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ABSTRACT

Global thresholds are typically utilized to band acceleration dependent upon intensity. However, global thresholds do not account for variation in individual capacities, failing to quantify true intensity of acceleration. Previous research has investigated discrepancies in high-speed distance produced utilizing global and individual speed thresholds, not yet investigated for acceleration. The current aim was to investigate discrepancies between global and individual thresholds when quantifying acceleration tasks. Acceleration data was recorded for thirty-one professional soccer players, utilizing 10-Hz GPS devices. Distances travelled performing low-, moderate-, and high-intensity acceleration were calculated for athletes utilizing global and individual thresholds. Global acceleration thresholds for low-, moderate-, and high-intensity acceleration were classified as 1-2 $m \cdot s^{-2}$, 2-3 $m \cdot s^{-2}$, and >3 $m \cdot s^{-2}$ respectively, with individual thresholds classified as 25-50%, 50-75%, and >75% of maximum acceleration respectively. Athletes were grouped low (LO), medium (ME), or high (HI) maximum accelerative capacity, determined utilizing three maximal 40-metre linear sprints. Two-way mixed design ANOVAs were used to analyze differences in acceleration distances produced between analysis methods and athlete groups. No significant differences were identified between analysis methods for LO. For ME, no significant differences were demonstrated for low-intensity. Moderate- and high-intensity acceleration distances were significantly higher for global compared to individual analysis method ($p<0.01$). For HI, significantly higher acceleration distances were produced for all acceleration intensities utilizing global thresholds ($p<0.01$). Significant differences identified between analysis methods suggest practitioners must apply caution when utilizing global thresholds. Global thresholds

do not account for individual capacities, and may provide an inaccurate representation of relative intensity of acceleration tasks.

Keywords: Global positioning systems, training load, team sports, speed thresholds, high intensity

INTRODUCTION

Introduction of Global Positioning Systems (GPS) to soccer has allowed an increased focus on high-speed activities (29). It is vital high-speed activities are quantified accurately, considering their high-energy cost (16), and link to goal scoring opportunities (11,20). Previously, global speed thresholds have been utilized to quantify an individual's high-speed activities (7). A limitation of global thresholds is the inability to acknowledge the relative intensity of activity. The exercise intensity continuum is individual-dependent, resulting in reduced accuracy when applying global thresholds to determine relative intensity for individuals (1). To increase the accuracy of quantifying individual training stimulus, individual thresholds have been developed. Individual speed thresholds have previously been calculated utilizing maximum sprint speed (13,27), maximum aerobic speed (25), gas ventilatory thresholds (1,8), or a combination of the aforementioned markers (17). Individual thresholds aim to quantify the relative intensity of high-speed locomotion, providing accurate information on an individual's training stimulus. Lovell and Abt (22) compared distances produced by global speed thresholds, and individual speed thresholds determined utilizing the second ventilatory threshold. Results demonstrated significant differences in high-intensity work performed between athletes of the same positional role utilizing individual speed thresholds, whilst non-significant results were demonstrated between the same athletes when utilizing global thresholds. Recently, several researchers have found discrepancies between values produced utilizing global and individual speed thresholds (8,13,27). These discrepancies highlight the precision required to accurately monitor individual athlete training load.

Despite having an important role, soccer training load should not focus solely upon monitoring high-speed activities. Focusing upon speed thresholds neglects metabolically demanding tasks occurring at low speed, such as acceleration (3,26). Research has reported a three- to eight-fold greater number of accelerations than sprints when comparing their frequency during competition (9,29). Lockie et al (21) state the mean duration of a sprint in soccer is approximately 2-seconds. Consequently, an athlete's ability to accelerate and reach high speed quickly is vital for on-field performance. Greig and Siegler (14) suggest sprinting and acceleration tasks are important underlying factors for muscular fatigue, given the high neuromuscular demand associated. Considering the link between fatigue and the occurrence of muscular strain injuries, as demonstrated by epidemiological injury data from the latter stages of competition, quantifying acceleration within the training load monitoring process would have large consequences for recovery.

As with high-speed activities, when quantifying acceleration tasks it is vital individual capacities are acknowledged. Previous research demonstrated acceleration demands vary significantly between playing positions during competition (9,19). Dalen et al (9) concluded wide defenders and wide attackers accelerated with higher frequency than central midfielders and central defenders. Ingebrigtsen et al (19) identified similar trends, with wide players producing significantly more acceleration maneuvers than central players. Authors explained central players typically operate in congested areas of the pitch, limiting space to accelerate maximally and achieve high speeds. A limitation of previous research investigating acceleration occurrence in soccer, is global thresholds were utilized to band acceleration tasks. Currently, no consistent global acceleration thresholds exist within the literature. Aughey (5) utilized a single threshold of 2.78 $m \cdot s^{-2}$ to quantify acceleration occurrence. Akenhead et al (3) further divided thresholds of 1-2 $m \cdot s^{-2}$ for low-intensity acceleration, 2-3 $m \cdot s^{-2}$ for moderate-intensity, and >3 $m \cdot s^{-2}$ for high-intensity, whilst Bradley et al (6) defined moderate-intensity as 2.5-4.0 $m \cdot s^{-2}$ and high-intensity as >4 $m \cdot s^{-2}$. Although global acceleration thresholds allow for comparisons in external workload completed by athletes, they fail to acknowledge individual's maximum accelerative capacities, and relative intensity of the stimulus placed upon individual athletes. The dose-response relationship is highly individual, with athletes' internal responses to the same external stimulus varying, and resulting in differing degrees of adaptation (18). Consequently, it is impossible to determine individual's acceleration intensity without an individualized approach to monitoring.

Considering the limitations of global acceleration thresholds, individual thresholds provide an alternative method for monitoring acceleration intensity. Sonderegger et al (28) were the first to attempt to individualize acceleration thresholds, incorporating individual's maximum accelerative capacity. This methodology was utilized to investigate acceleration values produced at various initial running speeds. Results highlighted the variance in maximum accelerative capacities in highly trained junior soccer players, with values ranging from 4.5-7.1 $m \cdot s^{-2}$. Despite a non-elite cohort, large variations in individual accelerative capacity provide further rationale for an individualized approach to quantifying acceleration tasks. Akenhead and Nassis (4) recently investigated current training load practices and perceptions amongst applied practitioners. Despite compelling physiological rationale, results demonstrated infrequent use of individual thresholds within applied sport. This is likely due to the time-cost associated with testing large squads, and the availability of expensive testing equipment. These barriers could be overcome by utilizing a field-based assessment with the capability of testing squads of athletes simultaneously.

Considering the advantages of an individual approach to monitoring acceleration, and the vast literature currently utilizing global acceleration thresholds, rationale exists for study into the discrepancies between global and individual acceleration thresholds. The current study aimed to determine the discrepancies between global and individual thresholds when quantifying acceleration tasks. Athletes were categorized dependent upon maximum accelerative capacities to provide further insight into individualizing thresholds for athletes of varying physical capacities. Considering the high proportion of applied practitioners utilizing global acceleration thresholds for athletes, results will have significant implications for future quantification of acceleration. It was predicted that significant differences would be evident between acceleration distances produced by global and individual analysis methods. Additionally, it was predicted the magnitude of differences between analysis methods would vary dependent upon individual's maximum accelerative capacities.

METHODS

Experimental Approach to the Problem

Subjects were sub-divided into three groups utilizing individual maximum acceleration values (LO – low accelerative capacity, ME – medium accelerative capacity, HI – high accelerative capacity). Subjects took part in twenty-three training sessions, and four friendly matches. Data collection spanned a four-week pre-season period. Acceleration data was recorded and quantified for each athlete, utilizing 10-Hz portable GPS devices (OptimEye S5B, Version 7.18; Catapult Innovations, Melbourne, Australia). GPS-derived acceleration data was analysed for individual athletes utilizing two analysis methods; a global analysis method, and individual analysis method. Distances travelled performing low-intensity, moderate-intensity, and high-intensity acceleration was recorded for individual athlete's training sessions. Distances produced utilizing global and individual analysis methods were compared for low-, moderate-, and high-intensity acceleration.

Subjects

Thirty-one, male, full-time professional soccer athletes from a Premier League academy in the UK (19.4 ± 1.7 years, height 180.4 ± 9.2 cm, weight 76.9 ± 7.2 kg) participated in the study. Subjects participated in twenty-three training sessions, and four friendly matches during the study (median 26 (IQR = 26-27) data collections per subject). Subject's mean involvement in soccer was 7.1 (± 1.6) years. Subjects had trained 4-5 times per week, and played 1-2 competitive matches per week for a minimum of two years. Goalkeepers were excluded from the study as they participated in separate training. Subjects were briefed with a detailed explanation of the proposed study and requirements. Subjects were informed of potential risks, and provided written consent. For subjects under the age of 18, parental or guardian consent was provided. Subjects were free to withdraw at any time, without any repercussions. The study was conducted with the protocol fully approved by the ethical review board at the institution prior to commencing. The study conformed to the requirements stipulated by the Declaration of Helsinki, and all health and safety procedures were complied with.

Procedures

The day prior to commencement of pre-season training, athletes completed a maximum acceleration protocol. The protocol required athletes to complete three maximal 40-metre linear sprints, with at least 3 minutes rest between repetitions. The protocol was completed on artificial grass, with football boots. This protocol has previously been utilized to determine maximum sprint speed (25), with a similar protocol utilized to determine maximum accelerative capacity in previous research (28). The maximum rate of acceleration was calculated for each sprint utilizing 10-Hz portable GPS devices (OptimEye S5B, Version 7.18; Catapult Innovations, Melbourne, Australia), with the highest acceleration values recorded for each athlete.

During the study, athletes followed the pre-season training plan constructed by the head technical coach and strength & conditioning coach. Training sessions (mean duration 81 ± 10 minutes) were a mixture of technical practices, tactical practices, small-sided games, replication of competition, and physical conditioning work. GPS units were switched on 15-minutes prior to each training session, in accordance with manufacturer's instructions, and switched off immediately following the session. Each GPS unit was worn in a designated tight-fitting vest located between the scapulae to reduce unwanted movement. Athletes wore the same unit for each training session to avoid inter-unit error.

Data Analysis

10-Hz GPS devices were utilized to record data for individual athlete's training sessions. Akenhead et al (2) state 10-Hz GPS units can accurately assess acceleration in team-sports, having been validated against 2000-Hz laser devices. The coefficient of variation for quantifying instantaneous speed during acceleration tasks ranged from 3.6-5.9%, confirming an acceptable level of validity (2,10). The mean number of satellites during data collection was 15 ± 1, and mean horizontal dilution of position was 0.8 ± 0.1. Malone et al (23) suggest >6 satellites for adequate data quality, however following conversations with the manufacturer, data was excluded if number of satellites decreased <12. If horizontal dilution of position was >1, data was excluded (23). Following training sessions, individual GPS units were downloaded to a PC and analyzed utilizing Catapult Sprint software (Catapult Sprint 5.1.5, Catapult Innovations, Melbourne, Australia). Using time and location data, speed and acceleration were calculated. Speed was calculated using measurements of the Doppler shift of signals received, distance was measured using positional differentiation (23). Acceleration was calculated as the increasing rate of change in instantaneous speed over time. Only the increasing rate of change in speed was measured, as a decreasing rate of change in speed is classified as a deceleration (15). Distances travelled performing low-, moderate-, and high-intensity acceleration tasks were recorded. The minimum effort duration for acceleration tasks was 0.4 seconds, similar to minimum effort durations cited in previous research (9,15,19). Acceleration data was not smoothed in any way. The analysis process was repeated twice, first applying global acceleration thresholds, and again applying individual acceleration thresholds.

Classification of Acceleration Thresholds

Acceleration thresholds utilized for the global analysis method were frequently cited thresholds within soccer literature. Global acceleration thresholds for low-, moderate-, and high-intensity acceleration was classified as 1-2 $m \cdot s^{-2}$, 2-3 $m \cdot s^{-2}$, and >3 $m \cdot s^{-2}$ respectively (3,15). The acceleration thresholds utilized by the individual analysis method were athlete specific, and determined by maximum acceleration values recorded during the testing protocol. The individual analysis method had previously been utilized by Sonderegger et al (28) to quantify intensity of acceleration activities. Sonderegger et al (28) banded low-, moderate-, and high-intensity acceleration as 25-50%, 50-75%, and >75% of maximal acceleration respectively.

Athlete Groups

Athletes were sub-divided into three groups utilizing maximum acceleration testing scores. The purpose was to compare discrepancies between analysis methods for athletes of varying accelerative capacities. Groups were characterized as low accelerative capacity (LO) (<1 *SD* from mean), medium accelerative capacity (ME) (±1 *SD* from mean), and high accelerative capacity (HI) (>1 *SD* from mean). Mean testing data for athlete groups, and mean acceleration thresholds utilized for global and individual analysis methods are presented in Table 1.

TABLE 1

Statistical Analysis

Descriptive analyses were conducted on the data set, with normality values assessed using Kolmogorov-Smirnov and Shapiro-Wilk tests. Significance values of $p > 0.05$ indicated data was normally distributed. Skewness and kurtosis values were assessed, with standard error between -2 and +2 indicating the data was normally distributed. To investigate differences low-, moderate-, and high-intensity acceleration distances produced by global and individual thresholds for LO, ME, and HI athlete groups, two-way mixed design ANOVAs were used where Analysis Method (Global, Individual) was the within-subjects variable, and Athlete Group (LO, ME, HI) was the between subjects variable. Eta-squared values were calculated to estimate the effect size for the ANOVA. An eta-squared effect size of η^2=0.02 was considered a small effect size, an effect size of η^2=0.13 was considered a medium effect size, whilst η^2=0.26 was considered a large effect size. Bonferroni tests were used post-hoc to assess where differences occurred, with Cohen's *d* tests used to calculate effect sizes. An effect size of *d*=0.2 was considered a small effect size, an effect size of *d*=0.5 was considered a medium effect size, whilst *d*=0.8 was considered a large effect size. All statistical analyses were performed using the software IBM SPSS statistics (version 22; SPSS, Inc., Chicago, IL, USA). The level of statistical significance was set at p <0.05.

RESULTS

For low-intensity acceleration distance, significant differences and large effects were identified for analysis method ($F_{(1,812)}$ = 2356.036; $p < 0.01$, η^2 = .809), with a weak interaction between analysis method and athlete group ($F_{(2,812)}$ = 27.766; $p < 0.01$, η^2 = .091). No significant differences were identified between athlete group ($F_{(2,812)}$ = 0.921; $p = 0.40$, η^2 = .003). Moderate-intensity acceleration distance also highlighted significant differences between analysis method ($F_{(1,812)} = 2424.522$; $p < 0.01$, $\eta^2 = .814$), and interaction ($F_{(2,812)} = 48.897$; $p < 0.01$, $\eta^2 = .150$), demonstrating large and moderate effect sizes respectively. No significant differences were identified for athlete group ($F_{(2,812)} = 0.257$; $p = 0.774$, $\eta^2 = .001$). High-intensity followed a similar trend to moderate-intensity and low-intensity acceleration distance, with significant differences identified for analysis method ($F_{(1,812)} = 3072.155$; $p < 0.01$, $\eta^2 = .847$), and interaction ($F_{(2,812)} = 23.312$; $p < 0.01$, $\eta^2 = .077$), but no significant differences identified for athlete group ($F_{(2,812)} = 3.206$; $p = 0.41$, $\eta^2 = .011$). A large effect size was demonstrated for analysis method, whilst a small effect was demonstrated for the interaction. When examining the direction of differences between analysis methods for low-, moderate-, and high-intensity acceleration distances, the global analysis method produced significantly higher distances than individual for all intensities (*ps* < 0.05).

Figure 1 presents mean distance travelled performing low-intensity, moderate-intensity, and high-intensity acceleration by LO athletes utilizing global and individual thresholds. Analysis demonstrated no significant differences in acceleration distances produced between analysis methods for any acceleration intensity.

FIGURE 1

Figure 2 presents mean distance travelled performing low-intensity, moderate-intensity, and high-intensity acceleration by ME athletes utilizing global and individual thresholds. Post-hoc analysis demonstrated no significant difference in low-intensity acceleration distances produced utilizing global and individual analysis methods, however significant differences were identified in moderate-intensity ($t_{(365)}$ = 34.060, $p < 0.01$, $d = 1.06$) and high-intensity acceleration distances ($t_{(365)}$ = 39.140, $p < 0.01$, $d = 2.24$) between analysis methods. For both moderate- and high-intensity, significant higher acceleration distances were produced utilizing the global analysis method. Mean moderate-intensity acceleration distances utilizing global thresholds were 43 m (95% CI ± 2.5 m) higher than individual thresholds, whilst mean high-intensity acceleration distances were 62 m (95% CI ± 3.1 m) higher. These distances equated to 74% (95% CI ± 4%) higher moderate-intensity, and 248% (95% CI ± 12%) higher high-intensity acceleration distances when utilizing the global analysis method.

FIGURE 2

Figure 3 presents mean distance travelled performing low-intensity, moderate-intensity, and high-intensity acceleration by HI athletes utilizing global and individual thresholds. Post-hoc analysis demonstrated significant differences between analysis methods for low-intensity ($t_{(210)}$ = 26.397, $p < 0.01$, $d = 0.70$), moderate-intensity ($t_{(210)}$ = 25.512, $p < 0.01$, $d = 1.38$), and high-intensity acceleration distances ($t_{(210)}$ = 28.173, $p < 0.01$, $d = 2.59$). For all acceleration intensities, the global analysis method produced significantly higher distances than the individual. When utilizing the global analysis method, mean distances were 92 m (95% CI ± 6.9 m), 61 m (95% CI ± 4.7 m), and 75 m (95% CI ± 5.2 m) higher for low-, moderate-, and high-intensity acceleration respectively. Distances equated to 45% (95% CI ± 3%), 122% (95% CI ± 9%), and 441% (95% CI ± 30%) higher low-, moderate-, and high-intensity acceleration distances respectively when utilizing the global analysis method.

FIGURE 3

DISCUSSION

The current study examined discrepancies in low-, moderate-, and high-intensity acceleration distances produced utilizing global and individual methods of analysis. Athletes were categorized dependent upon maximum accelerative capabilities, providing detailed insight into the effects of individualizing thresholds for athletes of varying physical capacities. Past research investigated discrepancies between global and individual analysis methods for quantifying high-speed activities, with the current study the first to examine discrepancies for acceleration.

Acceleration distances produced utilizing global and individual analysis methods varied significantly between athlete groups. The LO athlete group demonstrated no significant differences in low-, moderate-, or high-intensity acceleration distances produced utilizing global or individual analysis methods. In ME athletes, there were no significant differences between low-intensity acceleration distances, but moderate- and high-intensity acceleration distances were significantly higher utilizing the global analysis method compared to individual. For HI athletes, significantly higher distances were produced utilizing the global analysis method, for low-, moderate-, and high-intensity acceleration. For all acceleration intensities, the global analysis method produced higher acceleration distances when compared to the individual analysis method. Individual acceleration thresholds were calculated utilizing individual athlete's maximum accelerative capacities. Individuals with higher maximum accelerative capacities experienced larger variance between individual acceleration thresholds and global acceleration thresholds. For example, average individual thresholds for HI athletes were ≥1.8 ± 0.1 m·s^{-2}, ≥3.6 ± 0.1 m·s^{-2}, and ≥5.4 ± 0.2 m·s^{-2} for low-, moderate-, and high-intensity acceleration respectively. Global acceleration thresholds were ≥1 m·s^{-2}, ≥2 m·s^{-2}, and ≥3 m·s^{-2} respectively for all athlete groups. Average individual thresholds for LO athletes were ≥1.4 ± 0.0 m·s^{-2}, ≥2.8 ± 0.1 m·s^{-2}, and ≥4.3 ± 0.1 m·s^{-2} for low-, moderate-, and high-intensity acceleration respectively. With less variance between global and individual acceleration thresholds in LO athletes, fewer significant differences were demonstrated between acceleration distances when compared to HI athletes.

The current study was the first to examine discrepancies between global and individual thresholds for acceleration. Previous research conducted by Lovell and Abt (22), Clarke et al (8), Gabbett (13), and Reardon et al (27), investigated discrepancies between global and individual speed thresholds. Lovell and Abt (22) recruited elite soccer players, and determined individual thresholds utilizing the second ventilatory threshold. Similar to current results, Lovell and Abt (22) identified significant discrepancies between analysis methods. Specifically, significantly lower high-intensity distances were produced when utilizing global speed thresholds compared to individual. Clarke et al (8) utilized the second ventilatory threshold to individualize speed thresholds, for Women's Rugby Sevens players. Results concluded global thresholds underestimated high-intensity running distances by up to 30% when compared to individual thresholds. Similar to current results, both research groups identified significant discrepancies between global and individual analysis methods. Direction of discrepancies varied in comparison, with the global analysis method overestimating acceleration distances produced by ME and HI athletes within the current study. In contrast to current and previous research, Lovell and Abt (22) and

Clarke et al (8) did not allow for discrepancies to be examined between athlete groups.

Gabbett (13) calculated individual speed thresholds utilizing maximum sprint speed in youth Rugby League athletes. Results demonstrated that individual speed thresholds increased high-speed running attributed to relatively slower athletes, and decreased high-speed running attributed to relatively faster athletes. Reardon et al (27) identified similar trends utilizing maximum sprint speed to individualize thresholds in professional Rugby Union. Results demonstrated a high-speed running underestimation of 22% for forwards, and an overestimation of 18% for backs when utilizing global speed thresholds. Results from Gabbett (13) and Reardon et al (27) compliment current results, with significant differences identified between analysis methods, and varying differences identified between athlete groups. Current results identified significant differences in low-, moderate-, and high-intensity acceleration distances produced between analysis methods for HI athletes, but no significant differences were identified for any acceleration intensity in LO athletes. In addition, current results suggest discrepancies between analysis methods were more pronounced at higher acceleration intensities. For low-intensity accelerations, differences of 45% were identified between analysis methods in HI athletes. Whilst for moderate-intensity accelerations, differences of 74% and 122% were identified, and for high-intensity accelerations, differences of 248% and 441% were identified for ME and HI athletes respectively. Findings highlight the variance in physical capacity between athletes, providing further rationale for an individual approach to monitoring acceleration.

Current findings have significant implications for quantifying the relative demands of acceleration tasks. Previously, global acceleration thresholds have been utilized regardless of individual physical capacity. Although global acceleration thresholds allow for comparisons in external workloads between athletes, they do not represent the intensity an athlete is operating (17). This is vital when monitoring training loads of athletes with different ages and physical capacities (13). Accounting for athletes maximum capacity within acceleration thresholds provide practitioners a greater understanding of the relative intensity of activity. The mean maximum acceleration within the current study was 6.4 ± 0.6 $m{\cdot}s^{-2}$ with the mean 50-percentile equating to 3.2 $m{\cdot}s^{-2}$. Application of the individual analysis method resulted in the activity being classified as the beginning of moderate-intensity acceleration. However, when applying frequently cited global acceleration thresholds, the same activity would be classified as a high-intensity acceleration. For the majority of athletes within the current study, global acceleration thresholds provide an inaccurate representation of intensity when compared to individual acceleration thresholds.

Significant research currently focuses upon quantifying injury risk in team sports (12). Whilst utilizing such models, it is vital the training load input is a valid representation. An invalid representation of training load would render information obtained from the model inaccurate, increasing risk of over- or undertraining athletes. Current findings identified a mean overestimation of two-fold when utilizing global acceleration thresholds, potentially affecting the validity of injury risk models. Previous research suggests individual thresholds provide more accurate representations of athlete training load, considering the relative intensity of activity is acknowledged (17). Identifying an individual's relative demands for training or competition could potentially improve the prescription of training and recovery interventions. Researchers have highlighted the importance of acceleration within team sport performance, and the neuromuscular demand associated with acceleration tasks (14,21). Considering the aforementioned, and the discrepancies demonstrated between analysis methods, it is suggested an individual approach to monitoring should be applied to accurately quantify the relative demand of acceleration tasks.

It is important to note the limitations of the current study. Despite recent improvements in GPS hardware and software, associated error still exists within the devices. Delaney et al (10) state 10-Hz GPS devices demonstrate coefficient of variations of 1.2-6.5% when assessing acceleration, requiring practitioners to adopt caution when applying results. An issue associated with determining individual thresholds using physical capacities, is that physical performance has been demonstrated to fluctuate throughout a season (24). Performance can increase as a result of training adaptation, or decrease due to deconditioning or injury, requiring frequent re-testing of physical capacities. Currently, there are no recommendations for the frequency of re-testing when utilizing individual thresholds, requiring further investigation. Finally, the current study was conducted over a four-week period, with a limited sample size of thirty-one U23 professional soccer players at a Premier League academy. Consequently, findings are a representative of the athletes recruited, for the time period of the study, and not directly applicable to all populations.

PRACTICAL APPLICATIONS

Current findings have significant implications for applied practitioners aiming to quantify the relative demands of acceleration tasks for squads of athletes. Significant discrepancies were demonstrated between acceleration distances calculated utilizing global and individual acceleration thresholds. Additionally, the discrepancies in distances produced by global and individual acceleration thresholds varied dependent upon an athletes' maximum accelerative capacities. Considering the high neuromuscular demand of accelerating, and the frequent use of modeling to predict injury risk, it is vital training load is accurately represented. Advantages of global acceleration thresholds are the ability to compare physical performance between athletes, and determine an individual's ability to tolerate a given workload. Conversely, individual acceleration thresholds allow the relative intensity of acceleration tasks to be quantified, acknowledging athletes of different ages and physical capacities. If the aim of monitoring training load is to accurately quantify the relative intensity an athlete is operating, individual acceleration thresholds are recommended. Identification of the relative demands placed upon an individual by training and competition can improve consequent prescription training and recovery. The current protocol to determine maximum accelerative capacity can be replicated with large squads, and minimal equipment. Although the current study recruited soccer players, similarities in movement patterns mean findings are applicable to the majority of team sports.

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FIGURE LEGENDS

Figure 1. Distribution and mean distance travelled performing low-, moderate-, and high-intensity acceleration when utilizing global or individual thresholds, in LO athletes. N.B. asterisk represents significant difference, *d* represents effect size.

Figure 2. Distribution and mean distance travelled performing low-, moderate-, and high-intensity acceleration when utilizing global or individual thresholds, in ME athletes. N.B. asterisk represents significant difference, *d* represents effect size.

Figure 3. Distribution and mean distance travelled performing low-, moderate-, and high-intensity acceleration when utilizing arbitrary or individual thresholds, in HI athletes. N.B. asterisk represents significant difference, *d* represents effect size.