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The influence of compression garments on recovery during a triathlon training camp: a pilot study

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Abstract: Triathletes often schedule intense training camps into their program to promote functional overreaching, although these periods pose a greater risk of illness or injury due to heightened training load. To mitigate this risk, triathletes may implement recovery strategies such as the use of compression garments. However, little is known about the influence of such garments during multi-day exercise periods. Ten highly-trained triathletes (6 male, 4 female, mean ± SD age; 32 ± 8 y) completed a six-day intensive training block and were randomly assigned to one of two recovery groups; donning lower body compression tights (COMP, n = 5) for at least 6 hours following the last training session each day, or no compression (CON, n = 5). Physical performance data (6s sprint, 30s sprint, 4-minute mean power cycling tests) was collected on Day 1 and Day 6 of the training camp and subjective wellbeing monitoring was completed daily. There were no significant group x time interactions for any of the performance or perceptual measures ($p > 0.05$). However, a *large* ($d = -1.35$) reduction in perceived stress was observed from Day 1 to Day 5 in COMP compared to CON; and perceived muscle soreness was associated with significant main effects for group ($p = 0.047$) and time ($p = 0.02$), with COMP lower than CON on Day 4 and Day 6. Lower-body compression garments may reduce perceived stress and muscle soreness during an intense six-day triathlon training camp, with minimal influence on physical performance.

Keywords: muscle soreness; endurance; stress; multisport; cycling.

1. Introduction

The sport of triathlon is demanding from both a training and competition perspective, with recreational triathletes accumulating 8-16 hours per week of training across the three disciplines of swimming, cycling and running (29). In addition to this regular training schedule, many triathletes opt to take part in intense training blocks or training camps throughout the year in preparation for key races or competitive periods. These training blocks are designed to promote functional overreaching, with training stimulus increasing by as much as 229% (21). However, this may lead to health-related repercussions, including increased oxidative stress, delayed-onset muscle soreness and immunological impairment, in addition to decreased performance (33). In order to achieve the optimal balance of stress and adaptation while reducing the possibility of illness or injury during these intense training blocks, triathletes may implement recovery strategies such as hydrotherapy, massage or foam rolling to manage the daily training load (32). One such recovery strategy that has gained popularity amongst endurance athletes is the use of compression garments (CGs), which due to their portability and relative affordability, may be an ideal tool for day-to-day recovery during intense training camp scenarios.

Originally used in clinical and therapeutic settings for the treatment of pulmonary embolisms, oedemas and deep vein thrombosis (20), compression garments are now commonly implemented as recovery garments worn after strenuous exercise, to improve venous return and potentially enhance clearance of metabolites (e.g. creatine kinase, lactate dehydrogenase), thereby expediting muscular recovery (25). Wearing knee-high compression socks, for example, has previously been shown to improve subsequent five kilometre running time trial performance (7); while a combination of compression leg sleeves on top of compression tights resulted in lower blood lactate and a reduced heart rate during recovery between maximal cycling bouts (23). While there is limited research demonstrating actual performance benefits following recovery with compression garments, more than half of the investigations in this area have demonstrated a positive effect of compression garments on perceived muscle soreness (35). Given that muscle soreness is the most prevalent symptom of illness/injury amongst triathletes and related to subsequent training disruption or performance decrement (34), a potential reduction in muscle soreness is therefore likely to be beneficial amongst this athletic cohort.

Importantly, previous research tends to focus on recovery from lab-based endurance exercise protocols within 12 hours (25), which may not reflect 'real-world' scenarios where compression garments are implemented by athletes; for example, two-thirds of elite Australian athletes indicated they sleep in compression garments at least once per week (16). These extended periods of recovery – usually overnight – with compression garments have been associated with improved cycling time trial performance and decreased plasma blood lactate (36), decreased creatine kinase and reduced limb girths (10), as well as a lower perception of fatigue and greater perceived sleep quality (1). Only one study has reported the effect of compression garments on recovery during a multi-day judo training camp, where they were perceived as more effective for recovery than a placebo sugar drink but had no significant effect on physiological markers of recovery (9). While field-based studies such as this may involve more confounding variables than lab-based protocols, they report on observations of dynamic performance contexts where compression garments would actually be used, and therefore provide valuable guidance on the usefulness of these garments (30). This is particularly relevant as compression garments have only previously been investigated as performance aids during a triathlon event (14), and as such their applicability as recovery garments from the combined and ongoing demands of swimming, cycling and running training in a camp environment is unknown.

It is evident that there is a paucity of research concerned with the use of compression garments as a recovery tool during multi-day exercise, including overnight occasions of wearing the garments; and, specifically, as a recovery tool during an intensive triathlon training block. Therefore, the purpose of this pilot study was to assess how lower-body compression tights may influence aspects of physical and subjective wellbeing during a multi-day training camp in highly-trained triathletes.

2. Materials and Methods

Subjects— A total of ten highly-trained triathletes (6 male, 4 female, mean ± SD age; 32 ± 8 y) participated in the current study. All participants met the criteria for highly trained/national level athletes according to recent guidelines for the classification of participants (27), and had been training for the sport (swim, bike and run) for at least two years in order to take part in the study. Institutional ethics approval was provided (HEC21380) and a health screening check and informed consent was obtained from each participant prior to the commencement of data collection. Participant demographics are further detailed in Table 1.

Table 1. Participant characteristics (presented as mean ± SD).

	Control (n=5)	Compression (n=5)	Total (n=10)
Sex	2 female*, 3 male	2 female**, 3 male	4 female, 6 male
Age (years)	35 ± 10	30 ± 7	32 ± 8
Height (cm)	171.0 ± 7.8	179.0 ± 4.5	174.6 ± 7.4
Mass (kg)	67.4 ± 10.9	74.8 ± 8.7	71.1 ± 10.0
Triathlon experience (years)	8 ± 5	7 ± 5	8 ± 5

**At the time of physical performance pre-testing, the following data was collected by self-report: one post-menopausal female (no natural period in the previous 12 months); one naturally menstruating female in late luteal phase (days 22-28). **One naturally menstruating female in late luteal phase (days 22-28); one naturally menstruating female in pre-ovulation follicular phase (days 6-14).*

Design— A parallel-group study design was employed, whereby participants were matched based on physical characteristics (age and sex), training history and cycling performance. Within each pair, the participants were randomly assigned to one of two recovery groups, with lower body compression tights (COMP, n = 5) or without (CON, n = 5). Physical performance data was collected on Day 1 and Day 6 of the training camp, while subjective wellbeing monitoring (fatigue, muscle soreness, sleep quality, stress and mood) was completed daily. All participants completed the same training sessions and were unaware of the pairing throughout the study. Additionally, participants were advised to maintain their normal post-training recovery nutrition and hydration for the duration of the study and refrain from the use of any other recovery tools or strategies (e.g. foam rollers, intermittent pneumatic compression devices).

Compression Garments— Full-length (waist-to-ankle) compression tights (Pressio Inc., London, United Kingdom) comprised of 70% nylon and 30% Lycra (elastane) were used in the present study. Each COMP participant was correctly fitted for the tights by height and mass according to manufacturer recommendations. COMP participants were instructed to wear the compression garments after the last training session of each day for a minimum of 6 hours, including while sleeping if they felt comfortable to do so. CON participants were instructed to wear non-compressive clothing during this period.

The applied interface pressure of the compression garments was assessed upon first wear at three standard anthropometric sites on the participant's right leg using the Kikuhime pressure monitor (MediGroup, Melbourne, Australia), as described in de Glanville & Hamlin (15). The Kikuhime pressure monitor has previously been shown to be both valid and reliable (8).

Physical Performance Testing - Mean cycling power was measured on Day 1 and Day 6 with a 6-second maximal sprint, 30-second maximal sprint and 4-minute mean power (4MMP) test on an air-braked cycle ergometer (Wattbike Ltd, Nottingham, UK). This testing battery was selected to assess the neuromuscular power (6s sprint), short term anaerobic power (30s sprint) and aerobic power (4MMP) capacities of the athletes, while also being low impact in nature to reduce injury risk. All three performance tests have been shown to have low typical errors of measurement (CVs 2.2% peak power in a 6s sprint, 2.4% for mean power in a 30s sprint and 2.3% for average power in a 4MMP test) and high within-subject intraclass correlation (ICC 0.96-0.99, 0.99 and 0.94 for 6s sprint, 30s sprint and 4MMP test, respectively) in populations of highly-trained cyclists (19, 17, 18).

The cycle ergometer was set up for each test to match the participant's usual seat height and reach on their regular bike. Participants completed a set warm-up of 2 minutes cycling at 1.5 W/kg, 2 minutes at 2 W/kg and 2 minutes at 2.5 W/kg, including two 5s sprints to familiarise themselves with gear selection (air resistance level) for the 30s sprint test. Following the warm-up, participants completed two seated 6s maximal sprints from a stationary start at the manufacturer recommended gearing (based on rider weight and sex; (34)) separated by 90s active recovery at the lowest air resistance level. All participants then completed a seated 30s maximal sprint at a self-selected gear, followed by 4 minutes active recovery. During all three sprint tests, participants could view only the elapsed time and were blinded to all other performance metrics. The final cycling power test was a seated 4-minute maximal effort, during which time participants self-selected the gearing and cadence (rpm) and could view only their elapsed time on their screen. Standardised encouragement was provided every 30s by the same researcher during the 4MMP test. After completing the test, participants completed a 5-minute cooldown at a self-selected intensity. All participants used their own cycling shoes and pedals for the cycling tests and were permitted to drink water ad-libitum during testing.

Subjective Wellbeing Monitoring & Daily RPE— Each morning of the training camp, one hour prior to the morning training session, participants received a link via email and text message to complete an online subjective wellbeing questionnaire which recorded their perception of fatigue, muscle soreness, sleep quality, stress and mood, each on a five-point scale (28). The combined total score of the five categories was used to calculate an overall wellbeing score (best positive result = 25). In addition to the wellbeing questionnaire, each participant recorded their approximate sleep and wake times which was used to calculate total sleep duration, which has previously been shown to have a large positive correlation (r = 0.85) with actual sleep duration by actigraphy monitors (11). Additionally, on their daily questionnaire COMP participants were instructed to record the actual time spent wearing their compression garment after their last training session. Following each training session, participants also provided their Rating of Perceived Exertion (RPE) on the Borg 6-20 scale (5).

Training Camp Program— The triathlon training camp was based in Jindabye, New South Wales (elevation: 928 m) in the Australian summer, with average daily minimum/maximum temperatures of 12°C/25°C and average relative humidity of 62%. The six-day intensive training block consisted of two daily (morning and afternoon) training sessions delivered by an accredited triathlon coach (Triathlon Australia Development Coach Level), with the exception of Day 1 and Day 6 where one training session was completed alongside physical performance testing (Table 2). No additional training was permitted. All training sessions were monitored by heart rate/GPS watches (Garmin Forerunner 745/945 or Garmin Fenix 7) for time, distance, elevation and heart rate, and data was uploaded to a custom Microsoft Excel spreadsheet.

Statistical Analyses — Descriptive statistics are shown as mean ± SD values unless stated otherwise. Using SPSS (Version X, Chicago, IL), a 2x2, Group (COMP and CON) x Time (pre and post) repeated measures ANOVA was conducted to assess performance differences between groups. To assess changes in subjective wellbeing, a 2x6, Group (COMP and CON) x Time (Days 1-6) repeated measures ANOVA was utilised for each respective wellbeing factor, and overall wellbeing score. Data were assessed for normality via Normal Q-Q Plots and examination of studentized residuals for values greater than ±3. Homogeneity of variances and covariances were assessed by Levene's test of homogeneity of variance ($p > .05$) and Box's test of equality of covariance matrices ($p = .898$).

Table 2. Training camp program and average session metrics

Day	Modality	Session Description	Duration (hrs)	Distance (km)	Elevation gain (m)	HR (bpm, mean ± SD)	RPE (AUs, mean ± SD)
1	Bike	Performance testing (~20 mins)*					
	Bike	2 hr easy cycle	2:00	45.0	1007	145 ± 8	13.0 ± 1.9
2	Bike	~5 hour tempo cycle (incl. 90 min HC climb)	5:30	115.9	2680	137 ± 8	13.4 ± 3.8
	Run	15 min progressive build run after cycling	0:15	3.1	30	153 ± 17	13.3 ± 2.3
	Swim	30 min recovery open water swim	0:37	1.7			10.3 ± 2.1
3	Bike	~4 hr tempo cycle	4:17	111.5	1591	136 ± 7	14.1 ± 1.1
	Run	50 min run (tempo hill repeats)	0:56	9.7	299	139 ± 19	12.8 ± 3.0
4	Bike	~3.5 hr undulating cycle (incl. 60 mins at moderate altitude)	3:53	86.6	1817	136 ± 10	13.6 ± 1.3
	Swim	40 min recovery open water swim	0:40	2.2			10.3 ± 2.1
5	Bike	2 hr recovery cycle	2:09	47.3	936	131 ± 8	11.6 ± 1.4
	Run	2 hr tempo run at moderate altitude	2:11	20.2	547	146 ± 9	13.7 ± 2.5
6	Bike	~2.5 hr easy cycle	2:57	70.7	1245	133 ± 9	13.1 ± 0.9
	Bike	Performance testing (~20 mins)*					
		Total	***25:25***	***514***	***10151***		

*Not included in total training hours. **HC** = *hors categorie* (highest possible grade of climb for cycling). **Tempo** = moderate, aiming for RPE of 13-16. **Recovery =** RPE ≤ 11. **Moderate altitude =** ≥ 1000 ≤ 2500 m above sea level (4).

Magnitudes of the standardized effects between pre and post scores between groups were calculated using Cohen's d and interpreted using thresholds of 0.2, 0.5, and 0.8 for *small*, *moderate* and *large*, respectively (12). Effects were deemed unclear if the 90% confidence intervals overlapped the thresholds for the smallest worthwhile change (d > 0.2).

3. Results

All 10 participants completed the six-day training program, totalling (mean ± SD) 4000 ± 400 metres of swimming, 477 ± 31 kilometres of cycling and 33 ± 9 kilometres of running, for an average of 25:25 ± 0:16 (mean ± SD) h:mins training (Table 2). The average RPE (mean ± SD) for each session was 10.3 ± 0, 13.1 ± 0.8 and 13.3 ± 0.4 for swimming, cycling and running sessions respectively.

Mean pressure (±SD) of the compression tights was 13.8 ± 3.9 mmHg at the ankle (10cm above distal edge of spyhrion), 20.3 ± 5.2 mmHg at the maximal calf girth and 12.5 ± 1 mmHg at the mid-thigh. The average duration spent wearing compression tights by the COMP group each afternoon/evening of the camp was 9.2 ± 1.4 hours. Only one COMP participant did not meet the minimum 6 hours in compression tights per day (see Table 3).

There were no statistically significant interactions between group and time on 4MMP average power (F(1, 8) = 0.658, *p* = .441, partial η2 = .076), peak power (F(1, 8) = 1.710, *p* = .227, partial η2 = .176) or power/weight ratio (F(1, 8) = 0.898, *p* = .371, partial η2 = .101). Similarly, there were no statistically significant

Table 3. Hours spent wearing compression tights by COMP participants.

	Time wearing compression tights (hours)					
	Day 1	*Day 2*	*Day 3*	*Day 4*	*Day 5*	*Participant average*
Participant A	10	11.5	14	11.5	7.5	10.9
Participant B	6	10.3	12	10	6	8.9
Participant C	9	9.8	12	12	6	9.8
Participant D	10.3	11.5	11.5	11	11.5	11.2
Participant E	7	5	3.5	6.5	5	5.4

interactions between group and time on 30s sprint average power (F(1, 8) = 1.008, p = .345, partial $\eta2$ = .112), peak power (F(1, 8) = 0.224, p = .649, partial $\eta2$ = .027) or power/weight ratio (F(1, 8) = 0.003, p = .958, partial $\eta2$ = .000), and between group and time on 6s sprint average power (F(1, 8) = 1.005, p = .345, partial $\eta2$ = .112), peak power (F(1, 8) = 0.439, p = .526, partial $\eta2$ = .052), peak cadence (F(1, 8) = 0.000, p = 1.0, partial $\eta2$ = .0) or power/weight ratio (F(1, 8) = 0.617, p = .455, partial $\eta2$ = .072) (Figure 1). All performance measures were associated with either *trivial* or *unclear* effect sizes (Table 4).

There was no statistically significant interaction between group and time on muscle soreness (F(5,30) = 0.111, p = 0.989, partial $\eta2$ = 0.18) and effect sizes were *unclear*. However, there were main effects for both time (F(5, 30) = 4.852, p = .002) and for group (F(1, 6) = 6.231, p = .047). Specifically, muscle soreness was greater in CON on Day 4 and Day 6 compared

Table 4: Mean ± SD comparison of pre-post changes in cycling power test measures for the compression (COMP) and control (CON) groups.

			Pre	Post	Raw Change	Group x Time interaction	
						***p*-value**	**ES (*d*) ± 95% CI**
6s sprint	Average power (W)	COMP	976.4 ± 269.7	925.4 ± 268.9	-51	0.345	-0.07 ±0.24, *trivial*
		CON	821.4 ± 328.1	803.8 ± 346.4	-17.6		
	Peak power (W)	COMP	1171.2 ± 338.8	1201.4 ± 400.8	30.2	0.526	0.11 ±0.38, *unclear*
		CON	991.2 ± 422.1	979.8 ± 419.3	-11.4		
	Peak cadence (rpm)	COMP	165 ± 10	163 ± 13	-2	1.000	0.00 ±0.44, *unclear*
		CON	154 ± 16	152 ± 19	-2		
	Power/weight (W/kg)	COMP	13.0 ± 2.8	12.3 ± 2.9	-0.7	0.455	-0.11 ±0.34, *unclear*
		CON	11.9 ± 3.3	11.6 ± 3.8	-0.3		
30s sprint	Average power (W)	COMP	604.0 ± 145.2	648.4 ± 172.9	44.4	0.345	0.28 ±0.78, *unclear*
		CON	570.2 ± 239	555.6 ± 228.7	-14.6		
	Power/weight (W/kg)	COMP	8.8 ± 1.9	8.6 ± 1.9	-0.2	0.958	-0.38 ±1.04, *unclear*
		CON	8.2 ± 2.4	8.0 ± 2.3	-0.2		
4MMP	Average power (W)	COMP	295.0 ± 40.9	312.2 ± 49.4	17.2	0.441	0.16 ±0.46, *unclear*
		CON	293.6 ± 74.5	299.8 ± 92.7	6.2		
	Power/weight (W/kg)	COMP	4.0 ± 0.5	4.2 ± 0.6	0.2	0.371	0.26 ±0.66, *unclear*
		CON	4.3 ± 0.6	4.4 ± 0.8	0.1		

to COMP, with a mean difference of 1.0 AUs (95% CI, 0.001 to 1.999) and 0.75 AUs (95% CI, 0.138 to 1.362), respectively.

When comparing the remaining subjective wellbeing measures across the six-day training camp, non-significant (p = 0.367) *large* effects were observed for perceived stress from Day 1 to Day 3 (d = -1.43 ±1.54), Day 1 to Day 4 (d = -1.52 ±1.62) and Day 1 to Day 5 (d = -1.35 ±1.52) in favour of COMP when compared to the CON group (Figure 2B). No significant group x time interactions were reported for mood (p = 0.651), perceived fatigue

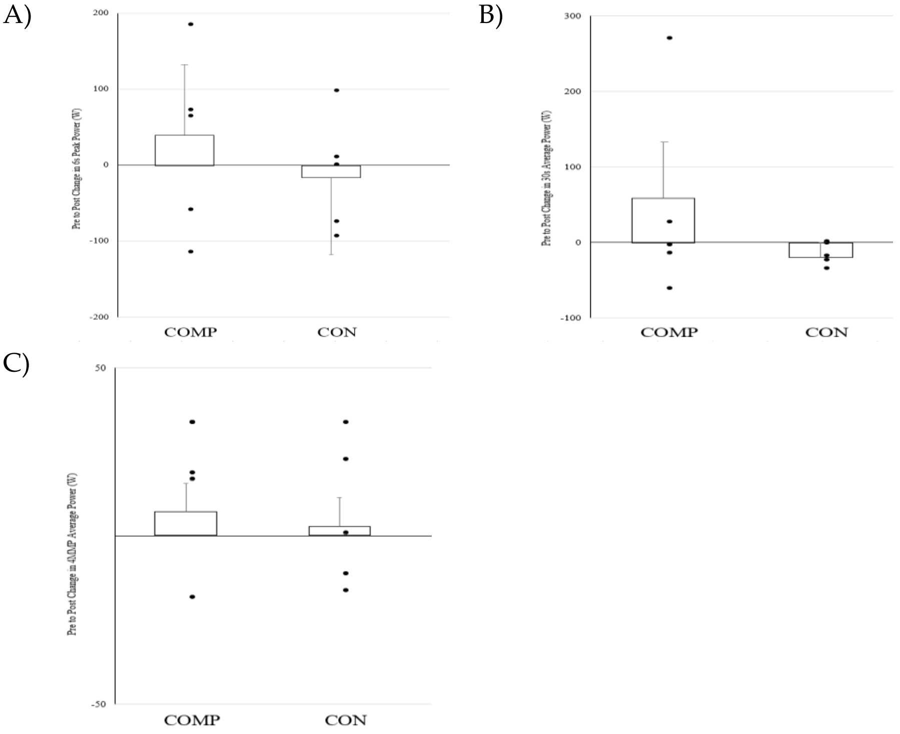

Figure 1. Changes in cycling power from Day 1 to Day 6 for COMP and CON groups for: A) 6s sprint peak power, B) 30s sprint average power, and C) 4-minute Mean Power (4MMP) test average power. Box with black outline represents group average; error bars

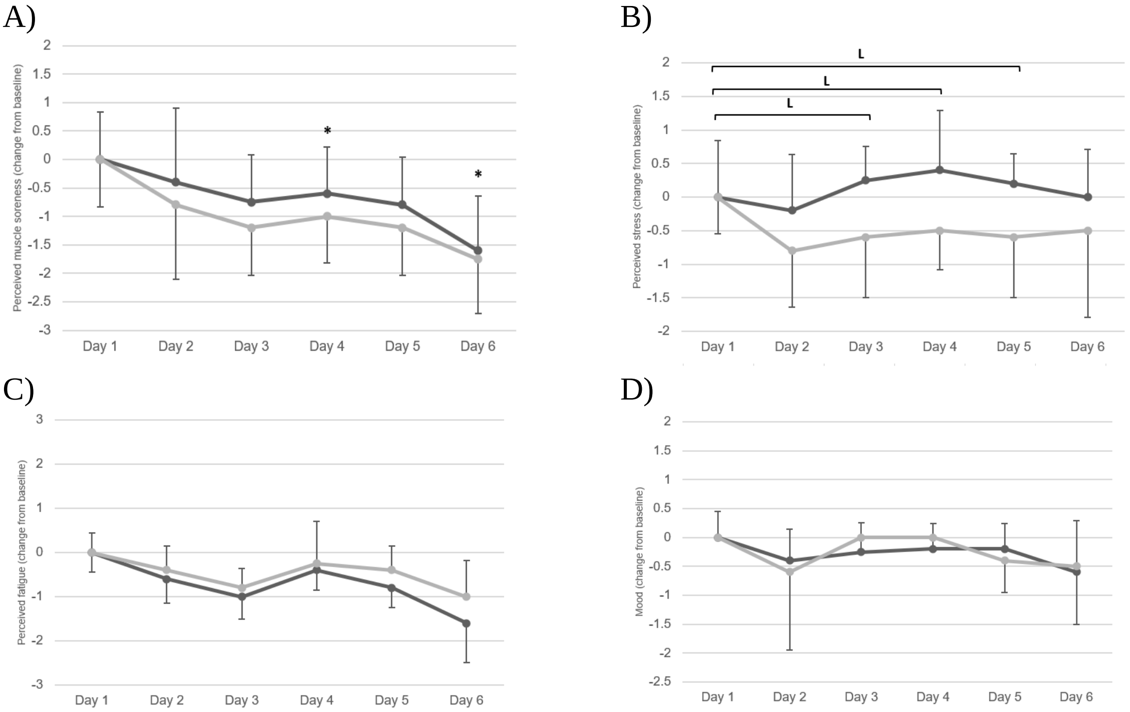

Figure 2. Comparison of (mean ± SD) **A)** perceived daily muscle soreness, **B)** average perceived daily stress, **C)** average perceived daily fatigue and **D)** average daily mood for COMP (black line) and CON (grey line) groups during a six-day triathlon training camp (1 = very negative, 5 = very positive for all four categories). *Significant difference between group values ($p < 0.05$); *L* large Cohen's d effect ($d > 0.80$).

(*p* = 0.094) or perceived sleep quality (*p* = 0.319), and effect sizes were *unclear*. Additionally, a significant (*p* < 0.009) increase in perceived fatigue and a significant (*p* < 0.018) reduction in overall subjective wellbeing (summation of five categories) were observed for both groups from Day 1 to Day 6 of the training camp.

4. Discussion

The aim of the current study was to investigate how aspects of physical performance and subjective wellbeing may be influenced by the daily application of lower-body compression garments during a six-day triathlon training camp in highly-trained triathletes. The findings suggest that wearing CGs for at least six hours per day during a period of intensive multi-day exercise may improve perceived muscle soreness and perceived stress at certain time points, although they do not appear to have any significant effect on physical performance measures. Additionally, the results of this study demonstrate that a six-day triathlon training camp significantly increases muscle soreness and decreases overall subjective wellbeing in highly-trained athletes. To our knowledge, this is the first study to investigate the use of compression garments during an intense training block in highly-trained athletes, where ~25 hours of training was completed over just six days. Despite negligible findings for physical performance, it was promising to see enhanced perceptions of physical and mental recovery, indicating that the COMP group may have been able to cope with the training load better than the CON group.

In agreement with previous research in this field, one of the key findings in the present study was a reduction in perceived muscle soreness on Day 4 and Day 6 of a 6-day training camp with the application of compression tights for recovery. Given that muscle soreness tends to develop within 24 hours following an intensive exercise session (6), this suggests that wearing CGs somewhat mitigated the sensation of muscle soreness that likely developed as a result of the intensive training on the first two days of the training camp. It has previously been reported that graduated compression stockings with 'low' level pressure (10-14 mmHg), consistent with the applied pressure recorded for the tights used in the present study, can increase mean blood flow velocities in the popliteal veins by 9.6%, indicating improved venous circulation in the lower limbs (24). Such an improvement in blood flow may have contributed to a reduction in muscle swelling and inflammation in the COMP group during the training camp in the current study and, in turn, this may have improved comfort and reduced 'leg fatigue', as reported in Liu et al. (24). However, without direct observation of limb girth or inflammatory blood markers in the participants, this is purely speculative. Considering that perceived muscle soreness significantly (*p* < .002) increased in all athletes from Day 1 to Day 6, the early use of CGs may be beneficial to reduce perceived muscle soreness as it develops across a training camp. Indeed, in comparison to other recovery tools that are more expensive and less portable (e.g. intermittent pneumatic compression devices, hydrotherapy interventions), CGs appear to be an easily implemented daily recovery aid that can improve an athlete's perception of muscle soreness towards the latter half of an intensive training camp.

Although a reduction in perceived muscle soreness with the use of CGs was reported on Days 4 and 6, this did not translate to significant effects on physical performance pre to post training camp. This finding contrasts to previous research, where average power has generally improved when lower-body CGs were worn for recovery between cycling bouts (36, 23, 15). However, unlike prior investigations, the participants in the present study were highly-trained, and therefore may have been better accustomed to the specific physical demands of triathlon training, with enhanced recovery capabilities and ability to maintain their cycling performance across the camp. While non-significant, it was interesting that COMP tended to improve in cycling testing measures; for example, the mean improvement in 4MMP average power for COMP was 5.8%, compared to 2.1% in CON. This is comparable to the ~6% improvement in 8 km TT performance reported by Williams et al. (36) after 24 hours wearing CGs (which had a lower applied garment pressure than the present study). However, the influence of a learning effect for the 4MMP test should not be ruled out, as participants did not undergo a familiarization trial for the protocol, as recommended by Driller et al. (18).

A novel finding of the present study was the *large* ($d > 0.80$) reduction in perceived stress for COMP compared to CON from Day 1 to Day 5. High volume endurance training periods have previously been reported to increase overall stress in athletes, which may contribute to the development of overtraining syndrome that is characterized by increased fatigue and loss of performance (22, 26). Only one previous study has considered the influence of CGs on perceived stress following an exhaustive sprint protocol, reporting no changes to measures on the Acute Recovery & Stress Scale after a period of 48 hours wearing compression tights for recovery (37). However, it is likely that the total stress experienced by participants in Zinner et al. (37) was substantially lower than the present study, where the total training time was 25:25 ± 0:16 (mean ± SD) h:mins across six days. It is possible that through a reduction in perceived muscle soreness, the use of CGs somewhat alleviated the 'recovery debt' induced by an intensive training period and improved the overall recovery-stress balance in the athletes (22), as indicated by a reduction in perceived stress. Although, as the questionnaire used in the current study did not differentiate between types of stress (e.g. mental, physical), it is unclear how participants interpreted this question, and therefore, what aspect of stress may have been moderated by the prolonged use of CGs.

The remaining subjective wellbeing factors of fatigue, mood and sleep quality were not significantly different between groups; however, overall wellbeing significantly decreased across the six days in all participants, which is to be expected following an overload training block (2). As such, this decrease in overall wellbeing would likely be a transient effect of intensified training volume which would have improved following a taper period or return to normal training (31).

By the nature of the study design, there are a number of limitations to consider when interpreting the results of this study. Firstly, the possibility of a placebo effect is likely, as the COMP group were aware they were utilising a recovery tool and no placebo/sham group was included. However, given that this psychological effect may still result in a meaningful change in performance for an individual athlete, it should not be excluded as a positive effect (3). Participants' nutrition, sleep environment and sleep duration were also not controlled in this study, which are potential confounding variables that influenced their recovery. It is also not well understood how repeated wear of compression garments may influence their applied pressure over time (38), which may have influenced the effect of the garments across a six-day camp. Further, the heterogeneity and size of the sample population in this pilot study should be considered in the interpretation of these findings. Future research incorporating larger sample sizes of highly-trained athletes is clearly warranted to confirm some of our findings. Finally, one participant in COMP did not meet the minimum 6 hours in CGs each day as they experienced discomfort while wearing the garments, though was still included in the final analysis.

5. Practical Applications.

Lower-body compression garments may reduce perceived stress and improve perceived muscle soreness towards the latter days of a six-day triathlon training camp. These results support prior research that compression garments are a beneficial recovery aid to improve perceptual measures of recovery and demonstrate the usefulness of the garments for highly trained athletes in a multi-day exercise setting such as a triathlon training camp. While the garments do not appear to influence physical performance, the improvement in subjective wellbeing measures may allow athletes to better manage the overall load of an intensive training block.

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