable physiological adaptations. In group settings, it is important to consider the role socio-environmental influence might have in diminishing or strengthening athlete motivation. The purpose of this study was to compare five modified strongman training session designs (i.e., 1. Individual, 2. Working in pairs, 3. Working in pairs with stronger partner, 4. Leader board with no feedback, 5. Leader board with feedback) on athlete motivation and performance. Performance was measured by the number of repetitions completed during sixty seconds for the keg swing and sledgehammer strike exercises. Motivation was assessed pre and post training via a questionnaire. To compare between the five session designs, a repeated measures analysis of variance was undertaken along with Cohen's d effect sizes between each session (e.g., 1v2, 1v3, 2v3). When examining changes in motivation, and motivation between session design an overall significant effect was demonstrated. For performance measures, overall significant differences were found across the session designs. The current findings demonstrate that athlete motivation and strongman performance can be enhanced by manipulating the design of a modified strongman training session. Working in pairs or using a leader board with feedback enhanced motivation and performance compared to working alone or using a leader board without feedback. These findings suggest than planning and delivering modified strongman training sessions that consider the socioenvironmental design of the session including ways to enhance motivation should be recommended for coaches to enhance athlete motivation and potentially improve physiological performance.

Keywords: motivation, coaching behaviours, strength & conditioning

INTRODUCTION

Strongman or modified strongman training (MST) to enhance sport performance is becoming increasingly utilised among S&C practitioners (52). MST implements and exercises are generally full-body movements performed in multiple planes. Hence, they may better replicate sporting movements and place greater demand on the body's core musculature than other resistance training approaches (52). Given rugby players encounter dynamic resistance (i.e., tackling, rucking, mauling) in the form of their opponents, MST exercises (e.g., water-filled kegs, sledgehammer strikes, yoke carries) afford athletes the opportunity to train with

that dynamic resistance (52).

Sport performance is determined by a complex interaction of variables including physiological, biomechanical, and tactical considerations (18). Rugby union is a high-intensity intermittent collision-based sport relying on individual maximal strength, power, and speed, interspersed with periods of lower intensity aerobic activity and rest (26). A competitive athlete's success will be linked to varied skills associated with performance in their chosen sport (competitive focus, improving a personal record, training intensity; 31). The purpose of a strength and conditioning (S&C) coach is to plan, deliver, and review the physical and physiological preparation of athletes, to support improvements in sports-specific performance outcomes (20). In recent decades, coaches, professionals, and researchers have identified these main performance indicators (heart rate, power output, motivation), so that they might be incorporated within the training process to improve an athletes' performance (8, 24, 32). To enhance an athlete's physiological outcomes, the S&C coach would utilise a diverse range of skills, including the effective planning, delivery, observation, evaluation, adaptation, and recording of training to support an effective motivational climate (i.e., the manipulation of training intensity and volume to optimise adaptive responses to training) (25). Recent studies (1, 17, 19) have demonstrated motivation to be strongly related with sport performance. In fact, as Clancy et al. (10) reported in their review, motivation is a fundamental construct related to an athlete's behaviour, the training process, and performance improvement. Therefore, establishing methods that enhance athlete motivation and the motivational climate is highly important for coaches (49).

For athletes to improve physiological characteristics (i.e., strength, power, speed) training at prescribed volume, intensity, and frequency over a prolonged period of time necessitates individuals and groups to be highly motivated (28). However, numerous factors such as neuromuscular fatigue (40, 50) or psychological state or characteristics (low motivation, conscientiousness) (50, 51) may limit physiological output. Furthermore, athlete motivation can be influenced by key social agents (coaches, teammates, peers, and parents), which is often referred to as the motivational climate, a term most closely associated with achievement goal theory (2, 38). Motivation can be defined as "the investigation of the energisation and direction of behaviour" (38, p. 6). Other frameworks supporting this investigation into athlete behaviour include self-determination theory (12) and self-efficacy (5). For self-determination, the components of autonomy; the freedom to choose, competence; the experience of mastery, and relatedness; the connection to others all contribute to the intrinsic motivation of the individual. Self-efficacy is the belief someone has that they have thew ability to achieve the given task and is influenced by verbal persuasion, experience (i.e., past, vicarious, imaginal), and emotional and physiological states. Motivation is a complex construct (or latent variable), rather than an observable entity, which contributes to the difficulty in accurately conceptualising and measuring it (29). An athlete who performs extra repetitions in the gym is often perceived by observers as highly motivated, though no measure of motivation has actually taken place (10). Despite these conceptualisation and measurement challenges, motivation continues to be an "ever-present and robust topic" in sport research (30, p. 77).

Athletes' motivation is associated with the perception that their coaches emphasize training and instruction, provide positive and information-based feedback, and social support (3). Coach autonomy support positively relates to athletes' contextual motivation, which promotes interest and undermines dropout intentions (16), while also being related to situational motivation and performance (17). Recently, Till and colleagues (46) presented a conceptual framework for decision-making within S&C coaching, based upon the premise that S&C coaches make decisions and shape their strategies for creating coaching interventions and establishing an effective motivational climate. Within the paper, Till and colleagues (46) presented the coaching planning, practice, and reflective framework (CPPRF) (35). The framework encourages coaches to explore the relationship between their: (a) coaching objectives (goals), (b) training activities, (c) behavioural strategies, and (d) athlete engagement, through the deliberate planning, manipulation, and alignment of training activity structure and their behavioural strategies to maximise athlete engagement and development opportunities.

Therefore, it was recommended that S&C coaches consider strategies for maximising athlete motivation through the design, planning, and delivery of their training activities and coaching behaviours that are developmentally appropriate, responds to an athlete's motivational requirements, and continually drives performance (36).

Whilst numerous studies and researchers have explored the mechanisms surrounding motivation and athlete performance (31, 37, 45, 50), the authors are currently unaware of any research studies that investigate the manipulation of MST session design (activity structure) on athlete motivation and performance. Therefore, the aim of this research study was to compare five MST session designs (i.e., working as an individual, working in a pair, trying to achieve leader board status) on the motivation and performance of athletes.

METHODS

Experimental Approach to the Problem

A repeated measures research design involving five differing session task designs was used. The sessions ran in sequential order, 1) working as an individual, 2) working as a pair, 3) working as a prescribed pair, 4) working towards a leader board with no feedback, 5) working towards a leader board with feedback). The sessions took place weekly at the same time and day. The athletes completed the same exercises, volume, and work:rest ratios each week, only the task design changed. Athletes completed a seven station MST circuit with the following exercises 1) Inverted Row (TRX) 2) Press Ups 3) Sledgehammer Strikes 4) Keg Swings 5) Battle Ropes 6) Tyre Flips 7) Yoke Carry. Each session consisted of sixty seconds per exercise and three rounds of the circuit, with sixty seconds rest in between exercises, and three minutes rest in between rounds. Athletes were evaluated during round two on the number of repetitions completed in the sixty seconds for exercises three and four (sledgehammer strikes and keg swings). Prior to each session athletes completed a five-question athlete self-reporting measures (ASRM) questionnaire (see figure 1). Individual levels of motivation were completed pre and post session (see figure 2) which included questions relating to the session structure and its impact on motivation (see figure 3), and finally, post session a differential rating of perceived exertion (dRPE) scale was completed (see figure 4).

Subjects

Twenty-four semi-professional rugby players from a single club participating in the United Kingdom's National League Two North were recruited for this study. The criteria for inclusion within this study was as follows: (a) over the age of 18 years (b) S&C training experience of over two years and (c) availability to participate in all training sessions. Subjects were informed of the purpose, rationale, risks, and benefits of participation before signing institutionally approved consent documentation. The study was approved by the Leeds Beckett University Research Ethics Committee.

Procedures

Familiarisation

All participants were familiar with the exercises they undertook as part of the prescribed sessions, as the movements were completed on a regular basis as part of their usual training programme. The exercises chosen were movements regularly used within the physical performance development within the sport of rugby union (52). Subjects completed a standardised ten-minute warm-up including light jogging, dynamic stretching, and potentiation

Sleep Quality	1	2	3	4	5
	Insomnia	Restless Sleep	Difficukity Falling Asleep	Good	Very Restful
Nutritional Quality	1	2	3	4	5
	Very Poor	Poor	Average	Good	Excellent
Delayed Onset of Muscle Soreness (Doms)	1	2	3	4	5
	Very Sore	Increase in Soreness / Tightness	Normal	Feeling Good	Feeling Great
Fatigue	1	2	3	4	5
	Extremely Tired	More Tired Than Normal	Normal	Fresh	Very Fresh
Wellbeing	1	2	3	4	5
	Highly Stressed	Stressed	Normal	Positive	Excellent

Figure 1. Athlete self-reporting measures questionnaire

Perception of Individual Motivation Scale		
Scale	**Descriptor**	**Athlete Score**
9-10	Very High High degree of intrinsic motivation, with a want and desire to complete the session	
7-8	Positive A strong degree of motivation and willingness to participate in the session	
5-6	Average Willingness to participate in the session	
3-4	Low Needs feedback, encouragement, engagement from peers to participate in session	
1-2	Amotivation Low level of motivation, high degree of lethargy and unwillingness to participate in session	

Figure 2. Individual levels of motivation questionnaire

The expectation of the session (following the framing or explanation) increased your motivational status				
Strongly Agree	Somewhat Agree	Neither Agree or Disagree	Somewhat Disagree	Strongly Disagree

The session design led to an increase in individual motivation to complete the session				
Strongly Agree	Somewhat Agree	Neither Agree or Disagree	Somewhat Disagree	Strongly Disagree

The coaching behaviours you experienced led to an increase in individual motivation to complete the session				
Strongly Agree	Somewhat Agree	Neither Agree or Disagree	Somewhat Disagree	Strongly Disagree

Figure 3. Impact of task design on levels of motivation

	1	2	3	4	5
Cognitive Rate of Perceived Exertion	Low No mental activity/ stress occurred. All thought processes and decision making were clear and concise	Average Some challenges and need to ensure attentional focus, but within my comfort zone	Difficult A number of points throughout the session caused a need for reflection, questioning, analysis and thought	Stressful A continued need to think, analyse, assess and consider decision-making processes with an eventual grasp on the concept	Very High Severe difficulty in assessing, analysing and implementing thought processes, decision-making or concepts
	1	2	3	4	5
Muscular Rate of Perceived Exertion	Low Minimal effect/re-sponse required from the muscular system to complete the task	Average Some challenges to muscular system but within force/velocity capabilities	Difficult A number of points throughout the session caused chal-lenges to force and/or velocity capabilities	Stressful A continued stress to the muscular system and individual force and/or velocity capa-bilities	Max Effort Extremely difficult to continue to exert maximum force and/or velocity for duration
	1	2	3	4	5
Cardiovascular Rate of Perceived Exertion	Low Minimal effect/re-sponse required from the cardiovascular system to complete the task	Average Heart Raye (HR) not raised above 70% of Resting Heart Rate (RHR)	Difficult A number of points throughout the ses-sion HR rose above 80% RHR	Stressful Continued periods of time where HR was above 80% RHR	Max Effort Level counld not be maintained for more than 90 seconds for repeated efforts

Figure 4. Differential rate of perceived exertion scales

exercises prior to the session.

Completion of ASRM's were recorded every session as part of the session preparation, meaning participants understand the scales and questions (13, 34).

Performance Measures

A video camera was positioned to record the two performance measures (i.e., sledgehammer and keg swings) so that repetitions completed could be counted and video verified for each exercise and subject after each session. All videos were watched by the lead researcher and number of repetitions counted for each exercise.

Sledgehammer

A 7kg sledgehammer was used with a 120cm wide tyre. Subjects were instructed to keep both hands on the sledgehammer at all times throughout the movement. The head of the hammer had to strike the tyre in a downward movement with both hands coming above the level of the head in the top position. If this protocol was not followed the repetition was not counted.

Keg Swing

A 20kg keg was used. Athletes held the specific handles at the top of the keg. Subjects were instructed that the hands had to reach shoulder level in the top position and pass through the inside of the legs in the bottom position. If this protocol was not followed the repetition was not counted.

Pre & Post Questionnaires

In research settings, ASRM are typically used to evaluate the impact of an acute training phase or intervention on athlete well-being. As a result, ASRM have been demonstrated to be sensitive, reliable, and practical measures of the athlete state (41). Prior to the session athletes completed a standard ASRM that included scoring sleep quality, nutrition, delayed onset of muscle soreness, fatigue, and wellbeing on a Likert scale one to five (41). Athletes also rated their motivation prior to completing the session on a Likert scale of one to ten. Post session athletes completed a dRPE question looking at cognitive, muscular, and cardiovascular load. A Likert scale of strongly agree, somewhat agree, neither agree or disagree, somewhat disagree relating to the expectation, session design, and coaching behaviours experienced was used to identify changes in scores. The questions for each of these questions were as follows:

1. The expectation of the session (following the framing or explanation) increased your motivational status
2. The session design led to an increase in individual motivation to complete the session
3. The coaching behaviours you experienced led to an increase in individual motivation to complete the session
4. Alongside scoring their motivation to identify if any changes had occurred.

Session Task Design

Five MST session designs were used to evaluate the effect of session task design had on athlete motivation and performance. Table 1 provides a summary description of the five sessions used with a rationale for the purpose (see table 1).

Coaching Feedback

When feedback was provided (e.g., session 2, 3, & 5), individuals received feedback on exercise technique, verbal encouragement (e.g., observation of effort, motivation), and time remaining in the set.

Statistical Analyses

Data are presented as means and standard deviations for motivation (expectation, design, behaviour), change in motivation between pre- and post-session and the performance in the keg swing and sledgehammer strike across the five session designs. Comparison of athlete motivation and performance across the five session designs was assessed using a repeated measures analysis of variance (ANOVA) test with pairwise comparisons. SPSS (version 28.0: IBM, Armonk, NY, USA) was used to conduct analysis with statistical significance accepted at the level of $p < 0.05$. In addition to the repeated measures ANOVA, Cohen's d effect sizes and 95% confidence intervals were reported. Cohen's *d* effect sizes were categorized as trivial (<0.2), small (0.20-0.59), medium (0.60-1.19), large (1.20-1.99) or very large (>2.0) (23).

RESULTS

Compliance within the training program was 100% for all training sessions and data collection. Table

Table 1. Descriptions of the differing task designs to evaluate motivation and performance

Session	Theme	Content & Activities	Purpose
1	Working as an individual	Only technical or instrumental feedback was provided (e.g., reinforcement of performance measure standards). No verbal or visual feedback was provided or notification of performance measures	Create a baseline of motivation and performance through standardised training session Self-Determination theory (Autonomy)
2	Working as a pair	Completed their exercise as part of a pair with full feedback on performance measures	Exploration of the impact the social environment played (working within groups) on motivation and performance Kohler effect Self-Determination Theory (Relatedness support)
3	Working as a (prescribed) pair	Completed their exercise as part of a pair with full feedback on performance measures. 1 person in the pair was >20% stronger than the other. These pairings were sorted via previous test battery data	Exploration of the impact the social environment played (working within groups) on motivation and performance Kohler effect Self-Determination Theory (Relatedness support)
4	Working towards a leader board position (no feedback)	Objective to get name on leader board (e.g., top five names) via performance measure result. Individuals were not provided with any feedback on performance and only saw names and positions on the leader board	Exploration of the impact the social environment played (competition and social standing) on motivation and performance Self-Determination Theory (motivational consequences) Goal orientations
5	Working towards a leader board position (full transparency)	Objective to get name on leader board (e.g., top five names) via performance measure result. Full transparency and feedback provided on performance measures detailed on leader board	Exploration of the impact the social environment played (Competition and social standing) on motivation and performance Self-Determination Theory (motivational consequences) Goal orientations

Table 2. Comparison of athlete self-reporting measures (ASRM) across sessions

	Session 1 (Individual)	Session 2 (Paired)	Session 3 (Prescribed Pair)	Session 4 (Leaderboard No Feedback)	Session 5 (Leaderboard with Feedback)	*P* Value
Sleep	4.1 ± 0.7	4.3 ± 0.6	4.1 ± 0.3	4.1 ± 0.7	3.8 ± 0.4	> 0.05
Nutrition	3.6 ± 0.5	3.8 ± 0.4	3.8 ± 0.4	3.5 ± 0.5	3.7 ± 0.6	> 0.05
DOMS	3.67 ± 0.7	3.6 ± 0.6	3.4 ± 0.6	3.7 ± 0.7	3.5 ± 0.5	> 0.05
Fatigue	3.67 ± 0.7	3.8 ± 0.6	3.8 ± 0.5	3.7 ± 0.7	3.7 ± 0.6	> 0.05
Wellbeing	3.75 ± 0.6	3.7 ± 0.6	3.7 ± 0.5	3.8 ± 0.6	3.7 ± 0.5	> 0.05

2 shows the ASRM obtained before each of the five training sessions. There were no significant differences for any measure.

Table 3 shows the athlete motivation across the five sessions, with table 4 showing effect size and confidence limits of athlete motivation between each session. An overall significant effect was found for change of motivation pre- and post-session, and motivation based on expectation, design, and behaviours. Session 2 (paired), session 3 (prescribed pair) and 5 (leader board with feedback) demonstrated significantly greater (very large effect sizes) motivation and change in motivation than session 1 (individual) and session 4 (leader board with no feedback).

Table 5 shows the performance measures for sledgehammer strikes and keg swing across the five training sessions. Overall significant differences in sledgehammer strikes and keg swings were found across the session designs. Session 5 (leader board with feedback) produced the highest performance (very large ES) with session 2, 3, and 4 higher (moderate to large ES) than session 1. Moderate and large ES were found with session 3 and 5 higher than session 2 and 4 respectively.

Table 6 showed no significant differences in differential rate of perceived exertion scores between training sessions.

DISCUSSION

The aim of the study was to compare five MST session designs on athlete motivation and performance. The findings demonstrated that both athlete motivation (i.e., change in motivation, expectation, design, and behaviours) and performance (i.e., sledgehammer strike and keg swing) was increased when the session design was manipulated compared to working alone. The session with the greatest motivation and performance was the leader

Table 3. Comparison of athlete self-reported motivation across sessions

	Session 1 (Individual)	Session 2 (Paired)	Session 3 (Prescribed Pair)	Session 4 (Leaderboard No Feedback)	Session 5 (Leaderboard with Feedback)	*P* Value	Pairwise
Change in Motivation	0.0 ± 0.4	1.2 ± 0.5	1.5 ± 0.7	-0.6 ± 0.7	1.5 ± 0.7	< 0.01	5 > 4 > 1; 3 > 4 > 1; 2 > 1
Expectation	2.7 ± 0.6	4.2 ± 0.5	4.3 ± 0.4	2.6 ± 0.5	4.5 ± 0.5	< 0.01	5 > 4 > 1; 3 > 4 > 1; 2 > 1
Design	2.7 ± 0.6	4.2 ± 0.5	4.3 ± 0.4	2.4 ± 0.6	4.6 ± 0.5	< 0.01	5 > 4 > 1; 3 > 4 > 1; 2 > 1
Behaviours	3.1 ± 0.3	3.7 ± 0.5	4.1 ± 0.7	2.4 ± 0.6	4.3 ± 0.6	< 0.01	5 > 4 > 1; 3 > 4 > 1; 2 > 1

Table 4. Effect size and confidence interval of athlete self-reported motivation

	Session 2 (Paired)	Session 3 (Prescribed Pair)	Session 4 (Leaderboard No Feedback)	Session 5 (Leaderboard with Feedback)
Motivation vs Session 1	2.7 ± 0.7	2.6 ± 0.7	1.1 ± 0.5	2.6 ± 0.7
Versus Pairing (2 v 3, 4 v 5)		0.5 ± 0.5		3.0 ± 0.7
Expectation vs Session 1	2.7 ± 0.7	3.1 ± 0.7	0.2 ± 0.5	3.3 ± 0.7
Versus Pairing (2 v 3, 4 v 5)		0.2 ± 0.5		3.8 ± 0.8
Design vs Session 1	2.7 ± 0.7	3.1 ± 0.7	0.5 ± 0.5	3.4 ± 0.8
Versus Pairing (2 v 3, 4 v 5)		0.2 ± 0.5		4 ± 0.8
Behaviours vs Session 1	1.5 ± 0.5	1.9 ± 0.6	1.5 ± 0.5	2.5 ± 0.7
Versus Pairing (2 v 3, 4 v 5)		0.7 ± 0.5		3.2 ± 0.7

Table 5. Comparison of performance measures across sessions including effect sizes and confidence intervals

	Session 1 (Individual)	Session 2 (Paired)	Session 3 (Prescribed Pair)	Session 4 (Leaderboard No Feedback)	Session 5 (Leaderboard with Feedback)	*P* Value	Pairwise
Sledgehammer	40.3 ± 3.0	43.0 ± 2.9	45.2 ± 2.4	44.2 ± 1.8	48.3 ± 3.0	< 0.01	5 > 4,3,2 > 1
ES vs Session 1		0.9 ± 0.5	1.8 ± 0.6	1.6 ± 0.6	2.7 ± 0.7		
ES vs Pairing (2 v 3, 4 v 5)					1.6 ± 0.6		
Keg Swings	34.3 ± 1.1	36.8 ± 1.0	38.6 ± 1.3	37.6 ± 1.6	40.9 ± 1.9	< 0.01	5 > 4,3,2 > 1
ES vs Session 1		2.4 ± 0.6	3.5 ± 0.8	2.4 ± 0.6	4.6 ± 0.9		
ES vs Pairing (2 v 3, 4 v 5)			1.5 ± 0.5		1.9 ± 0.6		

Table 6. Comparison of differential rate of perceived exertion (dRPE) across sessions

	Session 1 (Individual)	Session 2 (Paired)	Session 3 (Prescribed Pair)	Session 4 (Leaderboard No Feedback)	Session 5 (Leaderboard with Feedback)	*P* Value
Cognitive	1.0 ± 0.0	1.0 ± 0.0	1.2 ± 0.4	1.0 ± 0.0	1.2 ± 0.4	> 0.05
Muscular	3.5 ± 0.5	3.5 ± 0.5	3.5 ± 0.5	3.6 ± 0.5	3.8 ± 0.4	> 0.05
Cardiovascular	3.6 ± 0.5	3.7 ± 0.5	3.7 ± 0.5	3.7 ± 0.5	39 ± 0.3	> 0.05

board with feedback (session 5). These findings demonstrate that manipulating MST session design through activity structure and coach behaviours can increase athlete motivation and performance and is therefore recommended in the planning and delivery of S&C coaching sessions.

The current findings of improved performance in training sessions that are designed to incorporate feedback are consistent with previous research (4, 33, 50) For example, Weakley et al. (50) demonstrated improvements in mean concentric velocity (7.6% ± 3.6) for adolescent rugby union players when completing a back squat when provided with visual kinematic feedback. In addition, professional rugby union players when verbally provided kinematic information showed improvements of 1.3% (± 0.7) in peak velocity across multiple sets in the bench press throw (Argus 2011). The current findings further support and develop upon the use of feedback by suggesting that planning the session design alongside appropriate feedback are useful strategies for enhancing athlete performance and should therefore be considered within the design of MST sessions.

Due to the high frequency and intensity of S&C training during a periodised programme, it may be difficult for athletes to maintain their motivation during off-, pre- and in-season periods as athletes perceive S&C training to be monotonous (47). The current findings demonstrate that athlete motivation (i.e., change in motivation and motivation related to expectations, design and behaviour), were increased through manipulating the session design. For example, working in pairs (random or prescribed) enhanced motivation compared to working alone. Furthermore, using a leader board (with feedback) demonstrated increased motivation. Such findings may be apparent because within competence motivation theory (21) coaches and teammates may offer positive (e.g., approval, support) or negative (e.g., disapproval, criticism) feedback to sporting behaviours which subsequently influence perceived competence, affect, and quality of motivation (e.g., intrinsic motivation) (14). The more positive, supportive, and constructive the socialising agent is, the more favourable motivational outcomes (9). These findings suggest that enhanced motivation resulted in improved physical performance.

The purpose of the S&C coach is to plan, deliver, and review the physical and physiological preparation of athletes, resulting in sports-specific performance outcomes (20). The physical aspect of coaching, that is, how the S&C coach effectively conveys biophysical knowledge, occurs in a social space characterized by the interaction between the athlete and the coach (7, 27). Thus, to become an effective practitioner, the coach is required to understand and develop the psychological and social skills fundamental to successful human interaction (11, 15, 44). Szedlak (43) discovered that S&C coaches' psychosocial behaviours positively impact the athletes' development, including athletes' cognition and affect (i.e., motivation) and behaviours (i.e., extra effort and self-regulation). These means of incorporating psychosocial aspects within a training session can be implemented through activity design and coach behaviours within a session design. Recent investigations by Szedlak (42) found coaches talked about experiences that demonstrated an athlete-centred flexibility at the core of their coaching practice, which was designed to understand and meet the athlete's needs. As part of this process, these S&C coaches first focused on evaluating the context, and second, they were able to react to the context by changing their coaching approach. Through the recognition of the complexity of managing athletes' behaviours and characteristics, S&C coaches can demonstrate the importance of trying to create an environment for athletes to enhance motivation and improve performance.

This study applied a practical study design to compare five MST session designs on athlete motivation and performance but is not without limitation. Firstly, the lack of a crossover research design may have resulted in a possible ordering effect. However, implementing a crossover research design in an applied training context was difficult and would have affected how the session design was implemented within a team context. To overcome this the ASRM was used pre session which demonstrated no differences in athlete readiness across sessions. Furthermore, session order would be more likely to reduce in time, which was not evident in the current findings. Secondly, the use of strongman exercises within the training programme could be seen as a limitation. While several studies (6, 22, 48, 53) have made suggestions (coaches' responses to survey questions) on what strongman implements could be incorporated in S&C programmes of non-strongman athletes, very little research has examined how strongman training techniques are actually used (53). However, such exercises were implemented due to the specific movement patterns and their relation to performance within rugby union, as well

as the ability to incorporate large number of athletes within sessions. Overall, these limitations were due to the constraints of performing research within an applied setting which is recommended in solving common problems faced in practice (26). Therefore, considering these limitations, the study results should be viewed with a degree of caution but encourage coaches to explore MST session design for enhancing athlete motivation and performance.

PRACTICAL APPLICATION

The results of this study demonstrate that manipulation of session task design with an emphasis on feedback leads to an improvement in athlete motivation and performance. This research should inform practitioners on the worthiness of planning, delivering, and reflecting upon the psychosocial impacts of the training session within the training environment on both individual and group performance and motivation. Such planning and delivery considerations include; the use of performance feedback, peer to peer interaction, and goals or achievement within the session. The motivation and performance gains found within this research can be translated to various S&C environments through group and peer organisation, providing autonomy support through task purpose, and feedback that drives performance, cultivate group competition within sessions, making individual performance within group sessions identifiable, and offering a range of methodologies to suit individual and group motivations.

CONCLUSION

The aim of the study was to compare different session designs to identify improvements in athlete motivation and performance during off-season training. Findings indicate within a team sport setting the manipulation of task design does lead to increased motivation and athlete performance.

CONFLICTS OF INTEREST

No potential conflict of interest reported by the author(s).

FUNDING

No funding was received for this study.

ETHICAL APPROVAL

The study was approved by the Leeds Beckett University Research Ethics Committee.

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