International Journal of Sports Physiology and Performance, 2008, 3, 454-468

The Effects of Compression Garments on Intermittent Exercise Performance and Recovery on Consecutive Days

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Purpose: The aim of this study was to determine whether compression garments improve intermittent-sprint performance and aid performance or self-reported recovery from high-intensity efforts on consecutive days. ***Methods:*** Following familiarization, 14 male rugby players performed two randomized testing conditions (with or without garments) involving consecutive days of a simulated team sport exercise protocol, separated by 24 h of recovery within each condition and 2 weeks between conditions. Each day involved an 80-min high-intensity exercise circuit, with exercise performance determined by repeated 20-m sprints and peak power on a cart dynamometer (single-man scrum machine). Measures of nude mass, heart rate, skin and tympanic temperature, and blood lactate (La^-) were recorded throughout each day; also, creatine kinase (CK) and muscle soreness were recorded each day and 48 h following exercise. ***Results:*** No differences (P = .20 to 0.40) were present between conditions on either day of the exercise protocol for repeated 20-m sprint efforts or peak power on a cart dynamometer. Heart rate, tympanic temperature, and body mass did not significantly differ between conditions; however, skin temperature was higher under the compression garments. Although no differences (P = .50) in La^- or CK were present, participants felt reduced levels of perceived muscle soreness in the ensuing 48 h postexercise when wearing the garments (2.5 ± 1.7 vs 3.5 ± 2.1 for garment and control; P = .01). ***Conclusions:*** The use of compression garments did not improve or hamper simulated team-sport activity on consecutive days. Despite benefits of reduced self-reported muscle soreness when wearing garments during and following exercise each day, no improvements in performance or recovery were apparent.

Keywords: compression stockings, intermittent-sprint exercise, recovery, sports performance

In the endeavor to reach and maintain optimal performance, athletes often employ a variety of strategies to aid recovery and performance. A popular trend in

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a variety of sports over recent years has involved the use of full-body compression garments during training or competition. These garments have been proposed to assist in improving sporting performance, clearing metabolic by-products, and recovery from high-intensity exercise.[1,2] In part, these beliefs have stemmed from evidence suggesting the effective use of compression stockings to increase venous blood flow and reduce swelling in postoperative or vascular patients.[3,4] As such, athletes in sports involving high-intensity, intermittent-sprint exercise, combined with high levels of body contact collision, such as the various football codes (including rugby), have adopted compression garments as a method to improve training performance and assist in recovery between sessions.

To date, an inconclusive assortment of research findings exist on the influence of compression garments on general sporting performance and limited information is apparent for intermittent-sprint exercise. Previous research has reported improved vertical jump heights without improvements in 20-m or 60-m sprint time,[5,6] increased force production in repeated vertical jump efforts,[7] improved aerobic performance in repeated 5-min maximal cycle efforts[8] and faster recovery of force production in single arm bicep curls.[1] Recently, Duffield and Portus[9] reported no improvements in intermittent-sprint activity or submaximal distance covered when wearing compression garments; however, there was a trend for a reduced creatine kinase (CK) value 24 h following exercise. Gill et al.[10] have previously reported similar findings in 36 h and 84 h postgame CK values for competitive rugby players; indicating that the potential ergogenic value of compression garments may lie in the ability to assist recovery to improve subsequent exercise performance. To date, this has not been substantiated and, as such, the aim of this study was to determine whether compression garments improve intermittent-sprint performance and aid performance or self-reported (perceptual) recovery from high-intensity efforts on consecutive days.

Methods

Participants

Fourteen 1st division, Under 21, club-standard rugby players volunteered to participate in this study, all players were part of the premiership side for the local regional competition. There were 7 forward and 7 backs (mean ± SD, age 19 ± 1 y, body mass 96.5 ± 3.4 kg and 76.5 ± 3.4 kg respectively). Participants were currently engaged in rugby-specific training 2 to 3 days per week, strength training sessions 2 to 3 days per week, and 1 game of rugby per week. All participants gave verbal and written consent to engage in all testing procedures and Human Ethics clearance was granted by the Institutional Ethics Committee.

Overview

Following a familiarization session of all testing conditions and measures, participants performed two testing conditions involving consecutive days of a simulated team game (STG) exercise protocol in a randomized, cross-over design. The consecutive STG protocols were performed at the same time of day, separated by 24 h of recovery within each condition, and by 2 weeks between conditions.

All sessions were identical apart from the intervention of exercise and recovery with or without lower body compression garments (SKINS, Sydney, Australia). During the compression garment trials (CG), the garments were worn throughout the duration of the STG sessions (day 1 and day 2, excluding nude mass measurement) and for a 15-h recovery period following day 1 and day 2 (postexercise until the following morning). During the control trial (C), participants wore their usual athletic training gear. Participants recorded dietary and activity patterns for 48 h before the commencement of both testing conditions and maintained these for each session, with diaries inspected by members of the research team. Further, participants were required to abstain from the ingestion of alcohol, caffeine, and food substances 3 h before each session. Participants were given a high-carbohydrate/protein drink (~25 kJ/kg body mass; 60% carbohydrate, 36% protein) following final measures on each day to ensure standardized availability of glycogen for repletion and prevent glycogen depletion for the following day. All testing was conducted in an enclosed gymnasium at an ambient temperature of 16 to 18°C, 30% RH. Compression garments were fitted to participants based on the company guidelines involving measures of height and weight.

Simulated Team Game

Following a standardized warm-up of 5 min of cycling at 75 W (Monarch 818E, Stockholm, Sweden) and 3 laps of the STG exercise circuit and 3 × 20-m sprints, participants performed 4 × 15-min quarters of a STG exercise protocol as previously reported by Bishop et al,[11] which included a 10-min recovery following the second quarter. The STG consisted of a 1-min circuit that was repeated 15 times in each quarter. The circuit was 125 m in length and involved high-intensity sprints of 10 to 20 m separated by walking and jogging with the further addition of an agility component. The circuit involved typical movement patterns observed during motion analysis of team-sport games as reported by Bishop et al.[11] Before and following each half (after 2nd and 4th quarters of STG) of the STG protocol, participants performed a series of high-intensity tests (HIT), which consisted of 5 × 20-m sprints (sprint every 20 s) to determine repeated-sprint ability, immediately followed by 3 maximal efforts simulating scrum activities on a dynamometer cart (single-man scrum machine) attached to a force transducer and a bungee tether (GRUNT 3000, Sportstec, New Zealand) to determine peak power output. The force transducer was calibrated against a known resistance (40 kg) before each testing session. Further, at the end of the 1st and 3rd quarters of the STG, participants also performed 3 maximal sprints (sprint every 20 s) to impose a larger physiological load. Each HIT protocol lasted 5 min, so that the total duration of the intermittent exercise protocol was 80 min, plus a 10-min break at halftime.

Performance Measures

Exercise performance was determined from sprint time and peak power on the dynamometer cart. Twenty-meter sprint time (s) was measured with an electronic infrared timing system (Speed light, Swift, Australia). An active recovery (~25-m jog return to the start line) interspersed each sprint. For the maximal scrum efforts, 3 maximal single-man scrum efforts were made using a dynamometer cart measuring peak power (W) via force a transducer connecting the cart to a bungee tether. Participants stood 1 m behind the cart and drove into the cart as fast as possible for up to 5 s, with repeated efforts starting from similar stationary positions.

Body Mass, Temperature, Perceptual and Blood Measures

Before and after each testing session, nude mass was measured on a set of calibrated scales (JPS-2030, Jadaver, Taiwan) to estimate changes in body mass resulting from sweat loss. Heart rate was measured (Polar Electro Oy, Kempele, Finland) preexercise and every 10 min throughout the exercise protocol. Tympanic temperature was measured by infrared on the tympanic membrane (Pro 3000, Braun, Kronberg, Germany). Thigh skin temperature was measured on the surface of the skin midquadricep (Monotherm 4070, Mallinkrodt, St. Louis, MO) either on the exposed skin in training gear or under the garments. Both skin and tympanic temperatures were recorded preexercise, every 10 min during and postexercise. Rating of perceived muscle soreness (MS) was obtained pre- and postexercise, 24 h post day 1, and 48 h post day 2 from a 10-point scale that required participants to perform 2 deep unloaded squats and rate the soreness of their lower body. Pre and post each HIT and the overall STG sessions, 50 μL of capillary blood was sampled from a finger tip for analysis of blood lactate concentration [La^-] (Sport Lactate Analyzer 1500, Yellow Spring Instrument, OH). Further, before the warm-up on each day, 15 min postexercise on day 1, and 48 h postexercise on day 2, 60 μL of capillary blood was collected to measure creatine kinase (CK) as a marker of muscle damage (Reflotron 1, Boehringer, Mannheim, Germany).

Statistical Analyses

Data are reported as mean ± SD. A repeated measures (condition × time) ANOVA was used to determine significant main effects for change over time and interaction effects between respective conditions. Post hoc *T*-tests with Bonferroni correction were used to determine significant differences between conditions. Significance was set a priori at $P = 0.05$. Further, Cohen's *d* effect size (ES) analysis was performed to determine the magnitude of effect from using the compression garments that may be of importance for performance. Effect sizes were classified as small ($d < 0.3$), moderate ($d = 0.3$ to 0.7), or large ($d > 0.8$).

Results

Performance

There were no statistically significant differences between conditions (CG vs C) for mean sprint time (s) during the repeated sprint bouts or total time during day 1 or day 2 of the STG ($P = .21$ and 0.12 respectively; ES = 0.2 to 0.4; Table 1). Similarly, there were no differences between trials (CG vs C) for peak power (W)

Table 1 Mean Sprint Time for Sets 1, 3, 4, and 6 (5 × 20-m Sprints) and Sets 2 and 5 (3 × 20-m sprints) of Repeated Sprints During the Simulated Team Game for the Compression Garment vs Control Conditions on Day 1 and Day 2 of the Trials

	Day 1		Day 2	
Variable	Compression	Control	Compression	Control
Preexercise (s)	3.29 ± 0.13	3.32 ± 0.11	3.30 ± 0.13	3.32 ± 0.15
Post 1st quarter (s)	3.25 ± 0.13	3.28 ± 0.16	3.28 ± 0.15	3.29 ± 0.20
Post 2nd quarter3 (s)	3.34 ± 0.17	3.35 ± 0.18	3.35 ± 0.17	3.38 ± 0.22
Pre 3rd quarter (s)	3.37 ± 0.19	3.38 ± 0.17	3.41 ± 0.19	3.45 ± 0.25
Post 3rd quarter (s)	3.36 ± 0.17	3.29 ± 0.18	3.33 ± 0.15	3.32 ± 0.21
Postexercise (s)	3.36 ± 0.19	3.39 ± 0.23	3.38 ± 0.22	3.39 ± 0.20
Total sprint time (s)	102.92 ± 5.20	101.84 ± 6.69	101.94 ± 6.46	104.24 ± 6.2

Note. There were no significant differences between conditions at any time point ($P > .05$).

during the dynamometer cart test at any time point of the simulated game on day 1 or day 2 (P = .44; ES = 0.1 to 0.3; Table 2).

Heart Rate, Body Mass, and Skin Temperature and Tympanic Temperature

There were no significant differences in heart rate between the two conditions (CG vs C) at any time point throughout the trials (P = .70; ES = 0.1 to 0.3; Figure 1). There were no differences between CG and C for changes in body mass on day 1 (0.92 vs 0.94 kg respectively) or day 2 of the STG (0.78 vs 0.75 kg respectively; ES = 0.1 to 0.3). Skin temperature was higher than rest both before and after the HIT periods throughout the trials on each day and significantly higher in the CG condition than the C condition (P = .003; Figure 2). Tympanic temperature was not significantly different (P = .67; ES 0.1 to 0.3) at any time point throughout the study (day 1: 37.1 ± 0.4 vs 37.2 ± 06°C and day 2: 37.1 ± 0.4 and 37.1 ± 0.6°C for CG and control respectively).

Blood Lactate and Creatine Kinase (CK)

There was a significant increase in blood lactate following the HIT periods compared with preexercise; however, there were no significant differences between conditions (CG vs C, P = .54; Figure 3). There was a statistically significant increase in blood CK immediately and 24 h following the day 1 trial compared with preexercise, which remained elevated above preexercise levels 72 h after day 1 (48 h post day 2, P = .02; Table 3). However, there were no differences (ES = 0.1 to 0.3) at any time point between conditions (CG vs C).

Perceived Muscle Soreness

Due to the subjects having played a competitive rugby game ~48 h before each day 1 trial, perceived muscle soreness scores were above 0 before each trial (~1.5); however, there were no differences between pre–day 1 trial scores between conditions (Table 4). There was a significant increase in muscle soreness scores from pre- to post-day 1 of the STG; however, there were no differences between trials. Muscle soreness was significantly higher in the C than the CG condition 24 h following the day 1 STG (pre day 2; P = .01). Muscle soreness was still higher than rest 72 h after the day 1 trial (48 h post day 2) for both conditions; however, it was higher for the C than the CG condition (P = .02).

Discussion

The aim of the current study was to determine whether the use of compression garments improved exercise performance and recovery on consecutive days of simulated team-sport activity. Results indicated no significant differences in intermittent-sprint or explosive power performance on either of the two days of the high-intensity, simulated team-sport exercise. Heart rate, tympanic temperature, and body mass did not significantly differ between conditions, whereas skin temperature was higher under the garments. Finally, no differences in La^- or CK

Table 2 Mean ± SD, Dynamometer Cart Peak Power (PP) During the Simulated Team Game for the Compression Garment vs Control Conditions on Day 1 and Day 2 of the Trials

	Day 1		Day 2	
Variable	Compression	Control	Compression	Control
Preexercise (W)	1140 ± 275	1194 ± 297	1161 ± 278	1149 ± 223
Post 2nd quarter (W)	1113 ± 327	1105 ± 243	1159 ± 250	1098 ± 217
Pre 3rd quarter (W)	1086 ± 215	1128 ± 263	1195 ± 221	1139 ± 377
Postexercise (W)	1100 ± 309	1102 ± 234	1121 ± 207	1073 ± 235
Mean PP (W)	1110 ± 253	1132 ± 234	1159 ± 157	1115 ± 207

Note. There were no significant differences between conditions at any time point ($P < .05$).

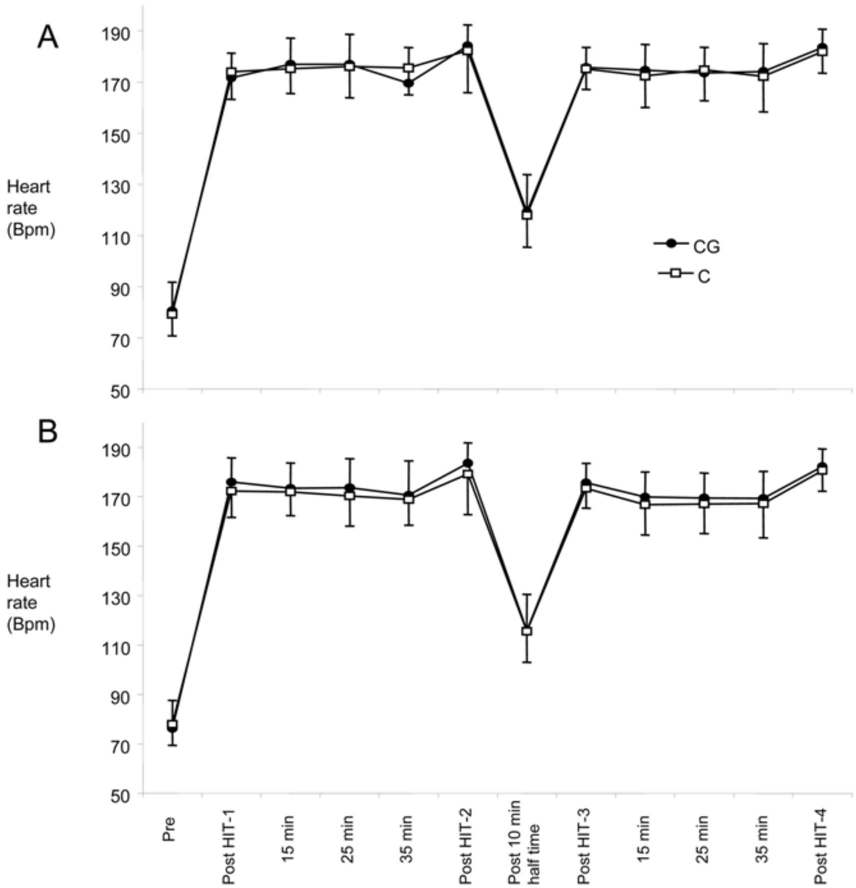

Figure 1 — Mean ± SD, heart rate during the simulated team game for the compression garment vs control conditions on day 1 (A) and day 2 (B) of the trials.

values were evident between conditions and participants reported reduced levels of muscle soreness in the ensuing 48 h postexercise when wearing the garments.

Performance and Recovery

Performance of sprint times and power produced on a cart dynamometer (scrum machine) were not different when wearing compression garments. Further, sprint times and power produced on both respective days of STG exercise was similar between conditions, highlighting minimal performance improvement and similar recovery patterns between conditions. Previous research into compression garments has reported a sporadic range of performance tests, not all of which are relevant to intermittent-sprint exercise or team-sport performance and recovery.[12] To date, as per the current results, neither sprint performance nor repeat-sprint ability has been improved by wearing compression garments.[5,6,9] Although respec-

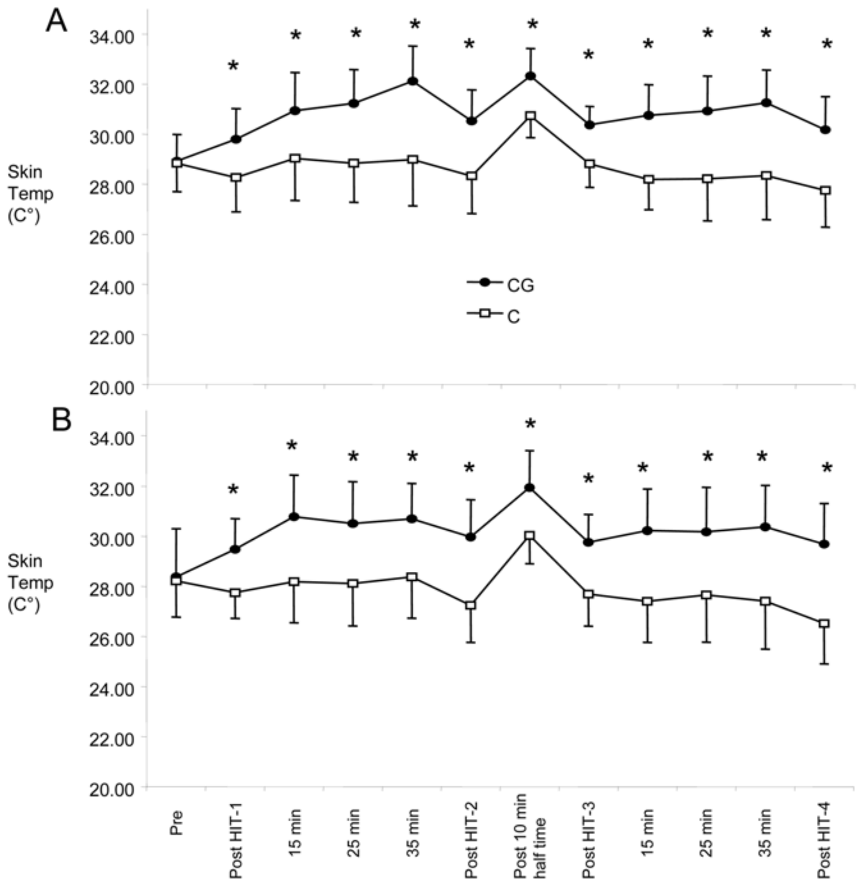

Figure 2 — Mean ± SD, skin temperature during the simulated team game for the compression garment (CG) and control (C) conditions on day 1 (A) and day 2 (B) of the trials. *Significantly different to C trial (*P* = .003)

tive compression garment products may alter range of motion of a limb[5,6] and accordingly assist the maintenance of repeated power output of vertical jumps,[7] as yet compression garments have not been shown to improve (or hinder) performance during team-sport exercise patterns.

While compression garments may not directly assist competitive team-sport activities, previous research has suggested the compression garments may be appropriate as a recovery aid.[12] A reduction in a range of blood variables associated with muscle damage and metabolism have been reported following the use of compression garments as a recovery tool;[10] however, little performance-based data are reported alongside blood markers to substantiate the use of garments to improve recovery.[12] The potential for compression garments to reduce blood markers of muscle damage following exercise has been previously reported, but data on changes in exercise performance on ensuing days are yet to be reported.

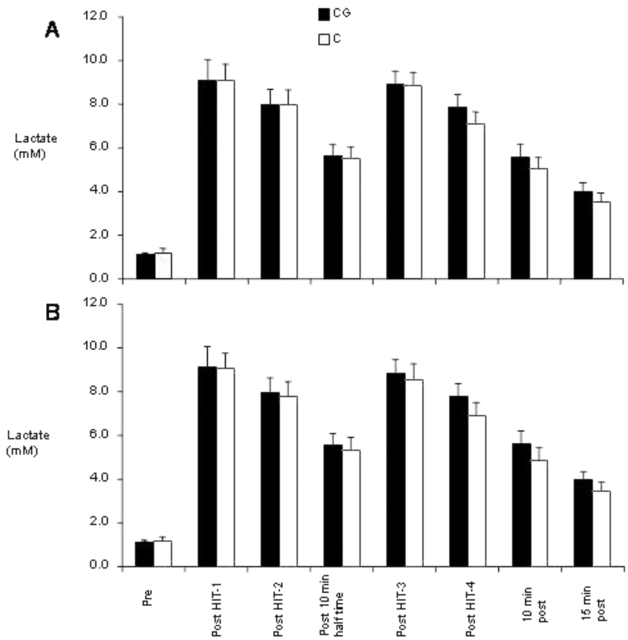

Figure 3 — Mean ± SD, blood lactate before the simulated team game (STG), after each period of high-intensity tests (HIT; 5 × 20-m sprints, 3 × maximal drives on the grunt) and 10 and 15 min following the STG for the compression garment vs control conditions on day 1 (A) and day 2 (B) of the trials.

Table 3 Mean ± SD, Blood Creatine Kinase (CK) Before and Following the Simulated Team Game (STG) for the Compression Garment vs Control Conditions on Day 1 and Day 2 and 48 h Following Day 2 of the Trials

Variable	Compression	Control
Day 1 pre-STG CK (UL)	307 ± 191	299 ± 139
Day 1 post-STG CK (UL)	577 ± 311*	509 ± 242*
Day 2 pre-STG CK (UL)	630 ± 298*	614 ± 327*
48 h post Day 2 CK (UL)	468 ± 300*	388 ± 256*

*Significantly different to pre-STG. There were no significant differences between conditions at any time point ($P < .05$).

Table 4 Mean ± SD, Perceived Muscle Soreness (Scale 0–10) Before and Following the Simulated Team Game for the Compression Garment vs Control Conditions on Day 1 and Day 2 and 48 h Following Day 2 of the Trials

Variable	Compression	Control
Day 1 pre-STG	1.3 ± 1.0	1.6 ± 1.2
Day 1 post-STG	5.5 ± 1.5*	6.6 ± 1.5*
Day 2 pre-STG	3.4 ± 1.5*§	4.3 ± 2.7*
Day 2 post-STG	6.9 ± 1.6*§	8.0 ± 1.7*
48 h post Day 2	2.5 ± 1.7*§	3.5 ± 2.1*

*Significantly different to pre-STG ($P < .05$). §Significantly different from C ($P < .05$).

Chatard et al.[8] reported improved metabolic recovery with reduced La^- values during recovery with compression garments, and additionally reported an improved performance on the second of two 5-min cycle efforts separated by 80 min of recovery. More relevant to team-sport training and activity, Duffield and Portus[9] reported reduced CK values 24 h following repeat-sprint exercise; however, no performance measures were recorded. Extending on that data, exercise performance in the current study was not different 24 h following intermittent-sprint exercise. Regardless of condition, speed and power did not differ during the STG on day 2. Despite the high-intensity nature of the protocol, simulating team-sport exercise, the small volumes of eccentric exercise and body contact are likely to have resulted in the lack of prolonged suppression of muscle contractile performance. Therefore, this may make conclusions on the ergogenic effects of the garments difficult to ascertain when a between-day decline in performance was minimal. However, Maton et al.[2] have previously reported no effect of compression garments on muscle fatigue or the evolution of recovery postfatiguing exercise based on EMG spectral analysis of leg and thigh muscles. Nevertheless, the current study, in agreement with the results of previous research,[5,6,9] indicated that compression garments did not improve speed or power, or aid performance recovery during the 24 h postexercise.

Physiology

Despite the limited available data and no evidence of improved recovery of performance measures 24 h postexercise in the current study, compression garments have been reported as reducing the magnitude of change in blood markers of muscle damage and metabolism.[12] Kraemer et al[1] reported a blunting of the rise in CK when wearing compression sleeves for 5 days following muscle damaging, eccentric exercise of the elbow flexors. Other studies incorporating a whole-body model have also reported lower CK levels 36 h following a rugby game[10] and 24 h following prolonged, high-intensity repeat sprint and throwing exercise.[9] Additionally, compression garments have been reported to alter the inflammatory response to muscle damage from downhill walking and potentially accelerate the repair process independent of changes in CK.[13] Despite the common use of reporting La^- values and linking this data with ensuing exercise performance,[8,14] there is little association between performance and either La^- production or removal. However, an often made claim regarding compression garments refers to the proposed superior ability for La^- clearance, which is then used to imply performance enhancement. Berry et al[14,15] have reported mixed findings for the rate of La^- clearance following exercise, with lower La^- values following 15 min of recovery with the garments after 3 min cycling at 110% V_{O2max} and alternatively having no effect on La^- values during recovery following 3-min running at 110% V_{O2max}. As with previous data on intermittent-sprint exercise, no differences were evident between conditions for La^- values during or following the simulated team game on either day,[9] indicating that metabolic recovery, regardless of exercise performance, was not aided. Further, the current study found no evidence for reductions in CK values immediately post day 1, 24 h post day 1, or 48 h post day 2 as a result of wearing compression garments.

The current finding of no difference between conditions in CK is somewhat in opposition to the results of Gill et al[10] and Duffield and Portus.[9] These contrasting findings may be due to the lower CK values reported in the current study than those in either of the two previously mentioned studies. The data reported by Gill et al[10] were obtained 36 h following full-body contact games of rugby, which were higher than the values of Duffield and Portus[9] obtained 24 h post high-intensity repeated sprinting and throwing, which in turn were higher than the values reported here for intermittent sprinting. However, it is difficult to compare the absolute CK values between these studies due to the use of differing measurement techniques (ie, transdermal vs capillary blood sample). In addition, the data of Duffield and Portus[9] was somewhat equivocal because, although absolute differences existed between conditions, there were no differences in the relative change in CK between control and the garment conditions. Further, the percentage change in CK values in the current study are comparable to those reported by Duffield and Portus.[9] In addition to differences in measurement technique, other factors may have also affected the differing response in CK values reported in the current study compared with others.[9,10] These include the length of time the garments were worn, training status of participants, and familiarity with the exercise in respective protocols. Regardless of these differences, even though ratings of MS were reduced postexercise, no evidence of a reduction in postexercise CK was present in the current study. Finally, it must be noted that the pre–day 1 CK measures were obtained approximately 48 h following a competitive rugby match, and the post–day 2 measures of a similar time frame (48 h) were increased compared with the pre–day 1 measure. Although the 24- to 48-h period postexercise is often reported as the normal time frame for a peak in CK values,[10] it must be noted that the occurrence of the game 48 h before testing may have affected the CK values recorded in the current study.

Cardiovascular responses to wearing compression garments during exercise have not differed from control conditions during repeat-sprint exercise[9] or endurance performance.[16] Accordingly, there were no differences in heart rate between conditions at any time point on either day of the current study. Not unexpectedly, and as has previously been reported[5,9] skin temperature under the garments was higher than control. As would be expected, a physical barrier overlaying the skin may reduce the effectiveness of evaporation and increase the reliance on conduction and/or convection,[17] although this has been reported to have minimal effect on thermoregulation in cool conditions.[18] While a potential reduction of evaporative efficiency from the skin may increase the thermoregulatory load, in the mild environmental temperatures of the current data collection, no effects on tympanic temperature were apparent. It is acknowledged that tympanic temperature may be a less accurate measure of core body temperature, particularly in the mild temperatures of the testing environment; however, this measure was used as a comparison between conditions as opposed to an actual measure of internal thermal load. Accordingly there were no differences in the rate of change between conditions. In conjunction, no differences were present between conditions in body mass pre- or postexercise on either day of testing. Therefore, in mild environmental temperatures where the difference between skin and environmental temperature is increased, compression garments did not unduly affect thermoregulatory function, evidenced by the fact that although skin temperature was higher, tympanic temperature did not differ and sweat loss was not different between conditions.

Perceptual

The wearing of compression garments during and following consecutive day exercise failed to show any differences in performance or blood markers of muscle damage. However, athletes continually self-report significantly lower MS when compression garments are worn during recovery. Several previous studies have reported the subjective perception of improved muscle soreness or reduced feeling of pain when wearing compression garments during or following exercise[6,9,14] although this finding is not universal.[13] Results from the current study suggest that there are perceptual benefits to be gained from wearing compression garments postexercise, including sleeping in the garments, which reduce the feelings of muscle soreness and may assist to improve readiness to engage in training or exercise. This in itself may be of benefit to athletes. However, we cannot exclude that a placebo effect occurred due to wearing the garment as the current study did not have a placebo condition (ie, using a garment, but no compression).

In conclusion, exercise as performed in many team sports was not improved or hampered by wearing compression garments, and no differences were present in recovery between consecutive days of simulated team-sport activity. Moreover, despite previous evidence to the contrary, no differences in blood markers of muscle damage (CK) or anaerobic metabolism (La^-) were present during or following either day of intermittent-sprint activity. While skin temperature was greater in the garment conditions, this did not increase the thermal strain of the exercise in mild temperatures as there were no differences in measures of heart rate, tympanic temperature, or body mass between conditions. As such, the use of compression garments did not change performance of simulated team-sport activity on consecutive days, and despite reductions in self-rated muscle soreness, no improvements in performance or recovery were evident.

Practical Applications

While the limited amount of previous research on compression garments has not shown any improvement in intermittent (team-sport) exercise performance, reductions in recovery creatine kinase and lactate values have indicated the garments may be an effective recovery tool when worn postexercise. However, there is very little performance data to substantiate this claim.

This study indicates that compression garments did not change performance or recovery of intermittent-sprint activity on consecutive days as is performed in many team sports. While no markers of physiology or performance appeared to improve when wearing the garments 24 h post exercise, athletes rated lower perceived muscle soreness and felt better when recovering in compression garments. Accordingly, despite the possibility of a placebo effect, the use of the garments may be of benefit for team sport athletes to improve self-reported recovery during the 24 to 48 h following high-intensity, intermittent-sprint exercise.

Acknowledgments

The authors would like to acknowledge and extend their gratitude for the support of SKINS for the generous supply of their products. However, the results of the current study do not constitute an endorsement of the product by the authors or the journal.

References

1. Kraemer WJ, Bush JA, Wickham RB, et al. Influence of compression therapy on symptoms following soft tissue injury from maximal eccentric exercise. *J Orthop Sports Phys Ther*. 2001;31(6):282–290.
2. Maton B, Thieney G, Dang S, et al. Human muscle fatigue and elastic compressive stockings. *Eur J Appl Physiol*. 2006;97(4):432–442.
3. Agu O, Baker D, Seifalian AM. Effect of graduated compression stockings on limb oxygenation and venous function during exercise in patients with venous insufficiency. *Vascular*. 2004;12(1):69–76.
4. Mayberry JC, Moneta GL, DeFrang RD, et al. The influence of elastic stockings on deep venous hemodynamics. *J Vasc Surg*. 1991;13(1):91–99.
5. Doan BK, Kwon YH, Newton RU, et al. Evaluation of a lower-body compression garment. *J Sports Sci*. 2003;21(8):601–610.
6. Bernhardt T, Anderson GS. Influence of moderate prophylactic compression on sport performance. *J Strength Cond Res*. 2005;19(2):292–297.
7. Kraemer WJ, Bush JA, Bauer JA, et al. Influence of compression garments on vertical jump performance in NCAA division I volleyball players. *J Strength Cond Res*. 1996;10(3):180–183.
8. Chatard JC, Atlaoui D, Farjanel J, et al. Elastic stockings, performance and leg pain recovery in 63-year-old sportsmen. *Eur J Appl Physiol*. 2004;93(3):347–352.
9. Duffield R, Portus M. Comparison of three types of full-body compression garments on throwing and repeat-sprint performance in cricket players. *Br J Sports Med*. 2007;41:409–414.
10. Gill ND, Beaven CM, Cook C. Effectiveness of post-match recovery strategies in rugby players. *Br J Sports Med*. 2006;40:260–263.
11. Bishop D, Spencer M, Duffield R, Lawrence S. The validity of a repeated sprint ability test. *J Sci Med Sport*. 2001;4(1):19–29.
12. Barnett A. Using Recovery Modalities between Training Sessions in Elite Athletes Does it Help? *Sports Med*. 2006;36(9):781–796.
13. Trennell MI, Rooney KB, Sue CM, et al. Compression garments and recovery from eccentric exercise: A ^{31}P-MRS study. *J Sports Sci Med*. 2006;5:106–114.
14. Berry MJ, McMurray RG. Effects of graduated compression stockings on blood lactate following an exhaustive bout of exercise. *Am J Phys Med*. 1987;66(3):121–132.
15. Berry MJ, Bailey SP, Simpkins LS, et al. The effect of elastic tights on the post-exercise response. *Can J Sport Sci*. 1990;15(4):144–148.

16. Bringard A, Perrey S, Belluye N. Aerobic energy cost and sensation during submaximal running – positive effects of wearing compression tights. *Int J Sports Med*. 2006;27(5):373–378.
17. Dawson B. Exercise training in sweat clothing in cool conditions to improve heat tolerance. *Sports Med*. 1994;17(4):233–244.
18. Gavin TP. Clothing and thermoregulation during exercise. *Sports Med*. 2003;33(13):941–947.