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Prevalence and application of priming exercise in high performance sport

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Abstract

Objectives: Recent research has revealed that low volume resistance 'priming' exercise may improve neuromuscular performance when completed within 48 hours before competition. The aim of this study was to investigate the current prevalence and application of this strategy by practitioners in sport.

Design: This study surveyed practitioners who were currently programming and/or prescribing resistance training programs for high performance athletes.

Methods: Sixty-nine practitioners completed the online survey relating to their perceptions of resistance priming exercise strategies and the training methods prescribed in the days prior to competition.

Results: Fifty-one percent of respondents currently prescribed priming exercise. Of the practitioners who prescribed this strategy, most respondents (59%) prescribed this session within 8 hours of competition. Sessions typically included 2-3 upper body and lower body exercises (mean = 2.5 ± 0.7 and 2.1 ± 0.6 respectively), usually involving both loaded and unloaded activities. Large variations in exercise selection were reported, however, unloaded jumps (87%), loaded jumps (60%) and bench press (56%) were commonly prescribed. A low volume of sets (mean = 2.8 ± 0.9) and repetitions (mean = 3.8 ± 1.3) were used during these sessions. Lastly, various resistance loading strategies were prescribed, ranging from unloaded activities to heavy loaded exercises performed at ≥ 85% 1RM.

Conclusions: Priming exercise is currently prescribed by many practitioners to prepare athletes for competition. A wide range of priming exercise methods are used, despite limited evidence supporting these methods. Future research should examine the effects of the various priming methods which are currently applied in practice.

Key Words: Resistance training, Athletic performance, Exercise, Priming, Strength, Power

Practical Implications

- Priming exercise strategies are currently prescribed by practitioners to high performance athletes prior to competition to assist preparation for sporting performance.
- Practitioners typically include 2-3 lower body and 2-3 upper body strength-power exercises including jumping, squatting, pressing and pulling derivatives, often performed at maximal or near maximal intent of velocity.
- Exercise selection and resistance loading methods vary considerably between practitioners, although the performance effects of many of these strategies are yet to be examined.
- Considering the prevalence of this strategy in sport, and the limited evidence of the performance effects that occur following priming exercise, further studies examining the effects of these activities on a range of physical performance measures are warranted.

Introduction

Recent studies have revealed that low volume resistance exercise may improve subsequent neuromuscular performance for up to 48 hours[1-3]. Some investigations have shown the benefits of "priming" exercise, which involves performing physical activity (i.e. resistance exercise, sprinting or cycling) in the hours prior to competition[1,4,5]. However, exercise utilising external resistance appears to be particularly beneficial to jumping[1,2,6], sprinting[1,4], throwing[7,8] and strength[1] performance thereafter; this is referred to as "resistance priming" exercise[3]. Considering these improvements, priming exercise methods including resistance priming prior to competition may be an effective strategy to improve subsequent performance in sport. However, there is only limited anecdotal evidence of these strategies being applied in the practical environment[9,] and as such the prevalence and methods of its application by practitioners are currently unknown. Determining the prevalence of this strategy and how it is currently applied in practice would provide contemporary insight into the pre-competition training practices of athletes. Additionally, this would provide direction for future investigations examining the effects of resistance priming exercise.

Studies which have investigated the effect of priming interventions have found that heavy loaded (≥ 85% 1RM) resistance exercise[1,6,7] and moderately loaded (30 – 40% 1RM) ballistic exercise[2,6] improves strength-power performance within 48 hours. It is conceivable that loading outside of these ranges (i.e. < 20% and 40-85% 1RM respectively) may also be beneficial in this period, however there has been limited research investigating these loads. Benefits to neuromuscular performance have been shown 4-6 hours following heavy loaded (≥ 85% 1RM) exercise[1,6,7] and up to 24 - 48 hours[2] after ballistic exercise at lower loads (40% 1RM). Additionally, studies which have examined the post activation potentiation (PAP) response have identified that expressions of strength and power can be improved within 12 minutes of completing a strength-power exercise[10-12]. The time course of these benefits suggest that there are many opportunities to influence performance over the 48 hours before competition. Sessions involving squat-based exercises, including the back squat and loaded jumps, have been the most commonly examined and appear to be an effective stimulus to improve strength-power performance within this period[3]. Other lower body exercises, such as the power clean[7] and upper body resistance exercise including the bench press[1,8] have also been shown to improve subsequent performance in this 48 hour period when compared with no exercise. These findings suggest that sporting performance involving either upper and/or lower body movement demands may be augmented following resistance priming exercise.

Although an increasing number of studies suggest that resistance priming exercise may be an effective strategy for athletes preparing for competition, some research has shown no significant improvements to lower body performance following priming exercise[8,13]. Additionally, many studies examining the effects of priming exercise have investigated

instantaneous measures of performance such as jumping and strength performance[2,6,7] and it is currently unclear if these priming activities would influence sporting performance in the competitive environment. Only few investigations have examined the effects of priming on sporting activities such as sprinting[1,4] and swimming[14]. This may discourage some practitioners from prescribing priming exercise strategies until further studies are conducted. Furthermore, logistical factors including limited time availability, travel and access to facilities may all present barriers for practitioners and athletes to include priming activities prior to competition. These considerations could particularly impact the use of resistance priming activities requiring heavy resistances (barbells, dumbbells etc.) which have been shown to benefit performance[1,6,7].

Considering the limited research examining the effects of priming on performance, as well as the barriers that practitioners and athletes face in using these strategies, it is not known if priming exercise is currently prescribed in high performance sporting environments. Additionally, if priming strategies are being used, the variables used by practitioners such as the type, volume, intensity and duration of exercise, and recovery periods prior to competition are also unknown. These variables have been shown to have a considerable effect on acute neuromuscular performance following resistance exercise[15-17] and may influence an athlete's performance if exercise is prescribed in this pre-competition period. Knowledge of the current training practices of athletes in the days prior to competition, including priming exercise, would be beneficial to researchers examining pre-competition strategies as it can inform the design of ecologically valid and relevant investigations.

The aim of this study was to investigate the prevalence and nature of exercise prescribed by practitioners in the pre-competition period, with particular emphasis on resistance priming. It was expected that only a small proportion of practitioners would prescribe resistance priming exercise to their athletes. Furthermore, it was hypothesised that these sessions would be prescribed in a similar manner to the methods that have been shown to be effective to performance in recent studies[1,8,14].

Methods

Following ethical approval, data were collected between September 2018 and March 2019. Practitioners working with high performance athletes were recruited to complete a survey which included questions relating to their current programs and training methods. Similar studies which have sought practitioner perspectives[18,19] and training methods[20-22] have provided considerable insight into the practices of athletes in competition.

To meet the study inclusion criteria, practitioners were required to be employed in a position which involved prescribing and/or programming resistance training programs to elite athletes, at the time of completing the survey. For this survey, 'elite athletes' were defined as any athlete who currently competed in national and/or international level sport, or for a professional sporting team. However, use of the term 'elite' athletes in research has been recently challenged[23]. The term 'high performance' may be more appropriate to describe the population of interest in the present study and is used throughout this paper. The survey was e-mailed nationally and internationally, to individuals who were identified as practitioners working in sport via publicly available information on official team websites and professional networking platforms. The survey was also advertised on various social media platforms to all practitioners working in the strength and conditioning field, to maximise its reach among individuals who were likely to meet the inclusion criteria. The study was advertised to be related to strength and power training in the pre-competition period, to reduce the risk of bias toward practitioners who were familiar with resistance priming practices.

Surveys were completed and submitted via an online survey portal (Checkbox Survey Inc, MA, USA); only surveys completed by participants who met the inclusion criteria were included for data analysis. Four surveys were removed prior to analysis; three survey respondents did not meet the inclusion criteria of prescribing or programming resistance training to elite athletes, and one survey was a repeated submission. Prior to the commencement of the survey, mandatory questions relating to participant identification and the role they were employed in, ensured that all participants met the inclusion criteria of the study.

Considering that only recent scientific evidence has described resistance priming[1,2,8], it was anticipated that some practitioners may not have been aware of the term resistance 'priming' or its application as a performance strategy. As such, resistance priming was clearly defined at the beginning of the survey and throughout each section as "any resistance exercise (utilising an external resistance, or unweighted/assisted jumps) prescribed within 48 hours prior to match/competition to enhance acute physical performance". Additionally, examples of exercise sessions that were included, and were not included as a resistance priming sessions, were provided. The survey consisted of thirty-four questions relating to the current training methods prescribed by the participants and was divided into three sections. The survey text appears in Appendix A; all questions and definitions were written in the English language only.

All survey questions were mandatory and the survey responses could not be submitted without completing all questions. Various types of questions were included, requiring open-ended (9 questions), Likert scale (4 questions), multiple choice (13 questions) and multiple option (8 questions) responses. A combination of open ended, Likert scales and multiple option questions were used to survey the training methods, exercise selection and intensities

prescribed by the participants. Likert scales were used in questions relating to the intensity of exercise; participants were asked to provide a rating of session intensity[24] on a scale of 1 – 10, taking into consideration all relevant factors including intensity, duration and rest periods. Multiple choice questions were used when only one response could apply to a question, including whether resistance priming exercise was currently prescribed by the practitioner. Multiple option and multiple choice questions also included an "other" option where applicable, inviting participants to provide alternative responses to those already provided as an option or choice. Numerical responses were analysed as numbers; the mean and range values were also analysed where ranges were provided (e.g. 4-6 repetitions). Responses provided for all other open ended responses, were assigned into themes. All questions were developed by the authors and were piloted with a subset of high performance practitioners (n = 7). Feedback was sought on length, content and language to maximise the content validity of the survey; in accordance with these recommendations, modifications were made prior to the commencement of data collection.

Part A was completed by all participants and contained 10 questions (7 multiple choice, 2 multiple option and 1 open ended question) relating to demographic information about the participants including years of experience working with high performance athletes and highest qualification level. Additionally participants also provided information relating to their employed position at the time of completing the survey, the sports which their athletes were competing and whether they currently prescribed resistance priming sessions to their athletes. Choices for participant responses to the question relating to their employed position were "strength or physical performance coach", "head of performance", and "sports coach". One 'other' response was received and was categorised as "sports scientist".

Part B was completed only by participants who currently, or had previously prescribed resistance priming sessions. This section included 18 questions (7 open ended, 5 multiple option, 4 multiple choice and 2 Likert scale) relating to the current resistance training program, other training methods and the prescription of resistance priming sessions of the participants. Specifically, in regards to resistance priming, participants were questioned on exercise selection, the range of sets and repetitions used, recovery periods between priming and competition, intent of movement velocity, and the frequency of prescribing this strategy prior to competition. Open ended responses were used to survey practitioners' exercise selection and were categorised into themes. For upper body exercises, one higher order theme was identified ("medicine ball throw") whilst other responses were categorised as "other upper body exercise". No higher order themes were identified for lower body exercise and such, all responses were categorised as "other lower body exercise".

Part C was completed only by participants who had never prescribed resistance priming sessions and consisted of 6 questions (2 multiple choice, 2 Likert scale, 1 multiple option and 1 open ended) relating to the prescription of resistance training and other training methods in the 48-hour pre-competition period. These participants were also asked to provide the reason/s to why they were not implementing resistance priming strategies in the training program and if they would consider prescribing this strategy if further investigation supported its use.

Frequency analysis for each question were conducted and analysed using SPSS Statistics (Version 25.0, SPSS Inc. Chicago, IL, USA) for Microsoft Windows. All responses, including those provided by participants in "other" responses, were included in the analysis. Results are presented as absolute and percentage of responses. Mean response and standard deviation are provided for Likert type responses. An independent two sample t-test analysis was used to compare the mean number of days between general resistance training and competition amongst participants working with team sport athletes, individual athletes and those who worked with both team sport and individual athletes. Cross tables and Chi-squared analysis was also performed to compare the differences in the prevalence of priming strategies between these groups of practitioners; alpha was set at 0.05.

RESULTS

Seventy-three surveys were submitted in total. Following the removal of four surveys which did not meet the inclusion criteria, 69 surveys were included in the data analysis. Eighty-one percent of participants described their role as "strength or physical performance coach", 16% had "head of performance" positions and 1% of participants each performed "sports scientist" or "sports coach" positions. Ninety percent of participants were employed full-time and the remaining 10% were employed in a part-time role. Participants were currently working with full-time (74%) and part-time (26%) athletes. The mean duration of experience working with high performance athletes was 11.3 ± 6.8 years. Fifty-one percent of participants had obtained a Masters degree, 36% had completed a Bachelor/Honours degree, 10% had completed a PhD and 3% of participants had a Diploma qualification.

Of the 69 participants, 84% believed that resistance priming sessions were beneficial to performance whilst the remaining 16% were unsure whether there were benefits to performance. Ninety-six percent of respondents believed that resistance priming was beneficial to speed and power respectively, while benefits to strength (54%) and agility (51%) performance were also reported. "Other" benefits were reported by 12% of participants; of these, multiple participants believed that resistance priming was beneficial to 'psychological' (n = 2), 'nervous system' (n = 2) and 'recovery' (n = 2) aspects of performance.

Fifty-one percent of respondents were currently prescribing resistance priming exercise prior to competition. A further 30% of participants had previously applied this strategy but did not currently prescribe it in their programs. The

remaining 19% of practitioners had never prescribed resistance priming sessions. Figure 1a represents the proportion of participants who currently prescribed resistance priming sessions prior to competition, amongst various sports. For those participants who were currently prescribing resistance priming sessions, the frequency in which they prescribed this strategy prior to competition is presented in Figure 1b. The remaining respondents, who had never prescribed resistance priming, reported the most common reasons for not using the strategy were: 'not enough evidence' (46%), 'did not fit in with the training schedule' (46%) and 'coaches did not believe it was beneficial for performance' (38%). Other factors of 'fatigue' (23%), 'players do not think it is beneficial' (23%) and 'education' (8%) were also reported as reasons for not prescribing priming sessions. Fifty-seven percent of participants working only with team sport athletes currently prescribed resistance priming sessions, compared with 36% of participants who worked only with individual athletes and 20% of respondents who worked with both team and individual athletes. Chi-Square analysis revealed there was no significant difference in the prevalence of priming between these groups of practitioners ($x^2 = 1.181$, $p = 0.554$).

(Insert Figure 1 here)

The average time that resistance priming sessions were most commonly prescribed prior to competition was 12.3 ± 10.8 hours. However, 59% of participants programmed the resistance priming session within 8 hours of competition (Table 1). The shortest recovery period that participants would prescribe between resistance priming and competition was 6.6 ± 7.1 hours (range = 0.25 to 26 hours).

Fifty-six respondents currently or had previously prescribed resistance priming; 98% of these prescribed lower body exercises during these sessions and 80% of respondents prescribed upper body priming exercises. Seventy-nine percent of the participants, who prescribed resistance priming, used both upper and lower body exercises. Eighteen percent reported using lower body but not upper body priming exercises and 2% prescribed upper body but not lower body priming exercise. Specific exercises used by participants for resistance priming sessions and other training variables related to the volume and intensity of resistance priming exercise are detailed in Table 1.

Fifty-two percent of respondents reported that the last general resistance training session, aiming to develop strength and power qualities, was most often completed two days before competition; 36% of respondents prescribed the last session three or more days before competition. Participants also reported prescribing general resistance training the day before competition (9%) or on the day of competition (3%).

There was no difference in the number of days between general resistance training and competition amongst participants working with team sport (mean = 2.13 days) when compared with those working with individual sport athletes (mean = 2.36 days) or both team and individual sport athletes (mean = 2.25 days) ($p = 0.193 – 0.579$).

All participants reported prescribing some form of exercise on the day prior to competition; 91% of all participants prescribed field-based training (Figure 2). On the day of competition, 65% of all participants prescribed some form of exercise, 58% of which prescribed field-based training methods. The proportion of coaches who prescribed exercise on the day of and the day prior to competition, including the intensity of these sessions, are presented in Figure 2.

(Insert Figure 2 here)

Discussion

The aim of this study was to investigate the prevalence of resistance 'priming' exercise in sport and the methods used to prescribe this type of strategy. Over half of the practitioners in this study were currently prescribing resistance priming to athletes prior to competition, indicating that these strategies are being applied in numerous team and individual sports (Figure 1a).

Considering that 30% of participants in this study had previously, though did not currently, prescribe resistance priming strategies with their athletes, it may be presumed that its application in practice is not novel. It has also been previously identified that a small proportion of strength and conditioning coaches working with rugby athletes prescribed strength-power exercise the day before (8%), or day of competition (3%) which may be indicative of its introduction into practice in recent years[21].

The priming methods reported in the present study, including exercise selection and resistance loading, varied considerably between practitioners (Table 1). Unloaded jumps, loaded jumps and partial squats were the most commonly used lower body exercises whilst the bench press, bench pull and chin up were the most commonly used upper body activities. Recent studies have examined the effects of some of these exercises on subsequent performance, with improvements found within 48 hours of priming exercise involving loaded jumping[2,6], squats[1,6,7] and Olympic lift derivatives[7]. One study has also shown that bench throw power was improved ~ 2 hours after performing the bench press exercise[8]. However, studies are yet to examine the effects of many other exercises despite their apparent application in practice (Table 1), including unloaded jumps. This may indicate that practitioners believe other exercises may be equally or more effective as priming exercises, or otherwise more appropriate to prescribe in practice. Alternatively, practitioners should carefully consider the use of the other exercises until further evidence is available to support their use. Further investigation examining the effects of these exercises, which are commonly prescribed in the practical environment, appears warranted.

The prescription of unloaded exercises and exercise utilising elastic bands for external resistance were the most common loading strategies reported in the present study. Although unloaded exercise appears to be commonly prescribed, only a small proportion (9%) of participants prescribed unloaded lower body exercise in isolation. Eighty-

seven percent and 93% of practitioners prescribed exercises using external loading (not including band resistance loading methods) for lower and upper body exercises, respectively. This indicates that unloaded exercises are often included in priming sessions in addition to externally loaded resistance exercise. Whilst practitioners commonly prescribed exercises with external loading, a large variability in resistance loading was reported (Table 1). This indicates that practitioners believe that a wide range of resistances are beneficial to performance, similar to long term training methods which target different adaptations with respect to the load-velocity spectrum[25,26]. Alternatively, it may reflect that the optimal loading stimulus for resistance priming exercise is not yet clear. Current evidence supports the use of traditional strength exercises such as the back squat and bench press performed at high resistance load (≥ 85% 1RM)[1,6]. However, results from this survey revealed that only a small percentage of practitioners prescribe priming exercise at high load (18 - 22%) (Table 1), suggesting that practitioners may be reluctant to use these highly loaded exercises during priming sessions. This highlights the need for further research examining whether lighter resistance exercises (< 80% 1RM) may be beneficial to performance compared with heavy loaded (≥ 85% 1RM) exercise. Additionally, considering the prevalence of unloaded exercises in practice, it would be beneficial to examine the effects of unloaded priming strategies compared with exercises utilising external resistance loading (i.e. barbells, dumbbells).

The present findings indicate that practitioners typically prescribe multiple exercises during priming sessions (Table 1). Although some studies have examined priming exercise sessions involving multiple lower body exercises[7,14,15], performance improvements are less clear than sessions that have included only one exercise[1,2,6]. Future studies investigating performance following multiple lower body resistance priming exercises would provide important insight into the effectiveness of this strategy. Additionally, exercises were commonly prescribed in 2-4 sets of 3-5 repetitions for lower body exercises, whilst a slightly higher repetition range is prescribed for upper body priming exercise (Table 1). Results also suggest that practitioners typically prescribe both lower and upper priming exercise. Although some practitioners prescribe lower body exercises without upper body exercise (18%), it is rare for upper body exercise to be prescribed in isolation during priming sessions (2%). This may be due to the limited number of studies which have investigated upper body priming exercise on performance (Russell, Mason) but may also be related to the demands of the athletes, which commonly involve lower body movements for field-based sports.

Several studies which have examined resistance priming have found improvements in performance within 8 hours of its completion[1,6,7]. This period seems to be the most commonly used by practitioners; the majority of participants (59%) reported most commonly prescribing priming sessions in the 0 – 8 hour period before competition. Only a limited number of studies have found neuromuscular performance improvements outside of this time, between 24 - 48 hours[2,15], however some practitioners did report prescribing priming exercise in this period. Future research

investigating the time-course of performance response in this 48 hour period may provide further understanding about the most effective times to prescribe priming exercise.

In this study 30% of practitioners had previously prescribed but were no longer prescribing resistance priming in their programs and 19% had never prescribed this strategy. Despite this, most practitioners (84%) perceived that priming was beneficial to performance, suggesting that practitioners face other barriers to include these strategies into their training programs. The most common barrier for participants who had never prescribed resistance priming was that that there was 'not enough evidence', highlighting the need for future investigation in this area. Additionally, many respondents perceived that priming strategies 'did not fit in with the training schedule'. Factors such as travel, facilities, time and other training modalities may conceivably contribute to these difficulties practitioners face over scheduling. Some other exercise priming methods, such as sprinting[1,4] and lighter resistance activities[14], may also benefit performance and do not require major facilities or equipment. These priming activities may be considered as an alternative to externally loaded resistance exercise for practitioners to overcome some of these barriers.

Results from this study also contribute toward the understanding of how other methods of exercise (excluding resistance training) are prescribed in the days preceding sporting competition, which has not recently been examined amongst multiple sports. All respondents prescribed some form of exercise on the day before competition, whilst 78% of participants also prescribed some form of exercise on the day of competition (Figure 2). Although other exercise prescribed in this period appears to be at a relatively low intensity (Figure 2), it is conceivable that the inclusion of other training may also influence athlete performance. This has been shown to occur following high intensity cycling and sprinting exercise[1,4]; however, no research has examined the effects of low- or high- intensity exercise prescribed between priming and the subsequent performance. Considering its prevalence in this pre-competition period, future investigations examining priming strategies should consider including other exercise methods to examine these potential effects.

Findings from this study also support previous research which has shown that the last strength-power training session is typically prescribed 2-3 days prior to competition[21,22]. Considering the acute fatiguing effects which can remain up to 48 - 72 hours following strength and power training[15-17], it is possible that priming exercise is prescribed during this period of fatigue. However, it is unknown if a resistance priming exercise stimulus is additionally fatiguing. Alternatively, some practitioners (3%) in this study perceived that some benefits of priming to performance occurred by facilitating recovery, although this is yet to be investigated. Exploration of various short-term periodisation strategies may provide further insight into the acute effects of programs which include both general strength-power training and priming exercise prior to competition. Additionally, research in this area may advance understanding of

how resistance exercise priming may best be included in the physical training program to prepare athletes for competition.

The findings from this study provide evidence of contemporary strength and conditioning practices in high performance sport, whilst also providing clear direction for future scientific investigation. Although this survey recruited a large sample size compared with previous survey studies in sport[20,21,27], only descriptive and percentage based statistics were reported in most analyses due to insufficient participant numbers for further analysis. This prevented further analyses comparing the training and priming methods between practitioners working in different sports; work which could be further expanded in future investigations. It may also be beneficial for future work to explore how coaches attained their knowledge of priming exercise strategies (i.e. from research, past experiences), which was not considered in the survey. Another limitation of this study may be the presence of voluntary response bias. Although a high proportion of coaches reported using this strategy, the survey was completed on a voluntary basis and such may have overrepresented the proportion of strength and conditioning practitioners using this strategy. Lastly, whilst this study provides insight into the prevalence of resistance priming exercise in the sporting environment, it should not be interpreted as evidence that this strategy can effectively improve competition performance in sport.

Conclusion

Findings from this study have revealed that priming strategies are currently used by many practitioners working in a wide range of sports. Recent literature highlighting the benefits of priming may explain this current trend, however, there appears to be considerable differences between priming exercises which have been shown to be effective in studies, and the priming methods which are being applied by practitioners. Practitioners typically prescribe multiple (2 - 3) lower and upper body exercises during these sessions; often including a combination of unloaded and externally loaded exercises. Presently, many studies have examined the effects of only single lower body and upper body exercises in isolation, such as the back squat[1,6], loaded squat jumps[2,6] and bench press[1,8]. Additionally, although resistance exercise utilising external resistances are commonly used by practitioners, there is a variety of loading methods from unloaded jumps to heavy loaded resistances (≥ 85% 1RM). Considering the wide range training methods used by practitioners during priming sessions, which have not yet been examined in studies, there appears to be much scope for further research. Due to the limited number of studies examining the effects of priming exercise, there is yet to be sufficient evidence of the optimal priming methods including exercise types, volumes, resistance loading and the recovery periods between priming and competition. Additionally, investigations are yet to adequately assess the influence of priming exercise on specific measures of sporting performance (e.g. sprint and repeat sprint ability, cycling performance, swimming performance). As such, practitioners should carefully consider the exercise

methods prescribed during priming exercise sessions. Future research should aim to examine the effects of the various methods which are being prescribed by practitioners in the applied environment.

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Conflicts of interest

The authors declare that they have no conflicts of interest relevant to the content of this article.

Ethical clearance:

Ethical clearance was granted for this study by the University of Queensland Institutional Human Research Ethics Committee, approval number 2018001855

The authors declare that this manuscript has not been published elsewhere and are not being considered for publication elsewhere. This manuscript will not be submitted for publication elsewhere until a final decision has been made as to its acceptability by the journal.

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Figure Legends

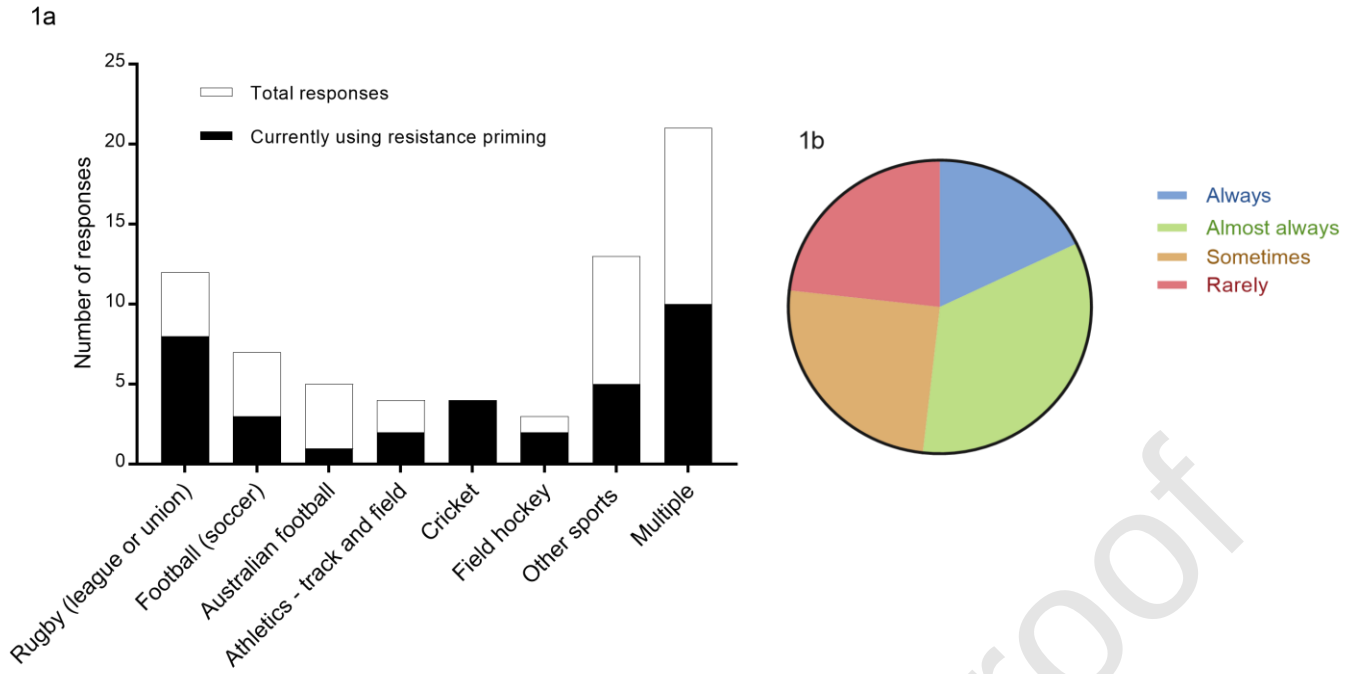

Figure 1 Figure 1a presents the proportion of participants who currently prescribe resistance priming exercise prior to competition amongst various sports. Figure 1b represents the frequency of prescribing priming exercise prior to competition amongst practitioners who currently prescribe resistance priming strategies.

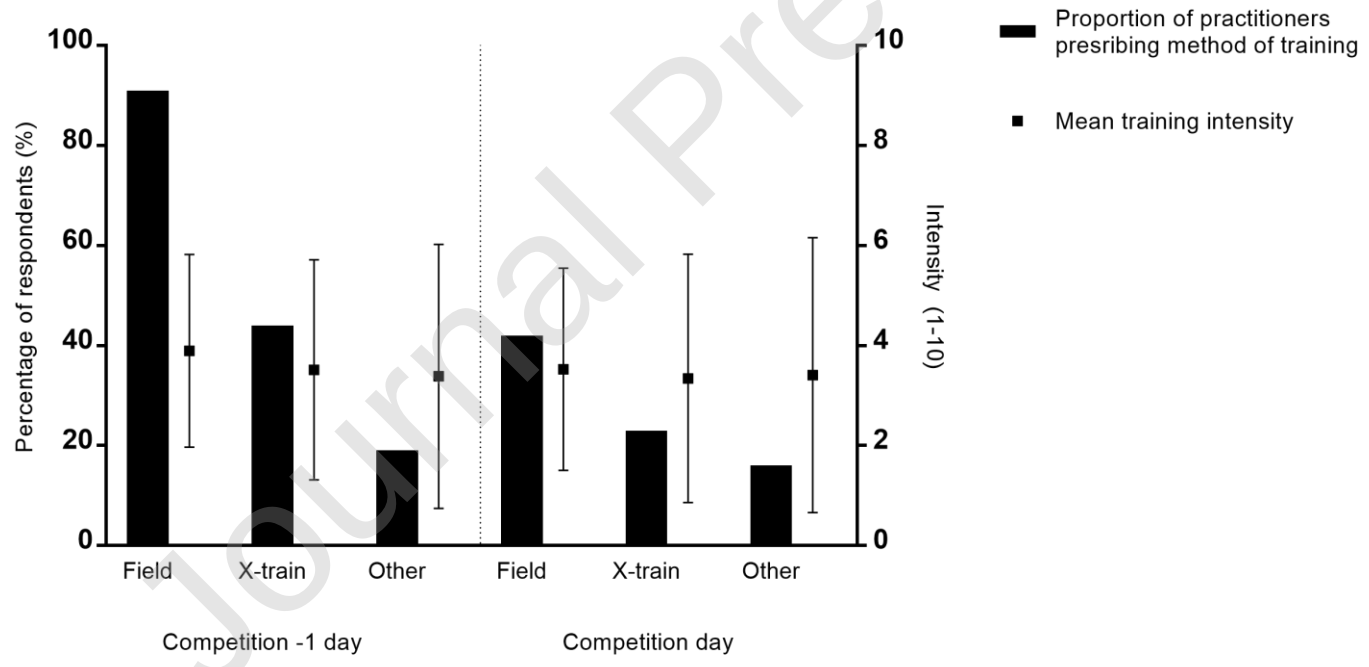

Figure 2 Left Y axis represents the proportion of practitioners who prescribe various methods of training on the day before competition (Competition -1 day) and the day of competition (Competition day). Right Y axis represents the mean training intensities used by practitioners who prescribe these methods of training on the days represented.

Intensity = Training intensity prescribed by practitioners (Borg 1-10) considering all factors including session duration, loading, intensity and recovery periods

Field = Training involving field and/or running-based exercise

X-train = Cycling, swimming and other off-feet training modalities

Other = Any other form of exercise

Table 1 Training methods prescribed by practitioners during resistance priming exercise sessions

	Lower body priming exercise		Upper body priming exercise	
Exercise volume	**Volume variables**	**Mean ± SD**	**Volume variables**	**Mean ± SD**
	Number of exercises	2.5 ± 0.7	Number of exercises	2.1 ± 0.6
	Sets	2.8 ± 0.9	Sets	2.9 ± 1.0
	Repetitions	3.8 ± 1.3	Repetitions	4.5 ± 2.1
Exercise selection	**Exercise**	**%**	**Exercise**	**%**
	Unloaded jumps	87%	Bench press	56%
	Loaded jumps	60%	Bench pull	33%
	Partial squat	41%	Chin up	33%
	Full squat	18%	Medicine ball throw	20%
	Olympic lift variations	11%	Push up	16%
	Other lower body exercise	18%	Other upper body exercise	25%
Resistance loading	**Range of loading prescribed**	**%**	**Range of loading prescribed**	**%**
	≥ 85%	22%	≥ 85%	18%
	70 – 84%	36%	70 – 84%	36%
	50 – 69%	36%	50 – 69%	44%
	30 – 49%	24%	30 – 49%	24%
	< 30%	29%	< 30%	31%
	Band resisted	62%	Band resisted	58%
	Unloaded	62%	Unloaded	42%
	Band assisted	33%	Band assisted	33%
Movement velocity	**Intent of velocity (subjective)**		**%**	
	Slow control		2%	
	Moderate		13%	
	High		46%	
	Maximum		75%	
Recovery period	**Time (hours)**		**%**	
	0 – 8		59%	
	9 – 16		11%	
	17 - 24		13%	
	25 – 32		13%	
	> 32		4%	
Session duration	**Duration (minutes)**		**%**	
	< 15		34%	
	15 – 30		59%	
	31 – 45		7%	

% = proportion of participants who currently, or have previously prescribed resistance priming
Band assisted = any exercise in which resistance band/s (with or without other resistance) were used to assist the production of force during the concentric phase of the exercise movement
Band resisted = any exercise in which resistance band/s (with or without other resistance) were used to resist against the production of force during the concentric phase of the exercise movement
Unloaded = exercise using no form of external resistance
Recovery period = period of time between resistance priming exercise and start of sporting competition