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## The effect of team competition level on youth female soccer players' training activity and response

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## ACCEPTANCE

This dissertation, THE EFFECT OF TEAM COMPETITION LEVEL ON YOUTH FEMALE SOCCER PLAYERS' TRAINING ACTIVITY AND RESPONSE, by Joshua Villalobos, was prepared under the direction of the candidate's Dissertation Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree, Doctor of Philosophy, in the College of Education & Human Development, Georgia State University.

The Dissertation Advisory Committee and the student's Department Chairperson, as representatives of the faculty, certify that this dissertation has met all standards of excellence and scholarship as determined by the faculty.

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**THE EFFECT OF TEAM COMPETITION LEVEL ON YOUTH FEMALE SOCCER  
PLAYERS' TRAINING ACTIVITY AND RESPONSE**

By

**JOSHUA VILLALOBOS**

Under the direction of J. Andrew Doyle, Ph.D.

By

JOSHUA VILLALOBOS

A Dissertation

Presented in Partial Fulfillment of Requirements for the

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Doctor of Philosophy

in

Kinesiology (Exercise Physiology)

in

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in

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## DEDICATION

I would like to dedicate this project to my family. Completion of this research project was made possible by your unwavering faith and love. Mom and Dad, Carmen and Rafael Villalobos, you are my heroes. Thank you, no number of written words can express the extent of my gratitude for all the sacrifices you have made to support my family, career and passion for the game of soccer. My sister, Mari Villalobos, you model the strength and perseverance need to complete this project, thank you. To My brother, Saul Villalobos, the “true scientist” in our family. Thank you for instilling in me a love for academia and science. My wife, Geanina Villalobos, I am blessed to share a life with you. Your belief in me is the inspiration behind this project.

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THE EFFECT OF TEAM COMPETITION LEVEL ON YOUTH FEMALE SOCCER  
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## Chapter 1

### Introduction

Soccer players' evolution from youth to professional standard of competition is multifactorial and complex in nature. Success in soccer can be attributed to circumstantial chance that effectively align innately talented players with optimal training environments over an extended period necessary to fulfill an individual's athletic potential (Baker & Wattie, 2018; Howe et al., 1998). Social structural constructs by which footballers experience the sport such as specific club organization, coach, team selection and parental guidance can vary yet have a significant net effect on talent development (Buchheit M, 2023). Consequently, early chronic exposure to higher quality training and level of competition may be deemed advantageous for footballers (Williams & Reilly, 2000).

While extensive training is fundamental in obtaining professional-level soccer performance our current understanding of training activity, response, and adaptation remains limited. Soccer clubs invest intensely in talent development by strategically partnering players with their most competitive-level teams, league competition, and experienced coaches. A soccer club's team standard of play and competition in part dictates players' training environment. Players' exposure to "quality" team-based soccer training and subsequent adaptation may together play a significant role in talent development. Thus, soccer players' response to various coaches' tactical formations, training aims, methodological structure, and in-practice activities warrant further exploration.

The purpose of the literature review section of this dissertation prospectus is to provide an examination of talent identification and development in soccer. An emphasis will be placed on describing current soccer training practice, namely the use of small-sided training activities to

mimic the physical, technical, and tactical demands of competition. Finally, female soccer training will be examined, and a theoretical model of talent development based on soccer players' team standard of play will be presented that warrants original investigation.

### Talent Paradigm in Soccer

It is often assumed that exceptional sport performance depends on presence or absence of “natural talent”. The talent account in sport performance has been extensively debated (Baker & Wattie, 2018; Gulbin et al., 2010). For the purposes of this review, we will assign four properties to the talent account that theoretically persist on a continuum and are maintained in youth through professional level of sport evaluation: 1. Talent is at minimum partly innate. 2. Full effects of talent may not be completely evident at an early age, but there will be some advanced indications, allowing trained coaches to identify the presence of talent before remarkable mature levels of performance are demonstrated. 3. Early indications of talent provide a basis for predicting players who are more likely to succeed 4. Only a minority are talented enough, enabling explanation for differential levels of success in sport (Howe et al., 1998).

Over the lifespan of footballer's playing career talent demonstrated through performance undergoes detection, identification, development, and selection processes that will directly and indirectly determine their current competitive state, upward and/or potential downward trajectory in the sport. While interconnected, each of these talent processes are distinguishable. Talent detection refers to the discovery of potential prospects who are currently not involved in a soccer club structure or an active member of a competitive-level team. Talent identification refers to the process of recognizing current footballers best suited for high-level competition. This practice

requires soccer coaches, scouts, and sport scientists to predict future performance over various periods of time by assessing physical, physiological, psychological, and sociological attributes alongside technical tactical skill. Talent development entails an appropriate training environment necessary to cultivate footballers' athletic potential. Talent selection involves choosing the most appropriate individual or group of individuals with the prerequisite levels of performance for inclusion within a given football team. A talent paradigm and theoretical framework in soccer has been recently proposed (Williams et al., 2020) (See Figure 1.0). This model highlights two key components of football's evolutionary cycle: 1. Soccer players' talent and performance is temporal yet continuously under evaluation 2. Soccer players' demotion, sustainment, or advancement is at least in part dependent upon respective level of competition and training environment.

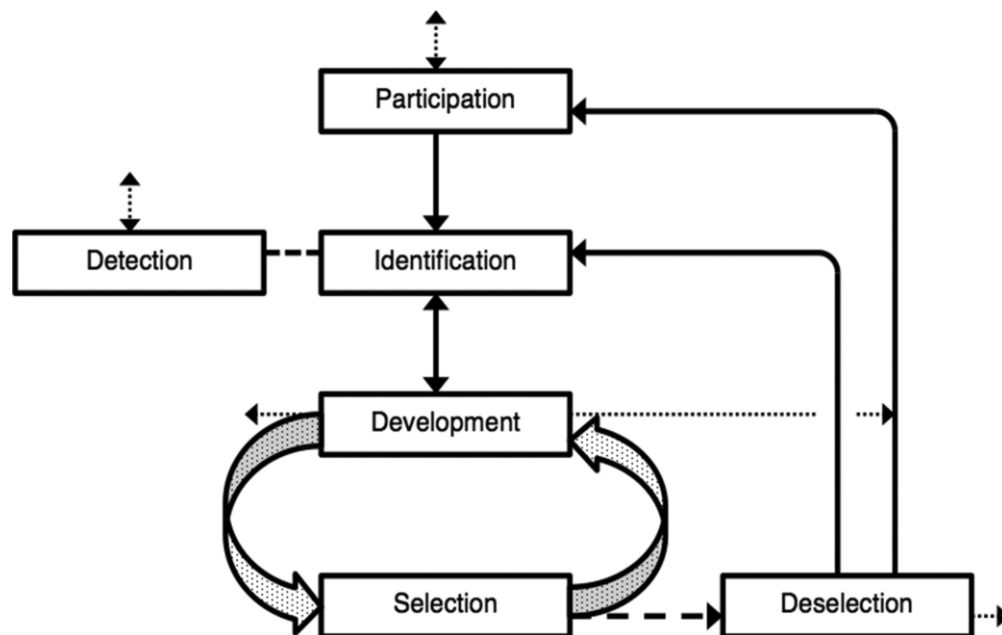


Figure 1. Key parts of the identification, selection, and development process in soccer. The arrows indicate possible player pathways; with heavy dashed lines indicating interlinked concepts and light dashed lines indicating exit or entry routes (Williams et al., 2020).

### Talent Participation & Detection

Popularity and investment into soccer has grown exponentially with thousands of young male and female players actively participating in systemic training programs in professional soccer clubs across the world (Ford et al., 2020). Despite interest in soccer, the potential talent pool is limited by socioeconomic factors, psycho-social response of low perceived competence due to early rejection during trial periods (Meylan et al., 2010). Detection of talent outside of professional football club structure is outside the scope of this review of literature. Instead, the focus will be narrowed to footballers currently participating within a soccer club's youth to a professional team-based structure. Within this context, detection of talent is further reduced in part to clubs' internal player pool and external competitive counterparts. During training and competition, the clubs' scouting, and coaching staff transition from detection to identification and onto recruitment of talent footballers suited for advancement. These interconnected processes are commonly driven by experienced coaches that consider potential predictors of professional-level football performance and receive empirical support from sport science staff. Various potential predictors and mediators of high performance in football have been identified (See Figure 1.1). More research investigation to elucidate current trends in talent recruitment is needed.

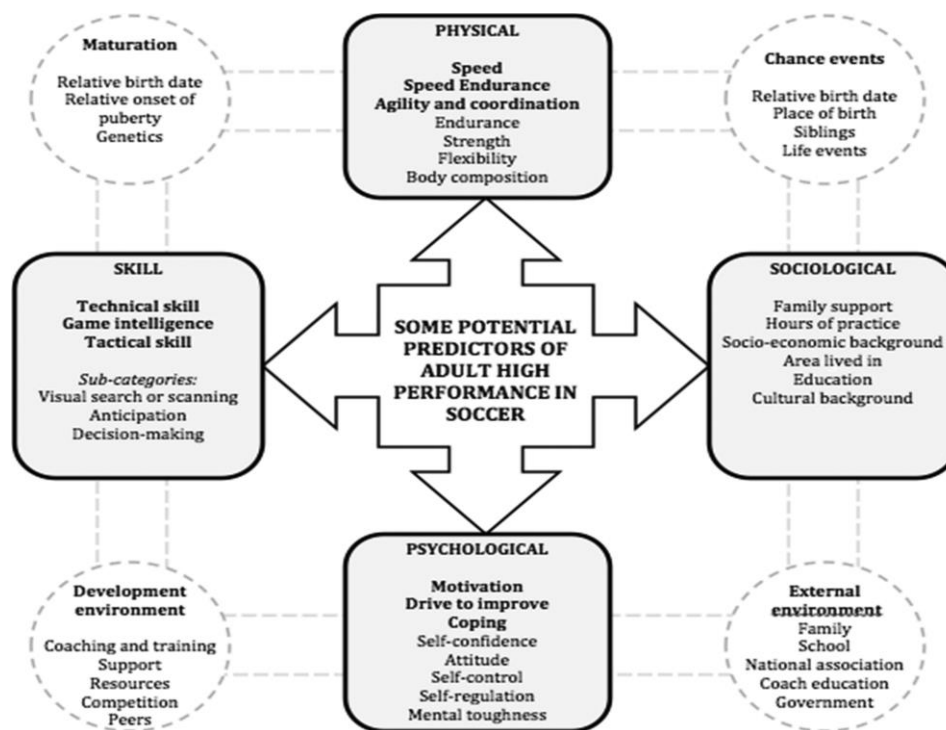


Figure 1.1 Potential predictors of adult high performance in youth soccer players from each sports science discipline, with mediating factors. **Bold** predictors denote those with at least some empirical evidence of predictive value from adolescence to adult performance level in soccer (Williams et al., 2020).

## Talent Identification

Talent identification theory and practice in soccer remains obscure blending professional scouts or coaches' subjective assessment of key performance indicators with more recent sport science evaluation. Criteria used to predict footballers' future performance and expertise vary in terminology and methodology ranging from TABS (Technique, Attitude, Balance, Speed), SUPS (Speed, Understanding, Personality, Skill) and TIPS (Talent, Intelligence, Personality, Speed)

(Reilly et al., 2000; Williams & Reilly, 2000). The intuition of professional coaches and scouts to interpret such criteria and evaluate specific performance aptitudes for future success should not be discredited (Thomas, 1999). Recent studies have highlighted the benefit in coupling coaches' subjective assessment with objective measures, using multidisciplinary approach, in more accurately predicting future professional-level soccer players (Dugdale et al., 2020; Sieghartsleitner et al., 2019).

Physical and physiological predictors of performance have been extensively investigated in comparison to psycho-social categories. Together studies have shown soccer players' whose physical and physiological performance resembles that of older and adult professional-level players are more likely to ascend through a football club's structure and be identified for higher competitive-level teams (See Table 1.) The time-spread of biological maturation has been shown to significantly affect young soccer players' physical stature and performance (Figueiredo et al., 2009) (See Table 2.). Resulting in the relative age effect phenomenon, by which a greater representation of more mature footballers born in the first quarter of the year across youth club and national-level teams persists (Götze & Hoppe, 2021; W. F. Helsen et al., 2005)(See Figure 1.2).

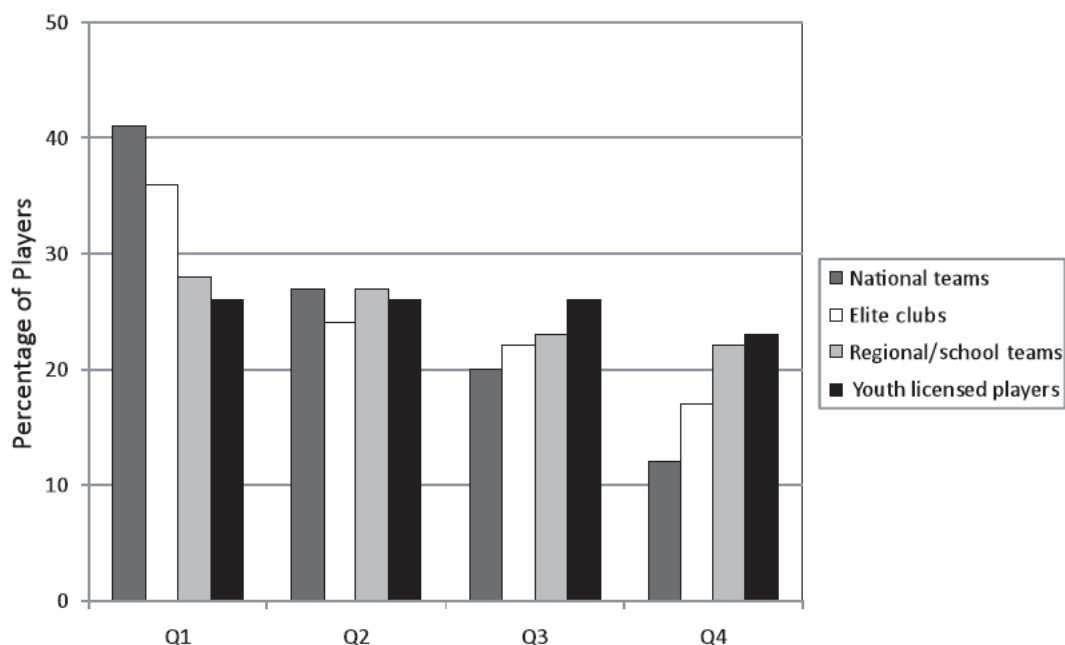


Figure 1.2 Summary of the Relative Age Effect in Youth Soccer Across Different levels of Play Presented in the Literature Since 2000 National teams players (U15-U21;  $n = 1,450$ ), elite club level players ( $n = 5,506$ ), regional and school level players ( $n = 12,316$ ) and French youth licensed players ( $n = 1,116,464$ ) birth date distribution are presented by quartile (Meylan et al., 2010)

Physical aptitude should be viewed as one potential predictor of soccer performance, as talented players' physical characteristics can remain underdeveloped yet compensated for with demonstration of advanced perceptual, tactical, and technical soccer skill (Huijgen et al., 2013; Unnithan et al., 2012; Ward & Williams, 2003). Psychological profiles, soccer-specific perceptual, and tactical awareness relative importance to achievement of superior performance is commonly noted by experienced coaches but remain largely unquantified. Most research to date has implemented cross-sectional measurement of anthropometrics and physiological

performance while informative, in scope are inherently limited. Multi-disciplinary longitudinal studies are needed to better understand the following: 1. Soccer players' sustainment of body stature, physiological, technical- skill performance, and game intelligence superiority across maturation. 2. Differentiation of talent in soccer players already selected to and exposed to professional club-level team training (Abarghoueinejad et al., 2021; Reilly et al., 2000).

### Talent Development

Talented prospects gravitate toward soccer clubs for training, coaching expertise, competition, and career advancement. Thus, professional soccer clubs play an important and predominant role in talent development. Socio-cultural organizational structure and developmental training processes implemented in Europe differ substantially in main objective and resource allocation compared to those most commonly practiced by clubs in the United States (Morris et al., 2015; Relvas et al., 2010) (See Figure 1.3a-b). Despite Major League Soccer's recent adoption of a club academy structure like their European counterparts, the majority of the country's clubs remain non-profit, pay to play organizations with limited resources available to help optimize young footballers' development. For the pool of potential male and female prospects outside Major League Soccer or other professional academy systems significant parental and financial support, accessibility to professional coaches and highly competitive standard teams are likely paramount for further development (Allison & Barranco, 2021).

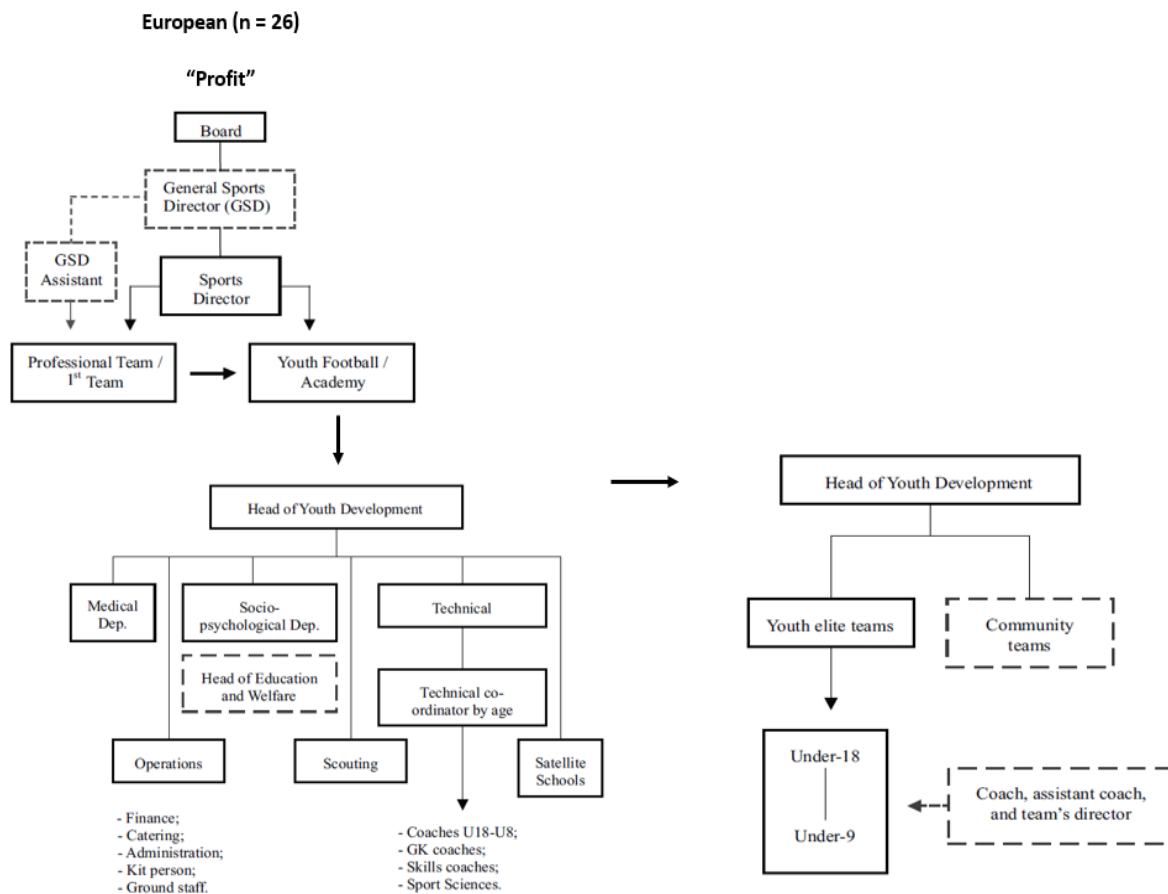


Figure 1.3a Representation of European (n = 26) football club youth developmental structure (Relvas et al., 2010) original version remodified.

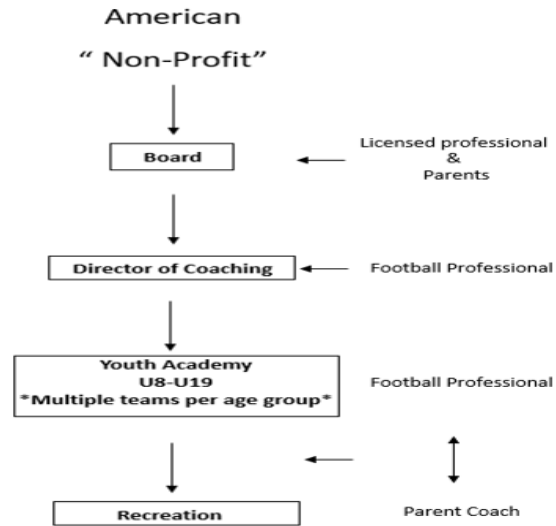


Figure 1.3b American soccer club youth developmental structure.

The value proposition of obtaining membership in a professional football club system relating to talent development stems from the aggregation of gifted players, experienced coaches, quality training and exposure to advanced level of competition. Football team coaches play an integral part in talent development for the following reasons: 1. Background football-skill expertise and tactical knowledge, 2. Comprehensive understanding of standard of league play or competition, 3. Construction, organization, and implementation of a quality training environment (including training aims, small-sided games), 4. Team selection during competition, and 5. Recommendation of individual players for advancement. Quality coaches aim to deliver team-based training sessions that mimic the technical, tactical, psycho-social, and physical demands associated with the level of football match competition (Hill-Haas et al., 2011). Coaches' tactical system of play, team-based training methodology and periodization have been shown to vary (Lacome M Fau - Simpson et al., 2018; Mendez-Villanueva, 2012). Soccer players' response to professional club coaches' team-based training warrants further exploration. Specifically, more

research is needed to evaluate the roles coaches' training regimens, footballers' standard of play and response to training have on talent development.

### Talent Selection

Though contentious, the selection process in football determines accessibility to advancement opportunities for talented prospects. Young footballers' early participation in specialized competitive teams coupled with engagement in an extensive volume of training seems to be a fruitful recipe for later success (Ford & Williams, 2017; Sieghartsleitner et al., 2018). Most football clubs and associations' talent selection rely solely on subjective data from coach assessments and intuition (Bergkamp et al., 2022; Christensen, 2009). A recent study highlighted Swiss national team youth coaches' "expert eye" were both reliable and valid in their appraisal of players' overall potential (Jokuschies et al., 2017). Motor and soccer-specific skill tests for talent selection has also been demonstrated, yet neither approach in isolation controls for developmental influences such as maturation and relative age effect (Huijgen et al., 2013; Slimani et al., 2019). Combining coach assessments with objective multidimensional performance data together were shown to be significantly better at predicting U19 footballers' professional or non-professional status (Sieghartsleitner et al., 2019). Use of video analysis and GPS with heart-rate monitoring system technology to track players' motor activity and technical execution during practice and competition has become a prevalent practice in soccer (Buchheit, 2014; Buchheit M Fau - Simpson & Simpson, 2017). Performance data collected from these tools are more contextually specific and applicable to soccer compared to other physiological assessments such as VO<sub>2</sub> max. Coaches' assessment supplemented with evaluation of soccer players' training performance should be considered in future talent selection research.

## Soccer Training

Professional soccer clubs' training methods are multi-faceted incorporating coaching, strength & conditioning, sport medicine, sport psychology, and personal skill training expertise for the purpose of maximizing players' development and performance. Though each component advances talent development this review's primary focus is on coach-led team field-based training. Coaches most commonly used small-sided games (SSGs), also referred to as skill-based games or game based training to prepare players for match competition (Hill-Haas et al., 2011). The preference towards SSGs in soccer is that they appear to mimic the movement, physiological intensity, technical requirements of match competition while also requiring players to execute skilled actions and make tactical decisions under pressure (Gabbett & Mulvey, 2008). A coach's training session can vary in duration in accordance with a team's competition schedule but is consistently comprised of various SSGS. Since talent evaluation and selection occurs during training sessions and subsequent match competitions, further study is needed to improve understanding of soccer players' response and development to each.

## Adaptations to football training

Soccer training preparation has been shown to elicit specific physical locomotor activity patterns and physiological responses to improve players' performance capacity (see Table 3.). Implementation of SSGs during pre and in season stages of competition provide an effective enough stimulus to enhance player's aerobic, anaerobic, change of direction, rate of recovery, and metabolic capacity (Dellal, Varliette C Fau - Owen, et al., 2012; Hill-Haas et al., 2009; Hill-Haas et al., 2011). High-intensity interval training HIIT in conjunction with SSGs have been shown to increase aerobic, repeated sprint capacity and distance covered at high intensity compared to SSGs alone (Fransson et al., 2018; Manuel Clemente et al., 2021). Soccer players'

physical activity and internal response to SSGs can vary significantly according to pitch size, game format/type, number of involved players, goalkeepers, and standard of play (Dellal, Owen A Fau - Wong, et al., 2012; Kelly & Drust, 2008; Lacomme M Fau - Simpson et al., 2018). Male and female anthropometry, motor ability, and decision-making are known to contrast making key components during SSGs like physical capacities, time-motion performance, technical-tactical behavior significantly different between male and female soccer players (De Dios-Álvarez et al., 2022). Investigations on physical responses have all shown that male footballers cover greater total distances at running, high-tempo, and sprint- intensities during SSGs than their female counterparts ("THE INTERCHANGEABILITY OF GLOBAL POSITIONING SYSTEM AND SEMIAUTOMATED VIDEO-BASED PERFORMANCE DATA DURING ELITE SOCCER MATCH PLAY," 2011; Jastrzębski & Radzimiński, 2017; Jastrzębski et al., 2016; Randers et al., 2010; Stevens et al., 2015).

Regardless of gender, the effect of number of players and pitch size during SSGs are important topics of significant practical significance from a coaches' perspective. Small quantity format SSGs ( $\leq 4$  v  $4$ ) have been shown to cause higher heart rate, blood lactate, rate of perceived exertion responses, and technical skill actions (such as tackling, dribbling and shots on goal) compared to medium to large quantity sized ( $5$  v  $5 - 11$  v  $11$ ) formats (Mara Jk Fau - Thompson et al., 2016; Rampinini et al., 2007). In contrast, research consensus is that large SSGs on bigger size pitches increase the total distance covered by players and number of high-intensity and sprint actions (De Dios-Álvarez et al., 2022; Dellal, Owen A Fau - Wong, et al., 2012; Lacomme M Fau - Simpson et al., 2018; Owen et al., 2004). Per coaches' discretion, a mixture of small, medium, and large formatted SSGs are commonly performed during team-based soccer training sessions. To better optimize soccer players' physical preparation for match

competition and talent development coaches might strategically consider timing and delivery of SSGs and HIIT in variation during a team's weekly training periodization (Mendez-Villanueva, 2012). More research is required to investigate how maturing players of various skill levels physiologically, physically, technically, and tactically respond to coaches' team-based training activity.

#### Standard of competition effect in female football

There is limited quantity of current research inquiries regarding the effect of standard of competition specifically on female soccer activity. Previous investigations have reported that female soccer players participating at the international level of competition tend to exhibit superior physical characteristics and perform greater locomotor activity during match play than their domestic professional counterparts (Andersson et al., 2010; Mohr et al., 2008). Brazilian senior international female team players cover significantly greater total distance, total distance at high and sprint intensities than U20 and U17 youth international female players during match competition (Ramos, 2017). Soccer players' maximal aerobic velocity and  $VO_2$ max performance are sensitive enough measures to distinguished between "starters" and "non-starters" on youth and senior international women teams. Collective consensus of the research suggests an emphasis be placed on physical capacity and match output development to the enable female players to meet the demands higher level of competition. (See Table 4.)

A recent study suggests an individual's physical characteristics might contribute to the outcome of a soccer match, but that in general the physical qualities and match performance between international and professional-elite level soccer players are not distinguishable (Scott et al., 2020). Thus, technical-tactical performance and other psychological elements might also play a prominent role in talent differentiation in women's football. Female soccer players of a higher

standard display better juggling, heading and target striking skill execution than lower-level equivalents (Pedersen et al., 2014). Australian first-team female players' better maintained passing accuracy and efficiency pre, during, and post football match simulation activity compared to their reserve-team colleagues (Lyons et al., 2021). In conjunction with a player's physical readiness, proper prioritization of technical-tactical skill augmentation to advance levels of competition in women's soccer is warranted.

Previous literature has aimed to highlight key differences in soccer players' physical capacity, match activity, and technical skill performance by standard of competition. While informative, the scope of these studies fails to acknowledge the potential effect differences in training according to the standard of competition may have on performance. Early chronic exposure and adaptation to higher-intensity more technical-tactically demanding training might account for previous reported performance differences in competitive-level soccer players. Obtaining a better understanding of training demands, subsequent physical adaptation, and acquirement of technical-tactical skill execution across various standards of play will help to enhance overall talent identification and development processes in women's soccer.

## Chapter 2

**ABSTRACT****THE EFFECT OF TEAM COMPETITION LEVEL ON YOUTH FEMALE SOCCER PLAYERS' TRAINING ACTIVITY AND RESPONSE**

The main purpose of this study was to determine whether the physical training demands of youth female soccer players differ based on team standard level of competition. A secondary objective was to substantiate whether differences in the physical team-based training activity between advanced and competitive-level female footballers persist across multiple sessions and remain consistent during a phase of a competitive season. This study utilized a repeated-measures design, with advanced and competitive-level female footballers aged 15-17 years participating in three trials of the same team-based football-specific training session, separated by 7-days, over a three-consecutive week period. The experimental training session was designed to replicate team-based training in football. Polar® Pro Sensors (GPS, accelerometry and heart rate) were worn across footballers' chests to measure distance covered, intensity of activity, and heart rate response during football training. External (total distance covered, number of acceleration & deceleration, and sprinting actions) and internal (%HRmax) load markers of training demand were compared by time, standard of competition, tactical playing position and training activity type. Detection of significant team standard of play differences in training activity and skill performance were found. The advanced female players covered a greater total distance at high intensity in training sessions 1 ( $964.58 \pm 318.86$  vs.  $485.90 \pm 242.67$  m) and 3 ( $690.58 \pm 252.68$  vs.  $446.90 \pm 187.34$  m), scored more total goals ( $1.11 \pm .40$ ), completed more dribbles ( $2.30 \pm$

.65), and tackles ( $1.02 \pm .41$ ) than competitive-level players over 3 weeks of team practice. These findings should be considered in female soccer talent identification, training and developmental processes.

## INTRODUCTION

The evolution of soccer players from youth to professional standard of competition not only involves physical maturation, but is a complex matter likely attributed to the coupling of talented prospects to an adequate training and competitive environment. During trial periods coaches are tasked to identify and select individual players to form teams best suited for future competition. Limited by a cross sectional evaluation period, coaches may base team selection on players' present performance profile including soccer-specific technical skill execution, physical attributes, physiological characteristics, tactical awareness, and psychological "make-up" (Meylan et al., 2010; Williams & Reilly, 2000). More physically mature players tend to perform better and be more influential during match competition compared to their similar chronological-aged counterparts. Most international and competitive domestic teams' rosters are comprised of players born earlier in the year and early maturers, highlighting the relative age effect's prominence in youth soccer (W. Helsen et al., 2005).

Team selection can dictate training environment, a potentially key determinant for soccer players' developmental trajectory and future performance thus warranting further exploration. Youth club teams competing at a higher versus lower standard of competition can receive substantial investment in coaching instruction, tournament exposure, training, match preparation, and financial resources. This construct suggests that early selection to a more competitive team might be both important and advantageous in providing players with access to not only a higher quality but also a greater volume and intensity of training. Soccer training and physical demand are known to vary and be highly contextual to a nation or club's culture, coaches' preference, training aims, players' age and quality, quantity of players, field dimensions, quality of opposition, league/tournament competition demands, and rules. (Buchheit & Mendez-Villanueva,

2014; Hill-Haas et al., 2009; Hill-Haas et al., 2011; Lacombe M Fau - Simpson et al., 2018). In response, national federations and clubs suggest coaching staff follow unique training methodologies and curriculums for internal continuity and maximization of soccer players' progression from youth to first-team participation. Despite the resourcefulness of a curriculum youth clubs in the United States contain multiple teams per age group led by coaches electing to implement distinct training regimens best suited to their respective teams' level of play and league competition. Present club-structure in which coaches' expertise and teams' level of competition determines training environment likely reduces developmental opportunity for some soccer players.

Non-selection to clubs' most competitive age-appropriate teams is disadvantageous for late-maturing yet potentially gifted soccer players. The social and psychological response to early rejection could lead to cessation of participation in soccer, decrease clubs' membership, and minimize future talent pool. Continued selection to lower standard of play soccer teams may also result in inequitable training and nurturing of talent. Young soccer players' physical activity and adaptation to standardized training regimens remain fundamentally unknown. To the best of our knowledge no study has been published that specifically examines training activity and associated physical demand of youth soccer players selected to different competitive-level teams. Therefore, the purpose of this study is twofold: 1) To determine what effect level of competition has on youth female football physical workload and skill performance during team practice, and 2) To discern whether differences in the physical workload and skill performance between advanced and competitive-level female soccer players persist across multiple practice sessions and remain consistent during the competitive season.

## STATEMENT OF THE QUESTION

The primary aim of this study was to determine whether there are meaningful differences in physical workload and skill performance between advanced and competitive-level players during soccer practice. A secondary aim was to examine whether meaningful differences in physical workload and skill performance between advanced and competitive-level players remains consistent across 3 practice sessions.

## HYPOTHESES

It is hypothesized that advanced-level players compared to their competitive-level counterparts will, on average, perform at a higher physical workload during practice, as evidenced by accrued muscle load (a.u.), total distance covered (m), and total distance covered (m) running velocities  $\geq 11.00$  km/hr. It is postulated that advanced-level players will, on average, exhibit superior skill performance during practice compared to competitive-level players, as evidenced by number of completed passes, receptions, dribbles, tackles, blocks, interceptions and goals scored. Finally, it is proposed that advanced vs. competitive-level players will maintain a greater physical workload, intensity, and superior skill performance across a series of team practices.

## DELIMITATIONS AND LIMITATIONS

### Delimitations

Female subjects aged between 15 and 17 years of age and determined to be current members of state, regional, or national-level league soccer teams were recruited to participate in this study. Individual athletes designated as recreational level were excluded from this study.

The results of this study are generalized to competitive female soccer players aged between 15 and 17 years who are currently participating in official league competition. The results of this study should not be generalized to subject populations outside of this age range, male, or who play soccer for unsanctioned or below state-level teams. Additionally, the results of this study cannot be generalized to physically or intellectually disabled athlete populations.

### Limitations

Limitations intrinsic to the design and methodological procedures employed in this study were considered and discerned as necessary.

Subject dropout was a concern due to the following: 1) 4-week experimental trial period and 2) risk of injury that could occur during official league competition. The 4-week experimental period during competitive season was necessary to replicate the physical nature of team-based preparatory football training held between weekly scheduled league matches. During initial scheduling of research trials, an attempt was made to consider the personal as well as team competition schedule to minimize the likelihood of subject dropout. The physical work required in this study was common practice associated with participation in competitive-level soccer, thus

posing no additional risk to subjects. As an additional precaution, athletes' injury status was requested before participation in each experimental trial. No injuries were reported.

## DEFINITIONS

Technical-skill activity (TSA): a specific type of team-based training activity that involves unopposed execution of fundamental soccer skills (i.e., passing, ball-control, dribbling, and striking).

Possession-based activity (PBA): a specific type of team-based training activity that does not involve traditional goal-oriented direction, by which the main objective is retainment of ball-possession from opposition.

Small-sided game (SSG): a specific type of team-based training activity that minimizes the number of participating players on each team but involves traditional goal-oriented direction, goalkeepers with the primary aim being to outscore the opposition.

Inter-Squad Scrimmage (ISS): a specific type of team-based training activity that mimics official match-play.

Maximum Heart Rate (HR<sub>max</sub>): the maximum heart beats per minute during team-based soccer training activity.

Minimum Heart Rate (HR<sub>min</sub>): the minimum heart beats per minute during team-based soccer training activity.

Average Heart Rate (HR<sub>avg</sub>): the average heart beats per minute during team-based soccer training activity.

Counter Movement Jump (CMJ) Height: the change in system center of mass position between the instant of take-off and peak positive vertical displacement of the system center of mass, calculated using the vertical velocity of the system center of mass at the instant of take-off and the equations of uniformly accelerated motion.

Reactive Strength Index (RSI): the time taken to complete the flight phase divided by the total time taken from initiation of movement to the instant of take-off (i.e., Time to Take-off) .

Peak Propulsive Power: the peak instantaneous mechanical power applied to the system center of mass during the propulsion phase.

Peak Relative Propulsive Power: the peak instantaneous mechanical power applied to the system center of mass during the propulsion phase relative to system mass.

Average Propulsive Power: the average mechanical power applied to the system center of mass during the propulsion phase.

Average Relative Propulsive Power: the average mechanical power applied to the system center of mass during the propulsion phase relative to system mass.

Peak Braking Power: the peak negative instantaneous mechanical power applied to the system center of mass during the braking phase.

Peak Relative Braking Power: the peak negative instantaneous mechanical power applied to the system center of mass during the braking phase relative to system mass.

Average Braking Power: the average mechanical power applied to the system center of mass during braking phase.

Average Relative Braking Power: the average mechanical power applied to the system center of mass during braking phase relative to system mass.

## EXPERIMENTAL PROCEDURES AND METHODS

### General Research Design

In this study 47 female soccer players were separated by competitive level to form two team-based training pools, one advanced-level (Advanced) and one competitive-level (Competitive). Athletes underwent baseline laboratory and field-based performance evaluation prior to participation in the same 90-minute team-based training session over three experimental trials. Experimental training trials were conducted for 3-consecutive weeks, 2 days post-regular season match competition with a 7-day period between each trial. For each individual trial, Advanced and Competitive training pools participated separately in the same team-based soccer practice session developed by a nationally accredited football club director of coaching. 90% of female soccer players in this study completed all three 90-minute team based experimental training trials. The remaining 10% of players completed in entirety two of three 90-minute team based experimental training sessions or attended all three training sessions but voluntarily engaged in early dismissal. The distance (m) covered and heart rate response (% HRmax) during each training trial were measured using Polar® Pro Sensors (Frequency 2402-2480 MHz; Maximum Power: 5.4 mW) placed around chest in line footballers' sternum. GPS and accelerometry were used to detect precise location and time length of team-based training activity. The distance covered by soccer players was examined with respect to standard of play and type of training activity to assess for differences. Goalkeepers participated in all training trials, but their training activity was excluded from analysis.

## Subjects

The Institutional Review Board of Georgia State University approved this study. With parental permission and subject assent, forty-seven youth female soccer players under the age of 18 from Elite Clubs National League (ECNL), Girls Academy League (GAL), National League (NL) and United States Youth Soccer Association (USYSA)-affiliated clubs participated in this study. Participants' date of birth, chronological age, prior football experience, anthropometric characteristic, pre-experimental injury questionnaire, grit and mindset surveys were collected (See Appendix A).

## Experimental Design

### *Level of Competition*

Level of competition in this study referenced participating soccer players current teams' level of competition within United States Youth Soccer structure. Youth amateur female soccer competition in the United States is arranged as follows in ascending order by level of competition: 1. Recreational 2. State-Governed Association 3. Regional-National League 4. Youth International. In this study players on a state-governed association club roster teams (USYSA/GA Soccer) were designated "competitive-level" (Competitive) while remaining players rostered to regional-national league, or international rosters (ECNL, GAL, NL) were grouped as "advanced-level" (Advanced). Females rostered to recreational-level teams did not participate in this study.

### *Laboratory Testing*

All soccer players performed laboratory tests a minimum of 7 days prior to experimental team-based training trials. Body fat percentage was estimated using skinfold caliber measurement (Jackson and Pollock, 1980). After preliminary tests, each footballer completed a 10-minute dynamic warm up prior to performing 3 maximal countermovement jumps (CMJ) on a commercially available, wireless, and portable dual-force plate (Hawkins Dynamic® Westbrooke, Maine) to examine lower extremity power characteristics (CMJ Height (m); RSI; Peak Propulsive Power (Watts); Peak Relative Propulsive Power (Watts/kg), Average Propulsive Power (W), Average Relative Propulsive Power (W/kg); Peak Breaking Power (W); Peak Relative Breaking Power (W/kg) Average Breaking Power (W); Average Relative Breaking Power (W/kg) (Cormack et al., 2008).

Following jump testing, footballers performed a treadmill test to assess maximal oxygen uptake (CardioCoach CO<sub>2</sub>, KORR Medical Technologies Inc, Salt Lake City, Utah), VO<sub>2</sub>max. The treadmill (SOLE ST90, SOLE US, Salt Lake City, Utah) test began at a level grade at a velocity of 8 km/hr for 2 minutes before progressively increasing velocity, 1 km/hr per minute, until footballers' voluntary termination. VO<sub>2</sub>max was defined as the average of the two highest oxygen values and/or the moment when an observed plateau in oxygen consumption occurs simultaneously with a slight increase in running velocity (defined as a change in VO<sub>2</sub> not exceeding  $\pm 2.5$  ml/kg/min in any two consecutive minutes) (Dillern et al., 2012). Relative VO<sub>2</sub>max was expressed as the oxygen uptake in milliliters per kilogram of body weight per minute (ml/kg/min). Velocity at VO<sub>2</sub> max (vVO<sub>2</sub>max) was defined as the slowest running velocity associated with VO<sub>2</sub>max. Researchers provided verbal feedback including VO<sub>2</sub> values, time and running velocity to each footballer during testing for motivation to ensure true voluntary exhaustion was achieved.

### *Field-Based Testing*

Soccer players were required to adhere to a minimum 24-hour recovery period after the laboratory testing before engaging in field-based testing on an artificial pitch. Players performed the experimental team-based training warm up routine (See Appendix B) before performing all field tests within the same session in the following order: 1) 30-meter Sprint 2) Illinois Agility Test.

#### *30 Meter Sprint Test*

A 30-meter distance was measured and identified using field markers. Brower® TCI Timing System photogates were placed at the start line, 10-meter (10m), 20-meter (20m), and 30-meter (30m) distance to record time taken to complete each sprint. Each player performed two maximal effort 30-meter sprints with a 3-minute recovery period between each sprint trial. Soccer players' 10-meter, 20-meter, and 30-meter mean sprint time in seconds were used for analysis.

#### *Illinois Agility Test*

After 5-minute recovery period footballers' Illinois agility Test running performance was evaluated using Brower® TCI Timing System, Draper Utah (Benounis et al., 2013; Hastad & Lacy, 1994). Soccer players initiated 10-meter sprinting action at self-selected time and turned back to the starting line. After returning to the initial start line, players sprinted in and out of four markers, completed two more 10 m sprints before performing a final 10 m sprint through the

finish line of predetermined agility protocol. The fastest time (s) achieved from two Illinois Agility trials with 3-minute recovery was used for agility score.

### *Experimental Team-Based Soccer Practice Trials*

The same team-based training session consisting of a variety of soccer-specific activities was performed on artificial surface pitch three individual times, separated by 7-day period, over a 3 consecutive week period during league competition. Prior to participation in experimental practice activity, with the aid of their respective parent/ legal guardian, players completed pre-participation health history questionnaire to make certain participants were injury-free (Appendix A). In addition, before each individual experimental team training session players completed a readiness-to-train survey to detect changes in perceived levels of muscle soreness and tiredness (see Appendix I). Pitch dimensions and time duration of all football training activities are described in detail (See Appendices B-G). Team-based training activities order were randomized for each individual experiment team practice session as follows: Session #1) Dynamic Warm up, 2) Technical-Striking Skill Activity (TSA), 3) Possession-Based Game (PBA) (4 v 4 + 2), 4) Small-sided Game (SSG) (5 v 5 + GK), and 5) Inter-Squad Scrimmage (ISS) (11 v 11); Session#2. 1) Dynamic Warm up, 2) Possession-Based Game (PBA) 3) Inter-Squad Scrimmage (ISS) (11 v 11), 4) Technical-Striking Skill Activity (TSA), and 5) Small-sided Game (SSG) (5 v 5 + GK); Session#3. 1) Dynamic Warm up, 2) Inter-Squad Scrimmage (ISS) (11 v 11), 3) Small-sided Game (SSG) (5 v 5 + GK), 4) Possession-Based Game (PBA), and 5) Technical-Striking Skill Activity (TSA). During all training activities, a ball was made readily available for replacement when the ball in play went out. Time duration from the start of the first to the end of the last series, including rest periods, for all training activities were used for analysis. Soccer

players were designated to either 4 player or 2 player “neutral” team (players joined the team with ball-possession) during possession-based games. They remained in these groups for all experimental team-based training trials. During small-sided games and inter-squad scrimmages players were on one specific team, competed in one team-tactical formation (1-4-3-3) and played one tactical position for all experimental team-based training trials. Final game and scrimmage scores were collected to assess the level of play and competitiveness amongst intersquad soccer teams. This study analyzed the experimental team training session as a whole and per specific training activity.

#### *Measurements during Experimental Team-Based Soccer Training Trials*

Polar® Pro Sensor accelerometry measured the total distance (TD) in meters (m) covered, number of sprints, accelerations, and decelerations performed. Polar® Team Pro software application used the following velocity-zones limits to analyze training activity: (a) Walking Zone 1: 3.0-6.99 km/hr. (b) Jogging Zone 2: 7-10.99 km/hr. (c) Running Zone 3: 11-14.99 km/hr. (d) High-Speed Running Zone 4: 15-18.99 km/hr. (e) Sprinting Zone 5: > 19 km/hr. The threshold for sprint activity was >19 km/hr. Measurement of acceleration and deceleration training actions were quantified by the following acceleration and deceleration zone limits: Acceleration zone limits: (a) Zone 1: 0.50 – 0.99 m/s<sup>2</sup> (b) 1.00 – 1.99 m/s<sup>2</sup> (c) 2.00 – 2.99 m/s<sup>2</sup> (d) 3.00 – 50.00 m/s<sup>2</sup>; Deceleration zone limits (a) Zone 1: -0.50 – -0.99 m/s<sup>2</sup> (b) -1.00 – -1.99 m/s<sup>2</sup> (c) -2.00 – -2.99 m/s<sup>2</sup> (d) -3.00 – -50.00 m/s<sup>2</sup>. To determine neuromuscular demand per 90-minute practice session and each training activity a cumulative Muscle Load score was calculated by Polar TeamPro software by integrating running power over time.

Heart rate response during training activity was measured using Polar® Pro Sensor. Polar® Team Pro software application training analysis used individual footballers' maximum heart rate (HRmax) measured during treadmill VO<sub>2</sub> max evaluation to generate the following percent of HRmax zone limits: (a) Zone 1: 50-59% (b) Zone 2: 60-69% (c) Zone 3: 70-79% (d) Zone 4: 80-89% (e) Zone 5: 90-100%. Polar® Team Pro software reported the duration of time spent within specific HRmax zones, average heart rate (HRavg), minimum heart rate (HRmin), and HR max during training activity. To determine cardiovascular demand per 90-minute practice session and each training activity a cumulative Cardio Load score was calculated by TeamPro software using Bannister Training Impulse = Duration (mins) x HRavg.

#### *Experimental Team-Based Football Training Technical Analysis*

A technical analysis was performed on all experimental team-based training including technical-skill striking activity, possession-based games, small-sided games and intersquad scrimmages. The list of soccer-specific skill parameters used in this study has been implemented previously in research (Owen et al., 2004); See Appendix H). Each team-based training session was filmed using a Veo Sports Camera, (VEO Technologies Copenhagen, Denmark). For all practice sessions, players were differentiated by specific color and numbered pennies. The frequencies of each skill were assessed and manually notated by a professional club's Director of Coaching and former international-level soccer player. The frequencies of 7 soccer-specific skills (passes, dribbles, goals scored, receptions, blocks, interceptions and tackles) performed per player per experimental training session were calculated. The Advanced and Competitive players' average total for each skill per session were used for tactical position and level of competition comparative analysis. For example, average total number of goals scored by Advanced and Competitive players per session were compared to assess between group

differences in shooting effectiveness during soccer training. The average total number of goals scored by Advanced and Competitive forward, midfielder, and defenders for each training session were also measured to discern within- and between group positional differences in goal scoring skill performance. The entirety of experimental training session 1 was not video recorded and thus excluded from soccer skill performance analysis.

### *Statistical analyses*

Results are presented as means  $\pm$  standard deviations. The Mann-Whitney U Test was used to substantiate group differences in mindset and grit by level of competition. Data sets were checked for homogeneity and normality using Shapiro-Wilk normality test. 2-Factor ANOVA was used to determine interaction and simple main effects of level of competition and tactical playing position on previous football experience, anthropometric and baseline physical performance characteristics. Independent t-tests was used to detect group differences in total physical workload (Cardio Load and Muscle Load) and skill accumulated (total # of successfully completed passes, receptions, dribbles, shots, interceptions, blocks, and tackles) during soccer training between advanced and competitive-level female soccer players. 4-Factor ANOVA with repeated measures was implemented to discern interaction and simple main effects of level of competition, tactical playing position, type of training activity, and time on physical workload. 3-Factor Mixed ANOVA with repeated measures was used to discern interaction and simple main effects of level of competition, tactical playing position, and time on skill performance. Follow up Bonferroni post hoc analyses were used to further detect group differences. Statistical significance was set at  $p < 0.05$ . All statistical procedures were performed using SPSS version 28 (IBM, Armonk, New York).

## RESULTS

### Female Players Baseline Characteristics

Participants in this research study included 47 female academy soccer players. Their soccer experience by level of competition is summarized in Table 1 below. No injuries were noted by the participants that kept them from engaging in the study. A Mann-Whitney U Test was performed to discern whether grit and mindset differed by level of competition. There were no significant differences in grit  $\{z = 0.17, p = 0.87\}$  or mindset  $\{z = 0.35, p = 0.72\}$  between Advanced and Competitive players. A one-way ANOVA was conducted that examined the effect of level of competition on total soccer, academy club, current level of competition, tactical playing position experience. There was no significant effect of level of competition on Advanced and Competitive players' total soccer  $\{F(1,41) = 1.36, p = 0.03\}$ , academy club  $\{F(1,41) = 0.55, p = 0.46\}$ , current level of competition  $\{F(1,41) = 0.749, p = 0.392\}$ , tactical playing position  $\{F(1,41) = 3.80, p = 0.06\}$ , team  $\{(1,41) = 0.95, p = 0.34\}$  or individual training experience  $\{(1,41) = 0.32, p = 0.57\}$ .

Table 1		
<b>Baseline Female Soccer Players Experience</b>		
<b>By Level of Competition</b>		
	<b>Advanced</b>	<b>Competitive</b>
	(N=27)	(N=20)
<b>Soccer (yrs)</b>	10.59 ± 2.27	10.05 ± 2.19
<b>Club Soccer (yrs)</b>	5.89 ± 2.93	5.08 ± 2.90
<b>Level of Competition (yrs)</b>	2.09 ± 1.69	2.48 ± 2.30
<b>Current Team (yrs)</b>	2.02 ± 1.04	1.83 ± 1.36
<b>Tactical Position (yrs)</b>	4.98 ± 2.98	3.70 ± 2.72
<b>Team Training(hr/wk)</b>	5.26 ± 1.16	4.99 ± .97
<b>Individual Training(hr/wk)</b>	2.87 ± 2.68	2.20 ± 1.67
<b>Mean ± SD</b>		

Research study participants' anthropometric characteristics by level of competition are summarized in Table 2 below.

A one-way ANOVA was conducted that examined the effect of level of competition on players' age, height, mass, body mass index, and body fat percentage. There was no significant effect of level of competition on age {F (1,41) = 0.76, p = 0.39}, height {F (1,41) = 0.58, p = 0.45}, mass {F (1,41) = 0.20, p = 0.66}, or body fat percentage {F (1,41) = .32, p = 0.58} between Advanced and Competitive players.

	Advanced (N=27)	Competitive (N=20)
<b>Age (yrs)</b>	15.93 ± .83	15.80 ± .77
<b>Height (cm)</b>	162.02 ± 5.62	163.10 ± 6.34
<b>Mass (kg)</b>	57.63 ± 8.20	57.67 ± 6.28
<b>BMI</b>	22.00 ± 2.59	21.87 ± 2.54
<b>Body Fat (%)</b>	23.10 ± 4.88	22.32 ± 5.49
<b>Mean ± SD</b>		

Performance characteristics of the study participants by level of competition are summarized in Table 3 below.

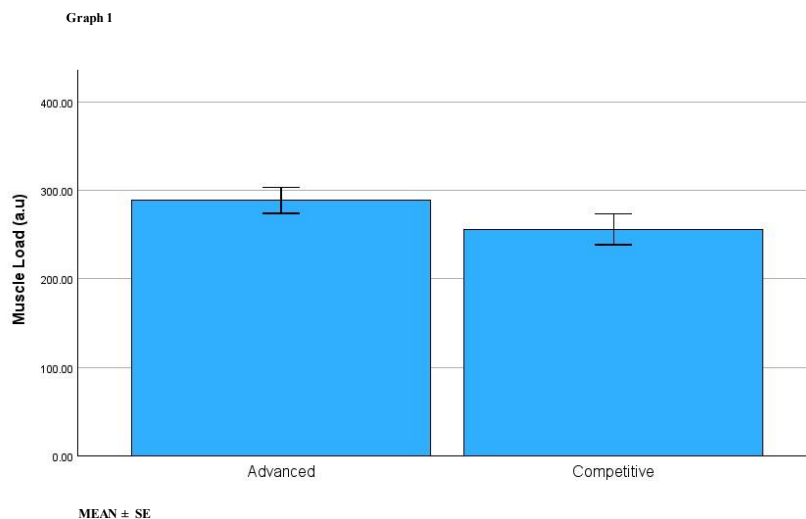
A one-way ANOVA was conducted that examined the effect of level of competition on players' 10m sprint, 20m sprint, 30m sprint, agility, countermovement jump height, absolute VO<sub>2</sub> max, relative VO<sub>2</sub> max and velocity at VO<sub>2</sub>max. There were no significant differences in 10m sprint {F (1,41) = 0.10, p = 0.92}, 20m sprint {F (1,41) = 2.92, p = 0.10}, or absolute VO<sub>2</sub> max {F (1,41) = 3.71, p = 0.06} between Advanced and Competitive players. There were statistically significant baseline differences in 30m sprint {F (1,41) = 5.67, p = 0.02, r<sup>2</sup> = 0.159}, agility {F (1,41) = 25.91, p = 0.001, r<sup>2</sup> = .403}, countermovement jump {F (1,41) = 8.95, p = 0.005, r<sup>2</sup> = 0.243} relative VO<sub>2</sub> max {F (1,41) = 7.51, p = 0.009, r<sup>2</sup> = 0.164}, or velocity at VO<sub>2</sub> max {F (1,41) = 24.81, p = 0.001, r<sup>2</sup> = 0.388} between Advanced and Competitive players.

		Advanced		Competitive
	N		N	
<b>10M (s)</b>	27	2.09 ± .10	20	2.08 ± .10
<b>20M (s)</b>	27	3.55 ± .16	20	3.62 ± .18
<b>30M (s)</b>	27	4.99 ± .24 *	20	5.14 ± .29
<b>Agility (s)</b>	27	16.56 ± .52 *	20	17.31 ± .64
<b>CMJHeight (m)</b>	27	.27 ± .04 *	19	.24 ± .04
<b>VO2 (L/min)</b>	27	2.91 ± .42	20	2.64 ± .38
<b>VO2 (ml/kg/min)</b>	27	51.04 ± 7.11 *	20	45.97 ± 5.01
<b>vVO2 (km/hr)</b>	27	16.39 ± 1.36 *	20	14.35 ± 1.30
<b>Mean ± SD</b>				
<b>* Denotes mean difference is significant at p &lt; 0.05</b>				

## Physical Workload

### Muscle Load

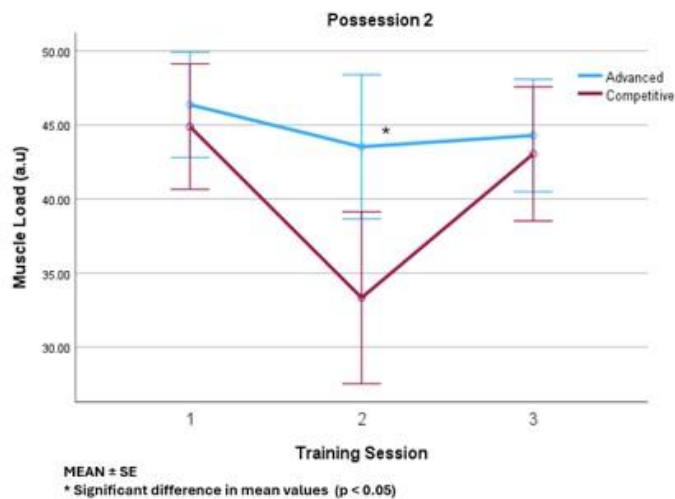
An independent t-test was used to determine the effect of level of competition on total mean muscle load, defined as an estimate of how much mechanical work players muscle performed during soccer training calculated by multiplying average power during each session by the duration of the session, accumulated during all three soccer training sessions. Level of competition had no effect on muscle load  $\{t(38) = 2.99, p = 0.586\}$  (see Graph 1).



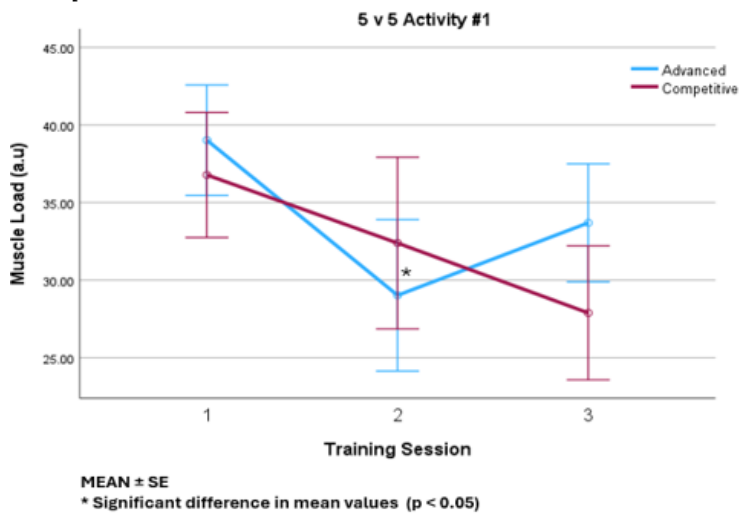
A four-way ANOVA with repeated measures was conducted that examined the effects of time, level of competition, tactical playing position and training activity type on muscle load. There was no significant interaction between the effects of time, level of competition, tactical playing position and training activity type on muscle load  $\{F(23.03, 360.79) = 1.42, p = 0.10\}$ . There was no significant interaction between the effects of time, tactical playing position and training activity type on muscle load  $\{F(23.03, 360.79) = 1.23, p = 0.21\}$ . There was a statistically significant interaction between the effects of time, level of competition and training activity type on muscle load  $\{F(11.51, 360.79) = 13.15, p = 0.001\}$ . Simple main effects analysis showed that Advanced female players' muscle load was significantly greater than their Competitive counterparts in second training session's possession activity 2 ( $p = .009$ , see Graph 2) and in the third training session's 5 v 5 activity #1 ( $p = .05$ , see Graph 3). The Advanced players' muscle load was significantly greater than the Competitive players' during training session #1 and #3, 11 v 11 scrimmage activities ( $p = .001$ ). Competitive

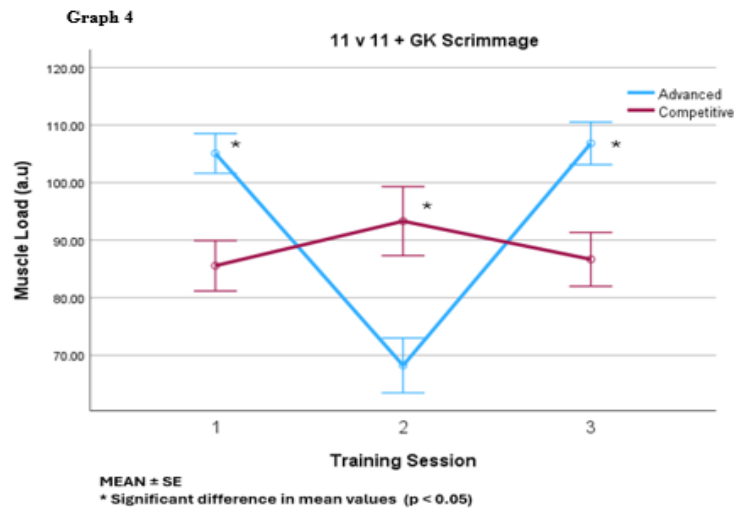
level female players' muscle load was significantly greater than the advanced-level group during the second training session's 11 v 11 scrimmage activity ( $p = .001$ , See Graph 4).

Graph 2

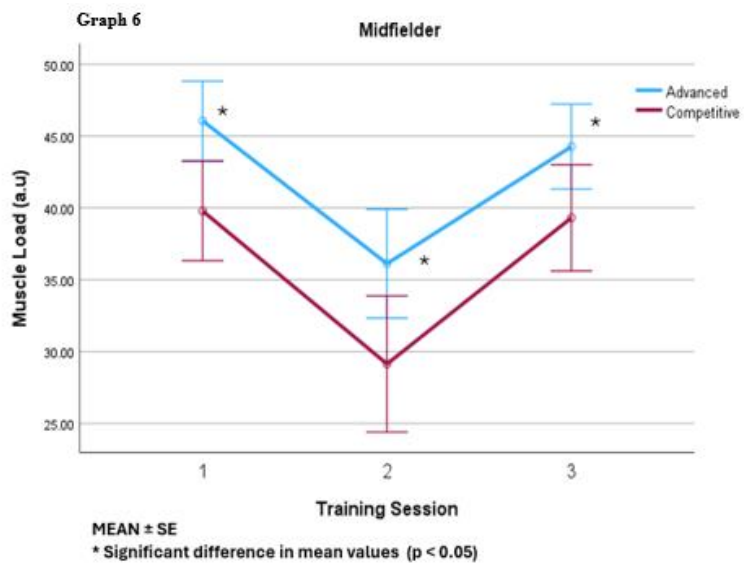
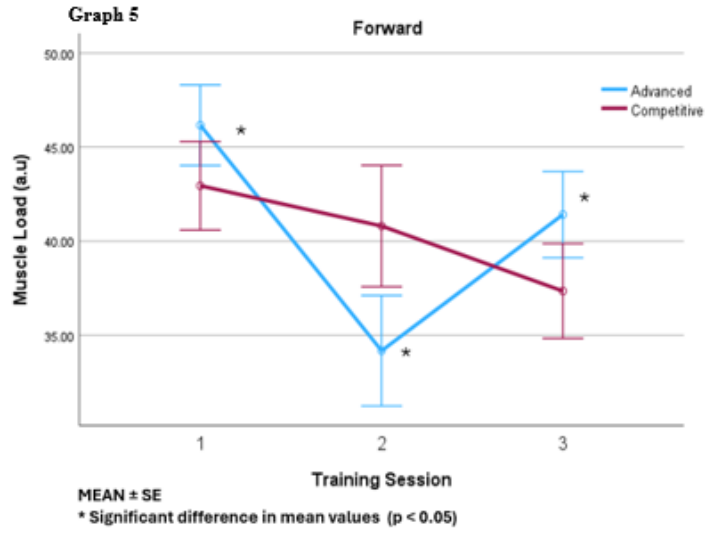


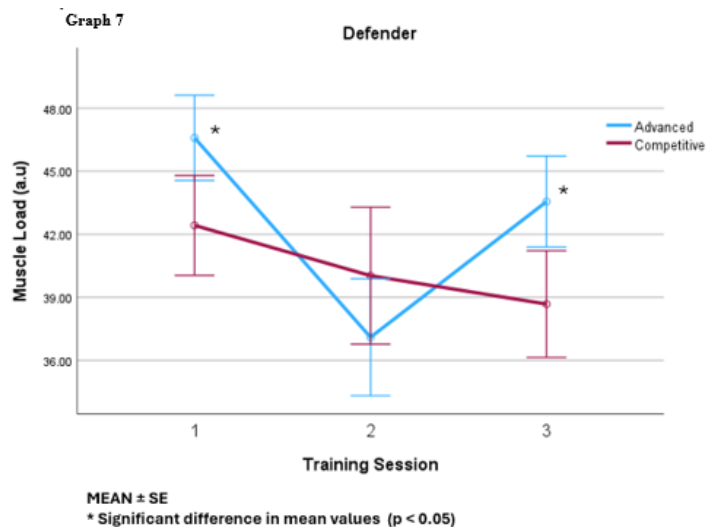
Graph 3





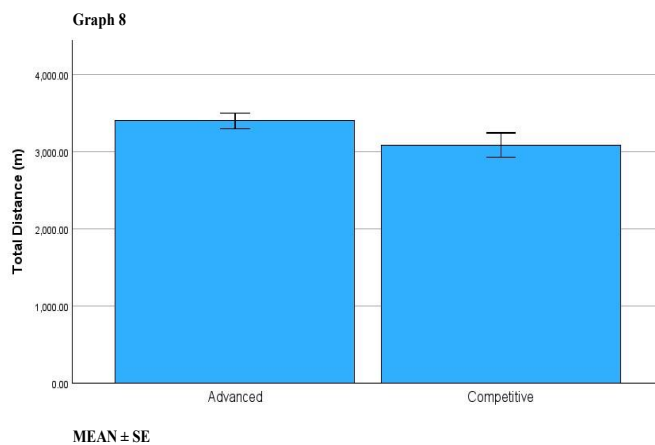
There was a statistically significant interaction between the effects of time, level of competition and tactical playing position on muscle load  $\{F(3.84, 376) = 2.86, p = 0.03\}$ . Simple main effects analysis showed that Advanced forwards' muscle load was significantly greater than their competitive-level counterparts, in training sessions #1 ( $p = 0.05$ ) and #3, but significantly less during training session #2 ( $p = .03$ , See Graph 5). The Advanced midfielders' muscle load was significantly greater than the competitive-level group, respectively across training sessions #1 ( $p = 0.01$ ), #2 ( $p = 0.02$ ), and #3 ( $p = 0.04$ , See Graph 6). Advanced-level defenders' muscle load was significantly greater than the competitive-level group in training sessions #1 ( $p = 0.01$ ), #3 ( $p = 0.04$ ), but no reported difference in training session #2 ( $p = .18$ , See Graph 6).





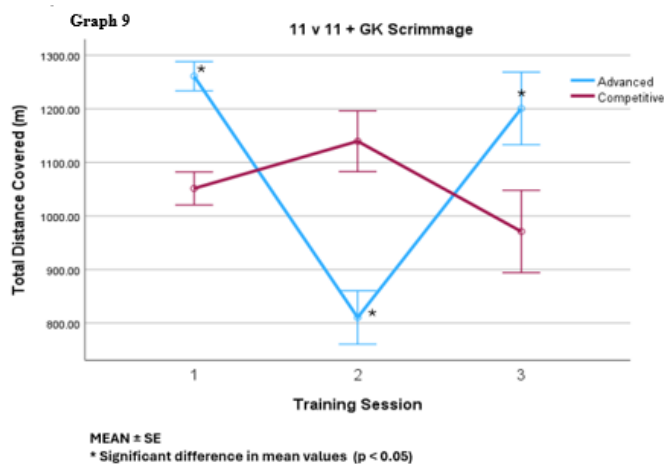
## Total Distance

An independent t-test was used to determine the effect of level of competition on mean total distance covered during all three soccer training sessions. Level of competition had no effect on total distance covered  $\{t(38) = 3.49, p = 0.167\}$  (see Graph 8).

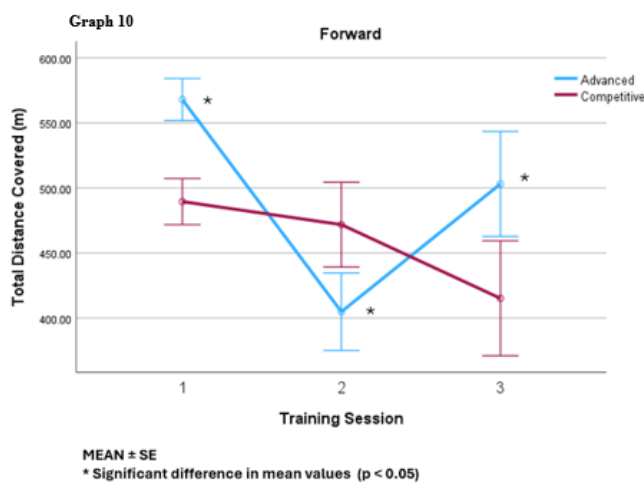


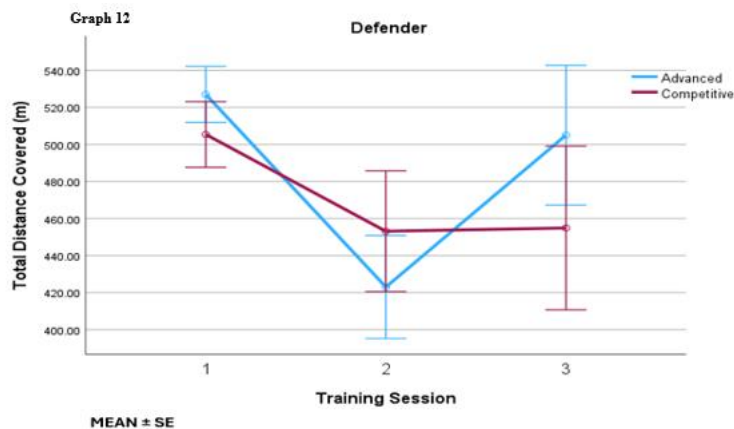
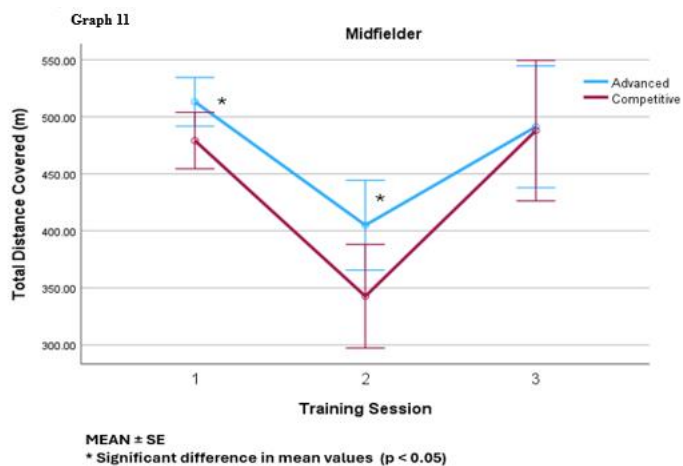
A four-way ANOVA with repeated measures was conducted that examined the effects of time, level of competition, tactical playing position and training activity type on total

distance covered. There was no significant interaction between the effects of time, level of competition, tactical playing position and training activity type on total distance covered {F (19.14, 309.50) = 1.00,  $p = 0.46$ }. There was no significant interaction between the effects of time, tactical playing position and training activity type on total distance covered {F (19.14, 309.50) = 0.86,  $p = 0.63$ }. There was a statistically significant interaction between the effects of time, level of competition and training activity type on total distance {F (9.57, 309.50) = 11.69,  $p = 0.001$ }. Simple main effects analysis showed that advanced-level female players' total distance covered was significantly greater than their competitive-level counterparts, in training session #2 possession activities 1 (MD±SE = 75.59 ± 38.31m;  $p = 0.05$ ) and 2 (MD±SE = 136.16 ± 39.38m;  $p = 0.001$ ). Advanced level female players' total distance covered was significantly greater than the competitive-level group during training session #1 and #3, 11 v 11 scrimmage activities ( $p = .001$ ). Competitive level female players' total distance covered was significantly greater than the advanced-level group during the second training session's 11 v 11 scrimmage activity ( $p = .001$ , See Graph 9).



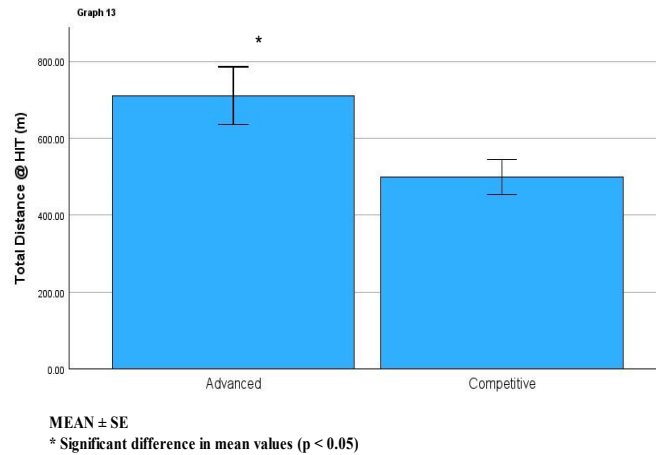
There was a statistically significant interaction between the effects of time, level of competition and tactical playing position on total distance  $\{F(3.19, 309.50) = 4.58, p = 0.03\}$ . Simple main effects analysis showed that advanced-level forwards' total distance covered was significantly greater than their competitive-level counterparts, in training sessions #1 ( $p = 0.001$ ) and #3 ( $p = 0.004$ ), but significantly less during training session #2 ( $p = .003$ , See Graph 10). Advanced-level midfielders covered a significantly greater distance compared to their competitive-level in training sessions 1 ( $p = 0.04$ ) and 2 ( $p = 0.04$ ), but no difference in 3 ( $p = .934$ , see Graph 11). Advance and competitive-level female defenders reported no differences in total distance covered across training sessions 1 ( $p = 0.07$ ), 2 ( $p = 0.17$ ), and 3 ( $p = .09$ , see Graph 12). Advanced-level players' total distance covered was statistically greater than competitive players  $\{F(1, 194) = 9.54; MD \pm SE = 26.75 \pm 8.66 \text{ m}; p = 0.02\}$ .





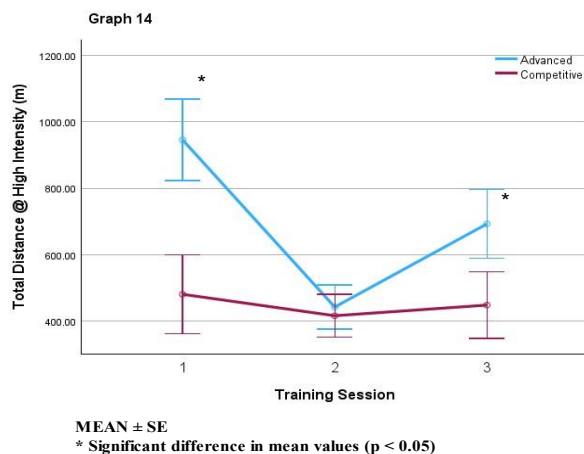
## High-Intensity Running

An independent t-test was used to determine the effect of level of competition on mean total distance covered at high intensity (velocities  $> 11.00$  km/hr.) during all three soccer training sessions. Level of competition had a significant effect on total distance covered at high intensity  $\{t(37) = 5.139, p = 0.04\}$  (see Graph 13).



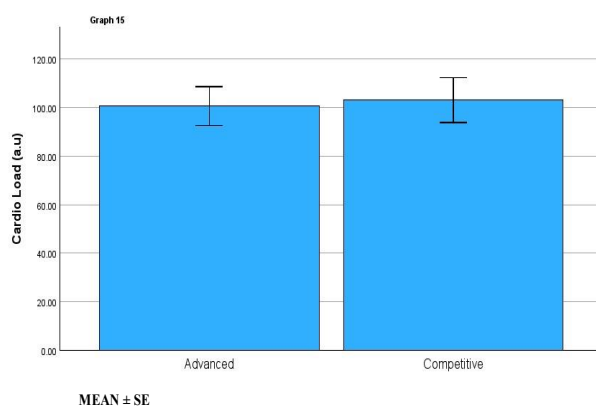
A three-way ANOVA with repeated measures was conducted that examined the effects of time, level of competition and tactical playing position on total distance covered at high intensity. There was no significant interaction between the effects of time, level of competition and tactical playing position on total distance covered at high intensity  $\{F(3.22, 53.04) = 2.08, p = 0.11\}$ . There was a significant interaction between the effects of time and level of competition on total distance covered at high intensity  $\{F(1.61, 53.04) = 13.12, p = 0.001\}$ . Advanced-level female players performed a significantly greater volume of high-intensity running compared to age-matched competitive-level colleagues during training sessions 1 ( $p = 0.001$ ) and 3 ( $p = 0.002$ ). No differences between groups differences in total distance covered at

high intensity occurred during training session 2 ( $p = 0.57$ , See Graph 14).

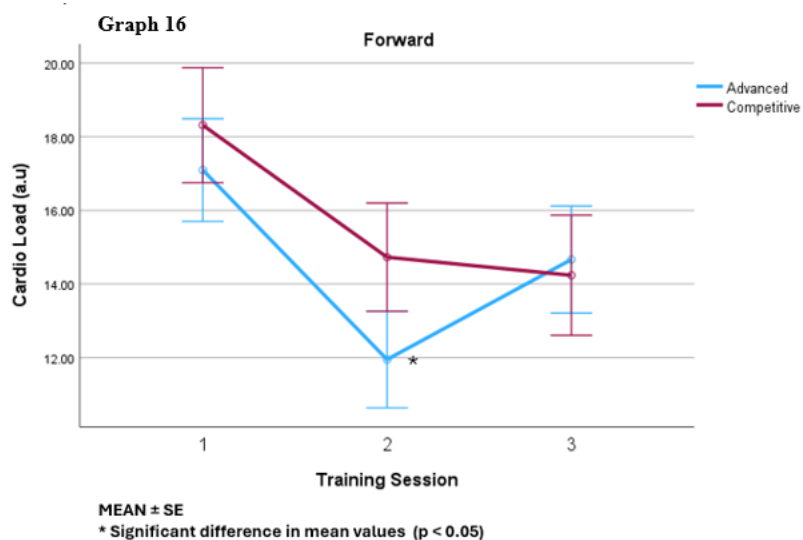


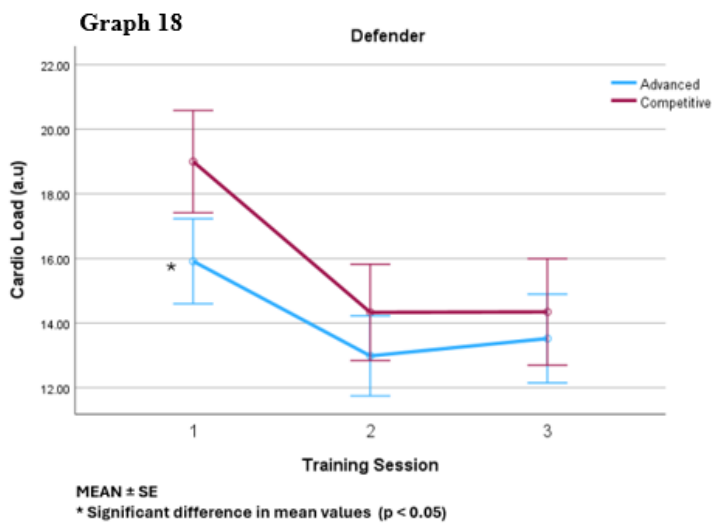
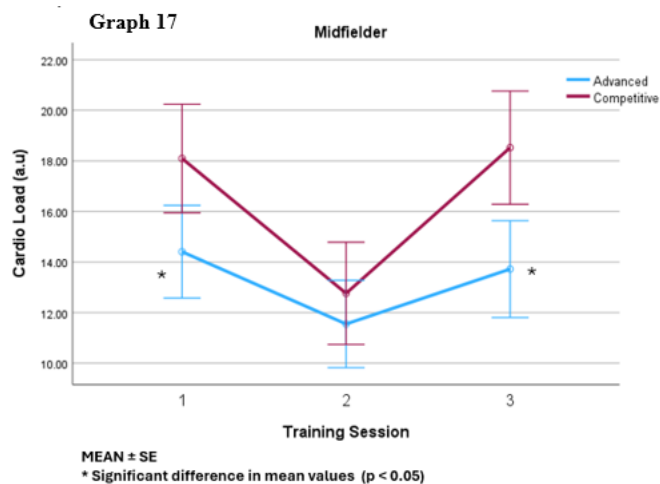
## Cardio Load

An independent t-test was used to determine the effect of level of competition on mean Cardio Load accumulated during all three soccer training sessions. Level of competition had no effect on Cardio Load  $\{t(38) = -0.414, p = 0.702\}$  (see Graph 15).



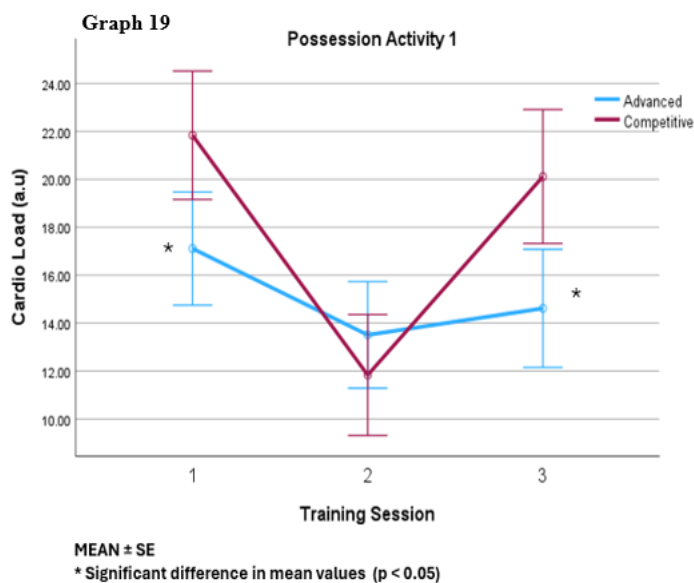
A four-way ANOVA with repeated measures examined the effects of time, level of competition, tactical playing position and training activity type on Cardio Load. There was no significant interaction between the effects of time, level of competition, tactical playing position and training activity type on Cardio Load  $\{F(22, 353.83) = 1.10, p = 0.34\}$ . There was no interaction between the effects of time, tactical playing position, and training activity type on Cardio Load  $\{F(22, 353.83) = 1.19, p = 0.25\}$ . There was a significant interaction between the effects of time, level of competition, and tactical playing position  $\{F(22, 353.83) = 2.49, p = 0.05\}$ . Advanced-level forwards' cardio load was significantly less than competitive forwards during training session 2 ( $p = .006$ , see Graph 16). Advanced-level midfielders' cardio load was significantly less than their midfielder counterparts in training session 1 ( $p = 0.01$ ) and 3 ( $p = 0.02$ , see Graph 17). Advanced-level defenders' cardio load during session 1 was significantly less compared to competitive-level defenders ( $p = 0.03$ , see Graph 18).

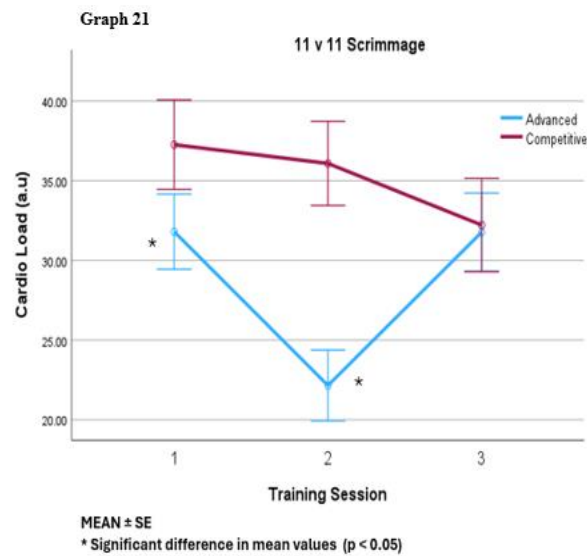
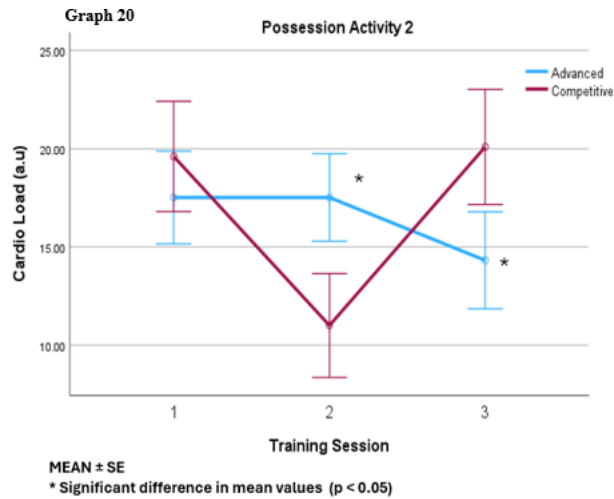




There was a significant interaction between the effects of time, level of competition, and training activity type  $\{F(22, 353.83) = 6.70, p = 0.001\}$ . In training session 1 ( $p = 0.01$ ) and 3 ( $p = 0.004$ ), possession activity #1, advanced-level players' cardio load was significantly less compared to competitive-level players (see Graph 19). In training session 2,

possession activity #2 advanced-level level players' cardio load was significantly greater than their competitive counterparts ( $p = 0.001$ ). In training session 3, possession activity #2, advanced-level players experienced significantly less cardio load compared to competitive-level players ( $p = 0.003$ , see Graph 20). Advanced-level players' cardio load was significantly less than competitive-level players during training 1 ( $p = 0.004$ ) and 2 ( $p = 0.001$ , See Graph 21), 11 v 11 scrimmage activity.





Level of competition and training activity type had a significant interaction effect on cardio load { $F(6, 193) = 3.26, p = 0.004$ }. Advanced-level players' cardio load was statistically less than competitive players during possession activity #1 ( $MD \pm SE = -2.85 \pm 1.18$  a.u.;  $p = 0.02$ ).

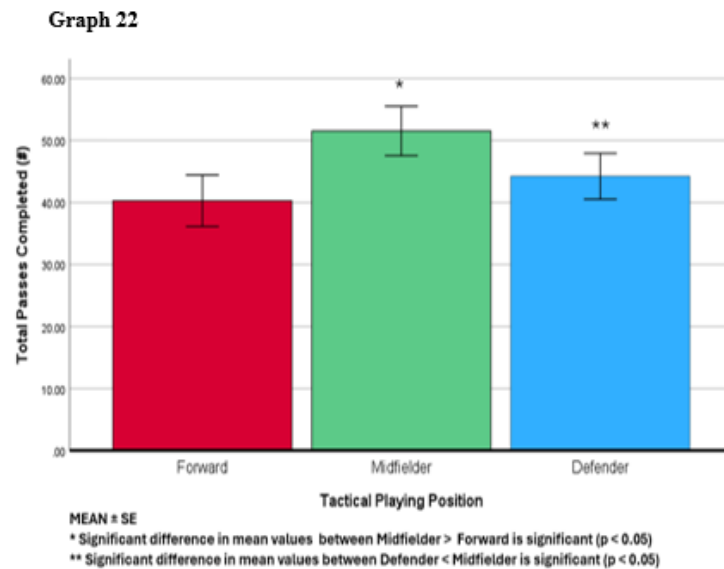
Advanced-level players' cardio load was significantly less than competitive players during 11 v 11 Scrimmage Activity ( $MD \pm SE = -6.62 \pm 1.21$  a.u.;  $p = 0.001$ ). Level of competition had a significant effect on cardio load  $\{F(1, 193) = 21.12, p = 0.001\}$ . Advanced players' cardio load compared to competitive-level players' cardio load was significantly less ( $MD \pm SE = -2.06 \pm .49$  a.u.;  $p = 0.001$ ).

## **Technical Skill Performance**

### **Total Passes Completed**

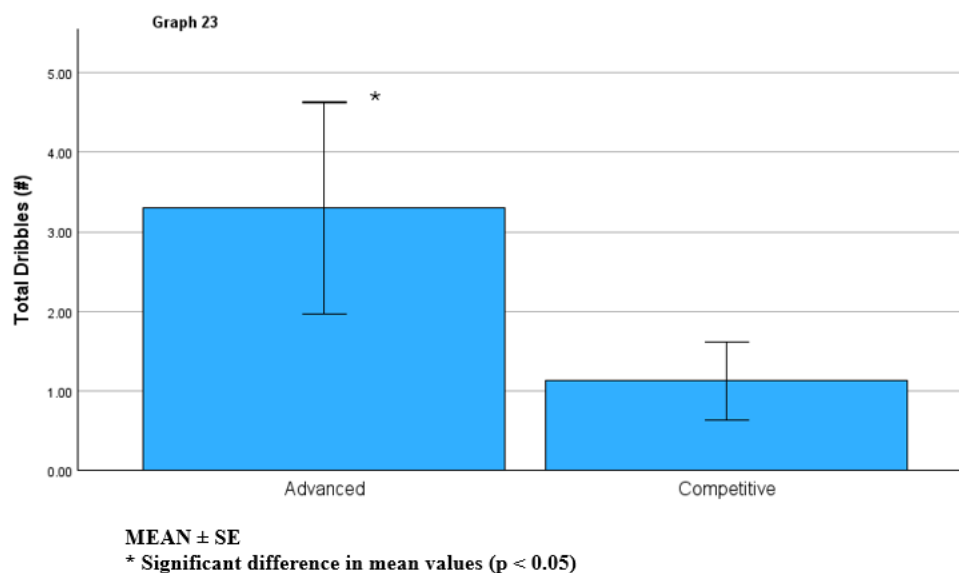
An independent t-test was used to determine the effect of level of competition on the mean total number of passes completed during all three soccer training sessions. Level of competition had no effect on total number of passes completed  $\{\text{Advanced: } 44.8 \pm 8.29$  vs  $\text{Competitive: } 46.05 \pm 8.47; t(38) = -0.472, p = 0.86\}$ .

A three-way Mixed ANOVA with repeated measures examined the effects of time, level of competition and tactical playing position on total passes completed. There was no significant interaction effect of time, level of competition, and tactical playing position on total passes completed  $\{F(2, 34) = .52, p = 0.60\}$ . No significant interaction effect of time and position on total passes completed  $\{F(2, 34) = .34, p = 0.72\}$ . Similarly, no significant interaction effect of time and level of competition on total passes completed  $\{F(1, 34) = .12, p = 0.73\}$ . Level of competition had no effect on total passes completed  $\{F(1, 34) = .08, p = 0.77\}$ . Tactical playing position had a significant effect on total passes completed  $\{F(2, 34) = 8.92, p = 0.001\}$ . Female midfielders successfully completed significantly more passes than forwards ( $MD \pm SE = 11.25 \pm 2.84; p = 0.001$ ) and defenders ( $MD \pm SE = 7.31 \pm 2.67; p = 0.03$ , See Graph 22).

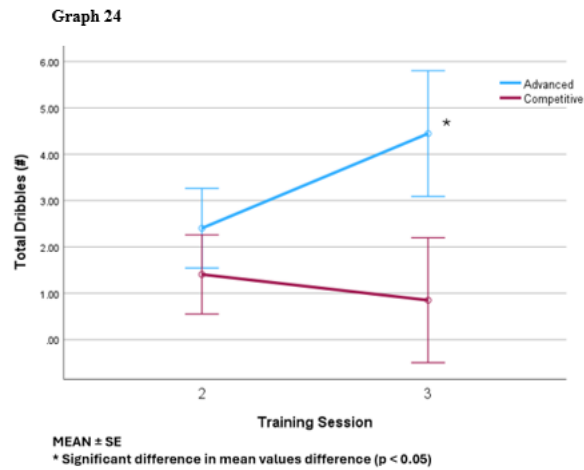


### Total Dribbles Completed

An independent t-test was used to determine the effect of level of competition on mean total of number of dribbles completed during all three soccer training sessions. Level of competition had a significant effect on mean total number of dribbles completed  $\{t(38) = 3.204, p = 0.01\}$  (see Graph 23).

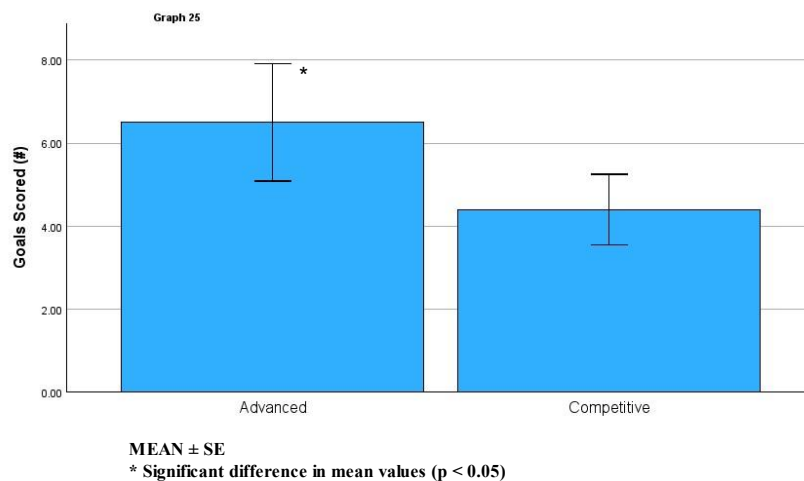


A three-way Mixed ANOVA with repeated measures examined the effects of time, level of competition and tactical playing position on total dribbles completed. There was no significant interaction effect of time, level of competition, and tactical playing position on total dribbles completed  $\{F(2, 34) = .18, p = 0.84\}$ . No significant interaction effect of time and position on total dribbles completed  $\{F(2, 34) = .04, p = 0.96\}$ . There was a significant interaction effect of time and level of competition on total dribbles completed  $\{F(1, 34) = 8.47, p = 0.006\}$ . No difference in dribbles completed between advanced and competitive-level female players occurred in training session 2 ( $p = 0.10$ ). Advanced players completed significantly more dribbles compared to competitive-level counterparts in training session 3 ( $p = 0.001$ , see Graph 24). Level of competition had a significant effect on successful number of dribbles completed by female soccer players  $\{F(1, 34) = 12.55, p = 0.001\}$ . Advanced players ( $MD \pm SE = 2.30 \pm .65; p = 0.001$ ) completed significantly more dribbles than the competitive-level players.



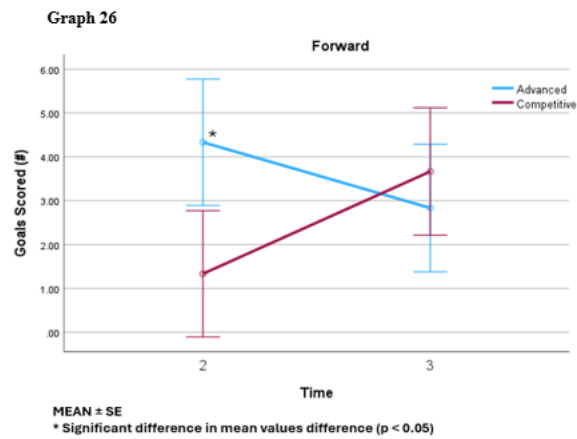
## Total Goals Scored

An independent t-test was used to determine the effect of level of competition on mean total of number of goals scored during all three soccer training sessions. Level of competition had a significant effect on mean total number of goals scored  $\{t(38) = 2.66, p = 0.028\}$  (see Graph 25).

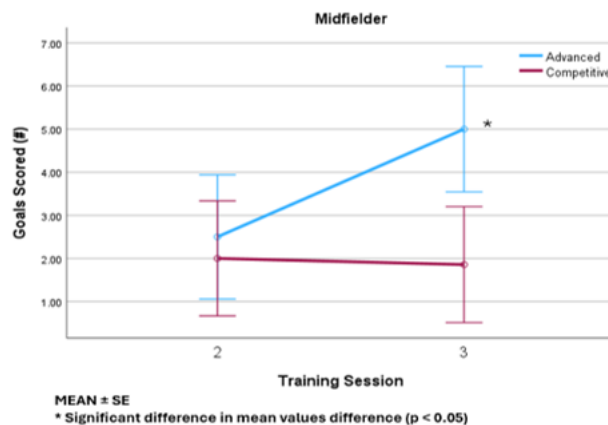


A three-way Mixed ANOVA with repeated measures was conducted that examined the effects of time, level of competition and tactical playing position on total goals scored. There was a statistically significant interaction effect of time, level of competition, and tactical playing position on total goals scored  $\{F(2, 34) = 5.45, p = 0.01\}$ . Advanced-level forwards scored significantly more goals than their competitive-level forward counterparts, in training session 2 ( $p = .005$ , see Graph 26), but there was no difference in goal scoring performance in training session 3 ( $MD \pm SE = 0.83 \pm 1.01; p = 0.42$ ). Advanced-level midfielders scored significantly more goals than their competitive-level midfielder counterparts, in training session 3 ( $p = .003$ , see Graph 27), but there was no difference in goal scoring performance in training session 2 ( $MD \pm SE = 0.50 \pm .97; p = 0.42$ ). There was no difference in goals scored between advanced and competitive-level female defenders in training session 2 ( $p = .50$ ) and 3 ( $p = .82$ , see Graph 28). Advanced players  $\{F(1, 34) = 7.80; MD \pm SE = 1.11 \pm .40; p = 0.01\}$  scored significantly more goals than the competitive-level players. There was no interaction effect of time and level of competition on

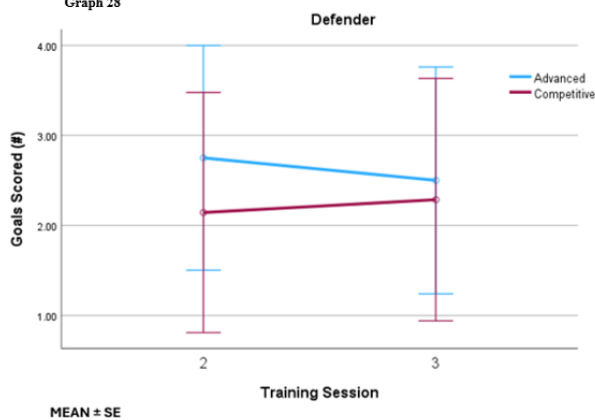
number of goals scored.  $\{F(2, 34) = .46, p = 0.50\}$ . There was no interaction effect of time and tactical playing position on number of goals scored.  $\{F(2, 34) = .89, p = 0.42\}$ . There was no interaction effect of level of competition and tactical playing position on number of goals scored  $\{F(2, 34) = 1.11, p = 0.34\}$ . Tactical playing position had no effect on the total number of goals scored between advanced and competitive level players.  $\{F(2, 34) = .89, p = 0.42\}$ .



Graph 27



Graph 28



## Receptions Completed

An independent t-test was used to determine the effect of level of competition on mean total of number of receptions completed during all three soccer training sessions. Level of competition had no significant effect on mean total number of receptions completed {Advanced:  $38.55 \pm 9.38$  vs Competitive:  $42.18 \pm 7.48$ ;  $t(38) = -1.351$ ,  $p = 0.103$ }.

A three-way Mixed ANOVA with repeated measures was conducted that examined the effects of time, level of competition and tactical playing position on receptions completed. There was no significant interaction effect of time, level of competition, and tactical playing position on receptions completed  $\{F(2, 34) = .05, p = 0.96\}$ . No interaction effect of time and level of competition on receptions completed  $\{F(1, 34) = .02, p = 0.91\}$ . There was no interaction effect of time and tactical playing position on receptions completed  $\{F(2, 34) = .05, p = 0.95\}$ . Similarly, no interaction effect of level of competition and tactical playing position on receptions completed  $\{F(2, 34) = .99, p = 0.38\}$ . Tactical playing position had a significant effect on receptions completed  $\{F(2, 34) = 8.92, p = 0.001\}$ . Midfielder soccer players completed significantly more receptions compared to forwards ( $MD \pm SE = 11.45 \pm 2.76, p = 0.001$ ) and defenders ( $MD \pm SE = 7.31 \pm 2.62, p = 0.03$ ). Level of competition had no effect on receptions completed  $\{F(1, 34) = 1.68, p = 0.20\}$ .

### **Tackles Completed**

An independent t-test was used to determine the effect of level of competition on mean total of number of tackles completed during all three soccer training sessions. Level of competition had no significant effect on mean total number of tackles completed  $\{\text{Advanced: } 2.75 \pm 1.34 \text{ vs Competitive: } 1.83 \pm 1.38; t(38) = 2.149, p = 0.850\}$ .

A three-way Mixed ANOVA with repeated measures was conducted that examined the effects of time, level of competition and tactical playing position on tackles completed. There was no significant interaction effect of time, level of competition, and tactical playing position on tackles completed  $\{F(2, 34) = 1.16, p = 0.33\}$ . No interaction effect of time and level of competition on tackles completed  $\{F(1, 34) = .13, p = 0.73\}$ . There was no interaction effect of time and tactical playing position on tackles completed  $\{F(2, 34) = 1.17, p = 0.32\}$ . Similarly, no

interaction effect of level of competition and tactical playing position on tackles completed  $\{F(2, 34) = 2.41, p = 0.12\}$ . Advanced-level compared to competitive-level female completed significantly more tackles  $\{F(1, 34) = 6.17; MD \pm SE = 1.02 \pm .41; p = 0.02\}$ . Tactical playing position had no effect on tackles completed  $\{F(2, 34) = 1.41, p = 0.26\}$ .

### **Blocks Completed**

An independent t-test was used to determine the effect of level of competition on mean total of number of blocks completed during all three soccer training sessions. Level of competition had no significant effect on mean total number of blocks completed  $\{\text{Advanced: } 1.98 \pm 1.15 \text{ vs Competitive: } 1.62 \pm 1.24; t(38) = 0.923, p = 0.845\}$ .

A three-way Mixed ANOVA with repeated measures was conducted that examined the effects of time, level of competition and tactical playing position on blocks completed. There was no significant interaction effect of time, level of competition, and tactical playing position on blocks completed  $\{F(2, 34) = 1.53, p = 0.23\}$ . No interaction effect of time and level of competition on blocks completed  $\{F(1, 34) = .45, p = 0.51\}$ . There was no interaction effect of time and tactical play position on blocks completed  $\{F(2, 34) = .86, p = 0.43\}$ . Similarly, no interaction effect of level of competition and tactical playing position on blocks completed  $\{F(2, 34) = 2.12, p = 0.14\}$ . Level of competition had no effect on blocks completed  $\{F(1, 34) = .91, p = 0.35\}$ . Tactical playing position had no effect on blocks completed  $\{F(2, 34) = 3.16, p = 0.06\}$ .

### **Interceptions Completed**

An independent t-test was used to determine the effect of level of competition on mean total of number of interceptions completed during all three soccer training sessions. Level

of competition had no significant effect on mean total number of interceptions completed {Advanced:  $3.68 \pm 1.52$  vs Competitive:  $3.50 \pm 1.77$ ;  $t(38) = 0.335$ ,  $p = 0.446$ }.

A three-way Mixed ANOVA with repeated measures was conducted that examined the effects of time, level of competition and tactical playing position on interceptions completed. There was no significant interaction effect of time, level of competition, and tactical playing position on interceptions completed { $F(2, 34) = .61$ ,  $p = 0.55$ }. No interaction effect of time and level of competition on interceptions completed { $F(1, 34) = .84$ ,  $p = 0.37$ }. There was no interaction effect of time and tactical play position on interceptions completed { $F(2, 34) = .21$ ,  $p = 0.81$ }. Similarly, no interaction effect of level of competition and tactical playing position on interceptions completed { $F(2, 34) = 1.56$ ,  $p = 0.23$ }. Level of competition had no effect on interceptions completed { $F(1, 34) = .12$ ,  $p = 0.75$ }. Tactical playing position had no effect on interceptions completed { $F(2, 34) = 2.66$ ,  $p = 0.08$ }.

Table 4

		Summary of Female Soccer Players Training Characteristics by Level of Competition	
		<b>Advanced</b>	<b>Competitive</b>
<b>Physical Workload</b>	<b>Muscle Load (a.u)</b>	Higher	Lower
	<b>Cardio Load (a.u)</b>	Lower	Higher
	<b>Total Distance (m)</b>	More	Less
	<b>Total Distance @ High Intensity (m)</b>	More *	Less
<b>Skill Performance</b>	<b>Receptions (#)</b>	Less	More
	<b>Passes (#)</b>	Less	More
	<b>Dribbles (#)</b>	More *	Less
	<b>Goals Scored (#)</b>	More *	Less
	<b>Tackles (#)</b>	More	Less
	<b>Blocks (#)</b>	More	Less
	<b>Interceptions (#)</b>	More	Less

Mean  $\pm$  SE

\* Significant difference in mean value ( $p < 0.05$ )

## Discussion

This study aimed to determine the effects of team level of competition of soccer training activity. The first objective of the study was to determine whether differences exist between advanced and competitive-level female soccer players' physical workload and skill performance during soccer practice. The results of this study showed that physical workload, specifically muscle load, total distance, and distance covered at high intensity, performed by Advanced players was significantly greater than their age-matched Competitive female counterparts. In addition, during practice the Advanced players experienced a statistically significant smaller cardiovascular load in comparison to the competitive level players. The Advanced players accomplished significantly more total number of dribbles, tackles, and goals scored than the Competitive players during training.

The secondary objective of this study was to examine whether differences in physical workload and skill performance between Advanced and Competitive female players persist over a series of team-based soccer practices. The results of this study revealed that Advanced players' physical workload was significantly greater than their Competitive counterparts across a 3 week-time period.

### *Effect of Level of Competition on Female Soccer Players Performance Characteristics*

Previous studies have reported female soccer players' physical capacity and performance characteristics differ according to age and level of competition {Haugen, 2014 #170} {Vescovi, 2011 #201; Vescovi, 2009 #195}. This study's findings support this notion. The 30m sprint characteristics of players in this study (10m: 4.78 m/s; 20m: 5.58 m/s; 30m: 5.94 m/s) were like other 14-17 yr club-level females (10m: 4.69 m/s; 20m: 5.48 m/s; 30m: 5.9 m/s)

investigated {Vescovi, 2009 #195}. While countermovement jump height between these similar aged population were markedly different (25 cm vs. 38 cm). This study provides further evidence that when controlling for age, the effect of level of competition on soccer players' physical performance characteristics persists. At baseline Advanced players in this investigation had significantly greater relative VO<sub>2</sub> max, faster 30m sprint and agility times, and higher CMJ height than their Competitive counterparts. The sprint characteristics and VO<sub>2</sub>max of players in this study was substantially less than that of professional-level female players (10m: 5.08 m/s; 20m: 6 m/s; 30m: 6.64 m/s; VO<sub>2</sub>max: 3.58 L/min) {Haugen, 2014 #170} {Vescovi, 2011 #201}. Advancement in female players' physical and physiological capacities is required to progress from youth to professional level of soccer competition. More research is needed to better our understanding of team-based training loads and physical adaptation in soccer.

*Interaction effects of Time, Level of Competition, Tactical Playing Position, and Type Training Activity on Muscle Load*

To the best of our knowledge, this study is the first to explore the effects of time, level of competition, and tactical playing position on accumulated muscle load during youth female soccer training activity. This study provides evidence that amassed muscle load varies across a series of team-based training sessions and depends on level of competition and tactical playing position. In training sessions 1 and 3 advanced-level forward and defenders accomplished a greater muscle load compared to similar aged, tactical position, and competitive-level counterparts. Advanced-level female midfielders' muscle load was significantly greater than competitive-level midfielders across all three team-based training sessions.

The results of this study provide evidence that muscle load can also be affected by time, level of competition and coaches' implementation of specific types of soccer training

activity. Significant differences in muscle load were found between advanced and competitive-level female players during possession and small-sided game activities in training session 2. Advanced-level players' muscle load was significantly greater than competitive-level players during team scrimmage activity in practice sessions 1 and 3. These preliminary findings suggest that advanced and competitive-level female soccer players physical training load may differ across a competitive season and depend on tactical playing position. Coaches should be cognizant of their organization of unique training activities and acknowledge performance differences amongst female soccer players. To match the physical load and intensity accomplished by Advanced players during team-based training and further enhance performance, Competitive players may warrant additional training. Coaches can purposely modulate training demand using strategic programming by increasing the duration or quantity of soccer-specific activities performed during team-based practice. If aligned with soccer academies' developmental philosophy, implementation of individual player performance plans with purposeful inclusion of Competitive players within Advanced team practices together may be effective strategies needed to augment training load and performance.

*Interaction effects of Time, Level of Competition, Tactical Playing Position, and Type Training Activity on Total Distance and High-Intensity Running*

Previous studies have documented differences between professional, semi-professional, and youth international soccer players in total distance covered and distance covered at high intensity during match competition (Dellal et al., 2011; Bangsbo, 2008 #27; Mohr et al., 2008)}. To our knowledge this study is the first explore differences in advanced and competitive-level young female soccer players in total distance and distance covered at high intensity over several team-based practice sessions. International and professional-level female

soccer players' total distance covered during a given training session can range between 3,000 – 6,300 m depending on future match competition ((Diaz-Seradilla et al., 2022; Doyle et al., 2022). In comparison, in this study youth female players' total distance covered on average 3,240 m (2,227 – 3,807.33 m) during training.

Advanced-level players overall covered a significantly greater total distance (m) compared to their competitive-level counterparts during specific practice activities. Interestingly, in training sessions 1 and 3 the advanced group covered significantly greater total distance during scrimmaging activity. However, in training session 2's scrimmage competitive-level players' total distance covered exceeded that of the advanced group. Differences in weather conditions and order of training activities may have been attributed to group differences in total distance covered while scrimmaging in training session 2. The environmental conditions by which advanced players underwent training session 2 was 75 °F and sunny versus 59 °F cloudy for the competitive players. In training session 2, 11 v 11 scrimmage activity occurred after possession-based and 5 v 5 +GK small-sided training activity. The Advanced group covered significantly greater total distance during possession activities 1 (75 m) and 2 (136 m) compared to the competitive players in training session 2. In conjunction to performing more physical output, the advanced players' accumulated Muscle and Cardio Load were significantly greater than that of the competitive group during possession-based activity 2.

In this study distance covered during scrimmage activity was measured across fixed time. Yet, scrimmage activity for time periods well exceeding that by which were explored in this study is a common training approach used by coaches to prepare their respective soccer teams for the physical and tactical demands of match competition. In 2 of the 3 training sessions investigated in this study, the advanced-level group covered significantly greater total distance

during scrimmage highlighting at the very least a difference in acute training volume amongst female soccer players of various levels. More longitudinal research is yet needed to establish whether acute differences in physical workloads between advance and competitive-level female soccer players during team-based practices persist and might account for differences in baseline physical performance characteristics found in this study and previous research (Villalobos, unpublished (Vescovi et al., 2009) (Haugen et al., 2014; Haugen et al.).

Soccer match activity profiles of young soccer players are dependent on tactical playing position (Castagna et al., 2003) and Villalobos (unpublished). Results in this study revealed that level of competition and tactical playing position interact to effect soccer training activity. Advanced-level forwards completed significantly greater total distances in training session 1 and 3, but less in training session 2 compared to competitive-level forwards. The advanced group's midfielders covered greater total distances than their competitive level colleagues in training sessions 1 and 2. There was no difference in the total distance covered between advanced and competitive defenders. In training session 1, advanced players covered approximately 500m more total distance at high intensity than competitive players. The advanced-level group's total distance covered at high intensity in training session 3 was also significantly greater than the competitive group, by roughly 250m. The primary tactical responsibility of forwards in soccer is to augment their team's attack and convert goal scoring opportunities. Midfielders aim to control the tempo of ball possession and facilitate defense to attack and vice versa. This study highlights that total distance and exercise intensity by which Advanced forwards and midfielders strive to meet their respective positional demands during practices are greater than their Competitive colleagues. The results from this study suggest increases in physical workload and intensity during team-based practice may be warranted to

adequately prepare players for the tactical and physical demands of higher-level soccer competition.

*Interaction effects of Time, Level of Competition, Tactical Playing Position, and Type Training Activity on Cardio Load*

This study's exploration of Cardio load during team-based soccer practice in young female soccer players is novel. Key findings highlight that advanced-level female players' Cardio load during team-based training was significantly less than the competitive group depending on tactical playing position and coaches' training activity selection. The advanced-level forwards' Cardio load was significantly less than the competitive forwards' group in training session 2. Similarly, advanced-level defenders' Cardio load was significantly less than competitive defenders in training session 2. In training sessions 1 and 3, the advanced-level midfielders' Cardio load was significantly less than their competitive contemporaries despite completing significantly greater physical workloads (i.e. Muscle Load and Total Distance).

The cardio load of the advanced-level group was significantly less than the competitive group during possession activity 1 in training sessions 1 and 3. This phenomenon also occurred during 11 v 11 scrimmage activity in training sessions 1 and 2. Collectively these findings suggest advanced-level players' physical work capacity are likely greater than competitive-level players. In further support of this notion the advanced-level female players' VO<sub>2</sub> max, 30-meter sprint speed, CMJ height and Agility performance characteristics were all statistically superior to that of the competitive group. More research is needed to clearly elucidate the effect level of competition has on soccer player's practice workloads and adaptation.

*The interaction effects of Time, Level of Competition and Tactical Playing Position on Skill Performance ‘*

Previous research has shown soccer skill performance varies according to type training activity performed (Hill-Haas et al., 2009; Hill-Haas et al., 2011 {Owen, 2004 #157}). The aim of this study was to examine the effect of competition-level on female soccer players’ skill performance during team-based practice. In training session 3, advanced players completed on average 3.5 more dribbles than the competitive group. Advanced forwards scored on average 1.3 more goals than competitive-level forwards in training session 2. While advanced-level midfielders scored 3.2 more goals than the competitive groups’ midfielders in training session 3. There were no group differences in defensive block or interception skill performance.

Overall, the advanced group of players averaged 2 more successful dribbles than their competitive counterparts. The advanced group averaged 1.1 goals scored and 1 tackle more per 90-minute practice session than the competitive-level group. Tactical playing position had a significant effect on the total number of receptions and passes completed during practice. Midfielders successfully completed more receptions and passes than forwards, defenders. This study provides evidence to suggest that tactical playing position and level of competition affect soccer skill performance during practice. Soccer clubs and coaches should consider these differences in their assessment and development of youth talent.

*Conclusion*

This study provides evidence that advanced and competitive-level female soccer players’ physical workload and soccer skill performance during team-based practice differs. The

repeated measures soccer practice protocol used for this study found between advance and competitive group differences in physical workload and soccer skill persisted across multiple practice sessions. This study also provided evidence that level of competition, tactical playing position and training activity type interact to effect soccer training activity. However, these results indicate there were no group differences in previous soccer experience, grit and mindset. These results suggest advanced-level female soccer players perform a greater volume of physical work, a high intensity, and maintain superior technical skill performance during practice compared to age-matched competitive players.

#### *Limitations and Future Directions*

This study's use of repeated measures design of the same practice session across time in the assessment of female soccer players' physical workload and technical skill performance during practice is limiting for the following reasons: 1. Soccer practice including the specific type of activities selected by a coach vary 2. A series of soccer practices are typically delivered in micro-cycles in accordance with the team's future match competition schedule. Future longitudinal research is needed to detect potential differences in-season physical workloads (including practice & matches) between female soccer players of distinct competitive-level teams. These studies would also assist in better understanding players' adaptation to soccer practice and corresponding performance development specific to level of competition.

Total number of successful receptions, passes, dribbles, goals scored, tackles, blocks and interceptions were examined to evaluate female soccer players' skill performance in this study. This methodology fails to address the contextual depth and nature of soccer skill performance. Difficulty level of execution per individual skill was not accounted for. Heading performance was not assessed. Future studies aiming to evaluate skill performance are yet needed to

emphasize female soccer skill development and performance across various levels of competition.

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Table 1. Summary of studies examining differences in footballers' physical, physiological, and soccer skill performance characteristics by competitive standard

Study	Year	Sample size (n)	Gender	Subjects	Country	Measurement	Competitive-standard	Significant Results (p > 0.05)	Significant findings (> = better )
1	Gil et al.	2007	241	Male	Spain	Ht (cm); weight (kg), %Fat; Agility (s); VO2max (ml/kg/min)	Selected	Weight (kg) MF 67.41 ± 8.19; BF % D 11.43 ± 1.67; VO2 (ml/kg/min) MF 60.09; Agility (s) F, 4.77; MF, 4.77; D, 4.87; GK,5.06	Positional Differences in Selected > non-selected footballers' physical stature & performance
							Non-selected	Weight (kg) MF 62.10 ± 10.93; BF % D 12.56 ± 2.47; VO2(ml/kg/min) MF 53.2; Agility (s) F, 4.98 ; MF, 5.01; D, 4.98; GK,5.2	

2	Figueiredo et al.	2009	159	Male	U13 Pre-Academy (11-12.9 yr) U15 Academy	Portugal	Ht (cm); weight (kg), Mean Sprint (s); Intermittent Endurance (m); Squat Jump (cm); Dribbling Speed (s)	Elite	<p>Weight (kg) 42.4 ± 8.3; Height (cm) 150.8 ± 8.3; Mean Sprint (s) 8.32 ± 0.31; Intermittent Endurance Run (m) 1997 ± 755; SJ (cm) 27 ± 3.9; Dribbling Speed (s) 14.21 ± 0.76</p> <p>Weight (kg) 36.5 ± 5.0; Height (cm) 143.7 ± 5.9; Mean Sprint (s) 8.80 ± 0.54; Intermittent Endurance Run (m) 1376 ± 697; SJ (cm) 23.4 ± 4.0; Dribbling Speed (s) 15.79 ± 1.68</p> <p>Weight (kg) 39.5 ± 6.4;</p>	Elite > Academy and Drop out physical stature and performance
								Academy	1.68	
								Dropout	39.5 ± 6.4;	

								Height (cm) 143.6 ± 6.1; Mean Sprint (s) 9.06 ± 0.71; Intermittent Endurance Run (m) 1000 ± 562; SJ (cm) 22.8 ± 4.6; Dribbling Speed (s) 16.63 ± 2.00	
								SF (mm) Women 74.4 ± 18.1; YOYOIR1 (m) Men 2414 ± 456, Women 1224 ± 255; 15m Sprint w/ ball (m/s) Women 3.41 ± .32	
3	Mujika et al.	2009	68	Male & Fem ale	Men's Senior 1st Division; Men's U20 4th Division; Women's Senior 1st Division; Women's U20 Junior 2nd Division	Spain	Ht (cm); weight (kg), Skinfolds (mm) 15M Sprint (s); Intermittent Endurance (m); CMJ (cm);	Senior	Male Senior > Male Junior > Female Senior > Female Junior performance
								SF (mm) Junior 95.1 ± 22.3; YOYOIR1	
								Junior	

4	Villalobos et al.	unpublished	60	Female	U14 regional and state-level	USA	Ht (cm); weight (kg); DEXA %; Absolute VO2 (L/min); Relative VO2 (ml/kg/min); vVO2 (km/hr); vVT (km/hr) 30M Sprint Velocity (km/hr); Illinois Agility (s); YOYOIR1 (m)	Regional	(m) Male-Junior 2092 ± 260 , Female-Junior 826 ± 160; 15m Sprint w/ ball (m/s) Female Junior 3.04 ± 0.21  VO2 (L/min): 2.397 ± 0.4; vVO2 (km/hr) 15.3 ± 1.2; vVT (km/hr) 11.6 ± 1.8; 30M (m/s) 5.77 ± 0.3; Agility (s) 17.3 ± 0.7; YOYOIR1 (m) 695 ± 234.7  VO2 (L/min): 2.159 ± 0.4; vVO2 (km/hr) 14.0 ± 1.5; vVT (km/hr)	Regional > State level physiological performance
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									10.2 ± 1.2; 30M (m/s) 5.26 ± 0.2; Agility (s) 18 ± 0.7; YOYOIR1 (m) 475.6 ± 173.5	
5	Vescovi	2011	140	Female	Senior (21-25 yr)	5m, 10m, 20m, 35m Speed (km/hr)		Drafted	5m (km/hr) 15.4 ± 1 ; 10m (km/hr) 18.3 ± 0.9; 20m (km/hr) 21.6 ± 0.8 1; 35m (km/hr) 23.9 ± 0.9 5m (km/hr) 14.8 ± 1.1; 10m (km/hr) 17.8 ± 0.9; 20m (km/hr) 21.0 ± 0.8 1; 35m (km/hr) 23.2 ± 0.9	Drafted > non- drafted
6	Bangsbø et al.	2008	214	Male	International, elite players; moderate	European YOYOIR1		International (n = 25)	YOYOIR1 2420m	High intensity running performance international > elite

				elite; sub-elite players					> moderate elite > sub-elite
							Elite (n = 71)	YOYOIR1 2190m	
							Moderate-Elite (n = 89)	YOYOIR1 2030m	
							Sub-Elite (n = 29)	YOYOIR1 1810m	
				Senior National Team (22.8 ± 3.5 yr); First Division (21.1 ± 3.5 yr); Second Division (20.9 ± 3.4 yr); Junior National (17.1 ± 1.1 yr); Junior (17.5 ± 1.7 yr)					
								VO2 (L/min) = 3.58 ± 0.37; vVO2 (km/hr) = 14.8 ± 1.1	
7	Haugen et al.	2014	199	Female	Norway	VO2max (L/min); vVO2max (km/hr)	Senior (n = 76)		VO2 max National > 1st division. 2nd division > juniors; vVO2max national, 1st division > 2nd division & Juniors
							1st Division (n = 53)	VO2 (L/min) = 3.25 ± 0.30; vVO2	

								(km/hr) = 14.4 ± 0.9	
								VO2 (L/min) = 3.08 ± 0.35;	
							2nd Division (n = 28)	vVO2 (km/hr) = 13.4 ± 1.1	
								VO2 (L/min) = 3.39 ± 0.36;	
							Junior National Team (n = 11)	vVO2 (km/hr) = 13.9 ± 1.1	
								VO2 (L/min) = 3.23 ± 0.38;	
							Junior (n = 17)	vVO2 (km/hr) = 13.2 ± 0.8	
								Elite > non-elite	
								Ht. (cm) 166.36 ± 10.0; SS (mm) 29.26 ± 7.3;	
								Dominant Leg MVC (N) 1,502 ± 35; Non- Dominant Leg MVC (N) 1,438 ± 37;	
8	Hansen et al.	1999	28	Male	Youth (10-12 yr)	Sweden	Ht (cm); Wt (kg); Sum of Skinfolds (mm); MVC (N); Grip Strength (N), Broad Jump (cm)	Elite (n = 16)	Abdominal MVC (N)



									(%) 6.2 ± 1.6	
									Initial 20M (s) 3.6 ± 0.1; Total 20M RSA (s) 23.3 ± 0.4; Fatigue Decrement	Ht & Maximal Aerobic Power National > State
								State (n = 8)	(%) 6.8 ± 2.7	
10	le Gall et al.	2008	143	Male	U16 National Academy	France	Mass (kg); Ht (cm); Body Fat (%); Maximal Aerobic Power (W);	International	Ht (cm) 176.1 ± 7.5; Maximal Aerobic Power (W) 2,716 ± 666	Future International, Professional > Amateur
								Professional	Ht (cm) 175.3 ± 8.2; Maximal Aerobic Power (W) 2,681 ± 95	
								Amateur	Ht (cm) 169.1 ± 8.2; Maximal Aerobic Power (W) 2,435 ± 554	

Table 2. Summary of studies examining effect of maturation on competitive level footballers' physical, physiological, and match activity profiles

Study	Year	Sample size	Gender	Subjects	Country	Measurement	Results	Significant findings (> = better)			
1	Buchheit & Mendez-Villanueva	2014	36	Male	U16 Academy	Qatar	Age (yr.) APHV; Ht (cm); Mass (kg); MSS; MAS, TD; MD@ ≥16km/hr; Peak Speed (km/hr); #HIA; #RHIA	More Mature (n = 16)	Age (yr.) 15 ± 0.2; APHV: +0.9 ± 0.4; Ht (100/0/0); Mass (100/0/0) MSS (100/0/0); MD@ ≥16km/hr; (92/8/0) Peak Speed (92/8/0); #HIA(99/1/0); #RHIA (91/9/0)	Standardized Differences Likely to Almost Certainly More Mature > Less Mature	
2	Malina et al.	2003	69	Male	U15 Academy (13.2-15.1 yr.)	Portugal	Stage of Pubic Hair Development (PH#1-5); Age (yr); Ht(cm); Wt (kg); YOYOIR1 (m); 30M Sprint (s); Vertical Jump (cm)	Less Mature (n = 16)	Age (yr.) 14.1 ± 0.2; APHV: 0.3 ± 0.3	Ht (cm) 155.8 ± 3.1; Wt (kg) 43.5 ± 4.4; YOYOIR1 (m) 1,473 ± 476 ; 30M (s) 5.3 ± 0.3; VJ (cm) 24.9 ± 3.3	PH5 > PH4 > PH3 > PH2 > P1

	Ht (cm)
	159.4 ± 7.0;
	Wt (kg)
	48.0 ± 8.8;
	YOYOIR1
	(m) 2,384 ±
	721; 30M
	(s) 5.2 ±
PH2 (n	0.3; VJ (cm)
= 10)	24.7 ± 3.3
	Ht (cm)
	169.0 ± 4.2;
	Wt (kg)
	57.7 ± 6.3;
	YOYOIR1
	(m) 2,471 ±
	664; 30M
	(s) 4.9 ±
PH3 (n	0.2; VJ (cm)
=13)	28.4 ± 2.1
	Ht
	(cm)167.3 ±
	6.9; Wt (kg)
	57.4 ± 6.3;
	YOYOIR1
	(m) 2,625 ±
	691 ; 30M
	(s) 4.8 ±
PH4 (n	0.2; VJ (cm)
= 21)	31.1 ± 4.5
	Ht (cm)
	175.9 ± 6.0;
	Wt (kg)
	63.9 ± 6.4;
PH5 (n	YOYOIR1
= 19)	(m) 2,655 ±

							409; 30M (s) 4.7 ± 0.2; VJ (cm) 31.9 ± 4.2		
							SSK (mm) 36.9 ± 11; VJ (cm) 40.1 ± 4.5; 30m (s) 4.1 ± 0.2; Endurance Shuttle Run (min) 10.2 ± 1.2	Maturity Status significantly affects Elite, sub-elite > non-elite SSK, VJ, 30M	
3	Vaeyens et al.	200 6 95	Male	U15 Academy	Belgium	TW2; SSK (mm); VJ (cm); 30m (s); Endurance Shuttle Run (min);	Elite (n = 37)	SSK (mm) 37.0 ± 12.1; VJ (cm) 40.3 ± 4.9; 30m (s) 4.2 ± 0.2; Endurance Shuttle Run (min) 9.4 ± 1.4	Maturity Status significantly affects Elite > sub-elite > non-elite ESHR performance
							Non- elite (n= 32)	SSK (mm) 46.6 ± 21.8; VJ (cm) 35.6 ± 5.9; 30m (s) 4.4 ± 0.3; Endurance Shuttle Run (min) 8.7 ± 1.7	

4	Figueiredo et al.	2009	87	Male	U13 Academy (11-12.9 yr)	Portugal	Relative Skeletal Age; Weight (kg); Ht (cm); Sum of skinfolds (mm); Intermittent endurance run (m)	Late	Wt (kg) 33.6 ± 3.6; Ht (cm) 139.4 ± 4.5; SS (mm) 23.2 ± 7.0; IER (m) 1774 ± 725	Early > On-time > Late Anthropometrics
								On-Time	Wt (kg) 37.5 ± 5.1; Ht (cm) 144.6 ± 5.9; SS (mm) 32.4 ± 12.3; IER (m) 1308 ± 657	Late > On-Time > Early Intermittent endurance run distance
								Early	Wt (kg) 42.1 ± 7.1; Ht (cm) 148.4 ± 7.3; SS (mm) 38.5 ± 18.5; IER (m) 1208 ± 788	
5	Edmonds et al.	2020	157	Female	Tier 1 Academy (U10, n=30; U12, n=38; U14, n=43)	England	Ht (cm); Mass (kg); Peak Force (N); CMJ (cm); 30M sprint (s); 505 CoD dominant (s)	Maturity Offset Group 1: '-.2.5 vs. '-1.5 YPHV	Mostly likely Ht (cm) -1.92 ± 0.56; Most likely Mass (kg) -1.23 ± 0.50 ; Most likely Peak Force (N) -	Speed, CoD time, CMJ, and aerobic capacity were all possibly most likely better in more mature players

U16, n  
= 46)

1.39 ± 0.51;  
Unclear  
Relative  
Peak Force  
(N/kg) -.08  
± 0.46;  
Likely CMJ  
(cm) -0.54 ±  
0.47; Very  
Likely 30m  
sprint (s)  
0.68 ± 0.47;  
Likely CoD  
(s) 0.85 ±  
0.48  
Most Likely  
Ht (cm) -  
1.96 ± 0.60;  
Most Likely  
Mass (kg) -  
1.61 ± 0.57  
; Most  
Likely Peak  
Force (N) -  
1.47 ± 0.56;  
Unclear  
Relative  
Peak Force  
(N/kg) -.19  
± 0.50;  
Maturity  
Offset  
Group  
2: '-1.5  
vs -.05  
YPHV  
Likely CMJ  
(cm) -0.65 ±  
0.51;  
Likely 0m  
sprint (s)  
0.65 ± 0.51;

	Unclear
	CoD (s)
	$0.65 \pm 0.51$
	Most Likely
	Ht (cm) -
	$1.36 \pm 0.59$ ;
	Most Mass
	(kg) $-1.71 \pm$
	$0.62$ ;
	Likely Peak
	Force (N) -
	$0.57 \pm 0.55$ ;
	Likely
	Relative
	Peak Force
	(N/kg) $-0.63$
	$\pm 0.55$ ;
	Unclear
	CMJ (cm) -
	$0.26 \pm 0.54$ ;
	Possibly
Maturity	30m sprint
Offset	(s) $0.30 \pm$
Group	$0.54$ ;
3:-0.5	Unclear
vs 0.5	CoD (s)
YPHV	$0.00 \pm 0.53$
	Most Likely
	Ht (cm) -
	$1.04 \pm 0.49$ ;
Maturity	Possibly
Offset	Mass (kg) -
Group	$1.17 \pm 0.50$
4:0.5 vs	; Very
1.5	Likely Peak
YPHV	Force (N) -

	0.88 ± 0.48;
	unclear
	Relative
	Peak Force
	(N/kg) -.23
	± 0.46;
	Possibly
	CMJ (cm) -
	0.26 ± 0.46;
	Unclear
	30m sprint
	(s) 0.21 ±
	0.46;
	Possibly
	CoD (s)
	0.45 ± 0.47
	Very
	Likely Ht
	(cm) -0.62 ±
	0.44; Likely
	Mass (kg) -
	0.41 ± 0.43;
	Very Likely
	Peak Force
	(N) -0.66 ±
	0.44;
	Possibly
	Relative
	Peak Force
	(N/kg) -.41
Maturity	± 0.43;
Offset	Most Likely
Group 5:	CMJ (cm) -
1.5 vs	1.17 ± 0.46;
2.5	Possibly
YPHV	30m sprint

							(s) 0.34 ± 0.43; Likely CoD (s) 0.53 ± 0.43	
							Ht (cm) 148.2 ± 3.8; Mass (kg) 39.2 ± 4.6; Thigh circumference (cm) 35.0 ± 1.7; Calf circumference (cm) 30.2 ± 1.2; 50M sprint (s) 7.99 ± 0.36; Bounding (m) 9.37 ± 0.40	
Itoh & N. Hirose	2020	49	Male	U13 J-League Academy (12.06 ± 0.2 yr)	Japan	Ht (cm); Mass (kg); Thigh circumference (cm); Calf circumference (cm); 50M sprint (s); Bounding (m)	Late (n = 13)	Earl, Average > Late
							Ht (cm) 158.2 ± 6.5; Mass (kg) 45.2 ± 5.7; Thigh circumference (cm) 38.1 ± 2.4; Calf circumference (cm) 33.0 ± 1.8; 50M sprint (s) 7.59 ± 0.36; Bounding	
							Average (n = 22)	

	(m) 10.09 ± 0.60
	Ht (cm) 162.7 ± 6.0;
	Mass (kg) 49.2 ± 6.3;
	Thigh circumferen ce (cm) 38.1 ± 2.6; Calf circumferen ce (cm) 33.5 ± 1.6; 50M sprint (s) 7.58 ± 0.34;
Early (n= 14)	Bounding (m) 9.98± 0.48

Table 3. Summary of studies examining SSGs effect on footballers' training activity, acute physiological responses, and performance characteristics

Study	Year	Sample size	Gender	Subjects	Country	Measurement	Intervention	Results	Significant findings (> = better)	
1	Dellal et al.	2012	24	Male	5th National Division (26.3 ± 4.7 yr)	France	Vameval test (km/hr); 30-15 IFT (km/hr)	SSGs	Pre Vameval (16 km/hr) vs. Post Vameval (17 km/hr); Pre 30-15 (19.5 km/hr) vs. Post 30-15 (20.5 km/hr)	SSGs, HIIT > CON
							HIIT	Pre Vameval (15.75 km/hr) vs. Post Vameval (17 km/hr); Pre 30-15 (19.5 km/hr) vs. Post 30-15 (20.5 km/hr)		
							Control	Pre Vameval (15.75 km/hr) vs. Post Vameval (16 km/hr); Pre 30-15 (19.0 km/hr) vs. Post 30-15 (19.0 km/hr)		
2	Hill-Haas	2009	19	Male	Elite Youth (14.6 ± 0.9 yr)	Australia	VO2 max (ml/kg/min); YOYOIR1 (m)	GTG	VO2 max Pre (60.2 ± 4.6) vs Post (61.4 ± 3.5 ml/kg/min); YOYOIR1 Pre (1,764 ± 256) vs	GTG > SSGs YOYOIR1 (m)

3	Dellal et al.	2011	40	Male	International (27.4 ± 1.5 yr) vs. 4th Division (26.3 ± 2.2 yr)	France	Sprints (#) ; High Intensity Running (m) during 2v2;3v3;4v4 SSGs	SSGs	Post (2,151 ± 261 m) VO2 max Pre (59.3 ± 4.5) vs Post (58.9 ± 5.5 ml/kg/min); YOYOIR1 Pre (1,488 ± 345) vs Post (1,742 ± 362 m)	International > 4th Division TD cover in sprint & HIR across all SSGS
									2v2 Sprint (201.7 ± 20.4 m); 2v2 HIR (282.3 ± 35.4 m); 3v3 Sprint (354.6 ± 45m); 3v3 HIR (473.2 ± 45.3m); 4v4 Sprint (437.7 ± 59.8m); 4v4 HIR (561.5 ± 64.6m)	
								4th Division	2v2 Sprint (174.6 ± 23.3 m); 2v2 HIR (259.1 ± 36.3 m); 3v3 Sprint (313.8 ± 42.9m); 3v3 HIR (427.4 ± 47.8m); 4v4 Sprint (363.0 ± 52.0m); 4v4 HIR (538.9 ± 51.4m)	

4	Impellizzeri et al.	2006	29	Male	Youth Serie C (17.2 ± 0.8 yr)	Italy	VO2 max (l/min); VO2 max (ml/kg/min); Lactate Threshold (%VO2 max)	GTG	Pre: VO2 (3.89 ± 0.31 l/min); LT (81.0 ± 4.3%); Mid: (4.14 ± 0.38 l/min); LT (81.7 ± 3.1%); Post: (4.16 ± 0.39 l/min); LT (84.6 ± 3.4%)	GTG = SSGs
								SSGS	Pre: VO2 (3.96 ± 0.38 l/min); LT (81.5 ± 4.3%); Mid: (4.2 ± 0.42 l/min); LT (82.2 ± 3.6%); Post: (4.2 ± 0.44 l/min); LT (84.7 ± 5.1%)	
5	Rampini et al.	2007	20	Male	Amateur (24.5 ± 41. yr)	Italy	YOYOIR1 (m); RPE (AU); Heart Rate (% of Max); Blood Lactate (mmol·l <sup>-1</sup> )	3 v 3 4 v 4	Pre YOYOIR1 (1,986 ± 334 m); Mid YOYOIR1 (2,117 ± 380 m); Post YOYOIR1 (2,132 ± 380 m); HR (89.4 ± 2.3 %Max); BL (5.5 ± 1.6 mmol·l <sup>-1</sup> ); RPE 7.6 ± 0.9 HR (88.0 ± 2.6 %Max); BL (	3 v 3 > 4 v 4 = 5 v 5 > 6 v 6  Small = Medium < Large Size Fields

							5.0 ± 1.7 mmol-l <sup>-1</sup> ); RPE 7.2 ± 0.9	
						5 v 5	HR (87.4 ± 3.5%Max); BL (4.8 ± 1.6 mmol-l <sup>-1</sup> ); RPE 6.8 ± 1.0	
						6 v 6	HR (85.7 ± 3.4 %Max); BL (4.2 ± 1.5 mmol-l <sup>-1</sup> ); RPE 6.3 ± 1.2	
							Mean HR (183 bpm); Header (2.5); Turn (4); Dribble (3); Receive (7); Pass (17); Block (2.75); Intercept (1.75); Tackle (3.5)	
6	Owen	200	Male	2nd Division Professional (17.46 ± 1.05 yr)	England	1 v 1	Mean HR (183 bpm); Header (2.5); Turn (4); Dribble (3); Receive (7); Pass (17); Block (2.75); Intercept (1.75); Tackle (3.5)	1 v 1, 2 v 2 > 3 v 3, 4 v 4, 5 v 5 in number of technical skill actions performed and greater average intensity
						2 v 2	Mean HR (181 bpm); Header (1.5); Turn (2.5); Dribble (2.75); Receive (13.5); Pass (12); Block (.5); Intercept (1); Tackle (2)	
						3 v 3	Mean HR (167 bpms); Header (0); Turn (2); Dribble (2.5); Receive (4);	

								Pass (8); Block (1); Intercept (.75); Tackle (1.75)	
								Mean HR (160 bpms); Header (.25); Turn (1); Dribble (1); Receive (4); Pass (7); Block (3); Intercept (1); Tackle (2)	
							4 v 4	Mean HR (162 bpms); Header (.5); Turn (.75); Dribble (.75); Receive (3.75); Pass (6); Block (2.5); Intercept (.5); Tackle (1.5)	
							5 v 5		
								%Hrmax (89 ± 4); Blood Lactate (6.7 ± 2.6 mmol-l <sup>-1</sup> ); RPE (13.1 ± 1.5); Avg. Max. Sprint Distance (11.5 ± 3.9 m)	2 v 2 > 4 v 4, 6 v 6 in intensity
Hill- 7 Haas	200 9 16	Male	U19 Top Division (16.3 ± 0.6 yr)	Australia	% Hrmax; Blood Lactate (mmol-l <sup>-1</sup> ); RPE (AU); Total distance (m); Avg. Max. Sprint Distance (m)		2 v 2	% Hrmax (85 ± 4); Blood Lactate (4.7 ± 1.6 mmol-l <sup>-1</sup> ); RPE (12.2 ± 1.8); Avg. Max.	2 v 2 < 4 v 4, 6 v 6 sprint distance

									Sprint Distance (15.3 ± 5.5 m) % Hrmax (83 ± 4); Blood Lactate (4.1 ± 2.0 mmol·l <sup>-1</sup> ); RPE (10.5 ± 1.5); Avg. Max. Sprint Distance (19.4 ± 5.9 m)	
								6 v 6		
8	Fanchini	2011	19	Male	Amateur and Professional (24 ± 4 yr)	Italy	Number of technical actions per min; RPE (AU); %Hrmax	3 v 3 (2 minutes)  3 v 3 (4 minutes)  3 v 3 (6 minutes)	%Hrmax (88.5 ± 3.2); RPE (6.7 ± 1.6)  %Hrmax (89.9 ± 2.5); RPE (6.8 ± 1.4)  %Hrmax (87.8 ± 2.8); RPE (6.8 ± 1.5)	3 v 3 (6 minutes) < 3 v 3 (4 minutes) in %Hrmax  No duration bout effect on technical skill actions  Peak total distance and HSR during 4 v 4, 6 v 6 and 8 v 8 were likely to most likely lower than during match competition (effect size: -0.59 [±0.38] to -7.36 [±1.20]). MechW during 4 v 4 + GK was likely to most likely higher than during match competition (1-4 min;
9	Lacomet al.	2018	21	Male	Champions League (25 ± 5 yr)	France	Total Distance (m); High Speed Distance (> 14.4 km/hr, m); MechW (A.U)	4 v 4 + GK  6 v 6 + GK		

0.61 [ $\pm 0.77$ ] to 2.30  
[ $\pm 0.64$ ].

1	Dellal et	200			1st Division (26 $\pm$ 2.9 yr)	France	% Heart Rate Reserve	30-30 PR (@100% MAS)	%HRres (77.2 $\pm$ 4.6)	30-30 AR, 10-10 PR > 1 v 1, 4 v 4 GK, 8 v 8, 10 v 10 GK
0	al.	8	10	Male				30-30 AR (@%100 MAS)	%HRres (85.7 $\pm$ 4.5)	
								15-15 PR (@100% MAS)	%HRres (80.2 $\pm$ 6.8)	
								10-10 PR (@%110 MAS)	%HRres (85.8 $\pm$ 3.9)	
								5-20 PR (@ %120 MAS)	%HRres (80.2 $\pm$ 6.8)	
								1 v 1	%HRres (77.6 $\pm$ 8.6)	
								2 v 2	%HRres (80.1 $\pm$ 8.7)	
								4 v 4 + GK	%HRres (77.1 $\pm$ 10.7)	
								8 v 8 + GK	%HRres (80.3 $\pm$ 12.5)	
								8 v 8	%HRres (71.7 $\pm$ 6.3)	
								10 vs 10 GK	%HRres (75.7 $\pm$ 7.9)	

1	Jastrzeb	201		Professional (Males: 26 ± 6.1 yr) (Female: 22.5 ± 3.5 yr)	Poland	%Hrmax; Total Distance covered (m)	MALE: 4 v 4 + GK FEMALE : 4 v 4 + GK	TD (2,229.7 ± 188.23 m)  TD (1967.5.7 ± 225.81 m)	Male = Females %Hrmax, but Male > Female in TD
1	Jastrzeb	201		Professional (Males: 27.5 ± 5.14 yr) (Female: 19.1 ± 3.14 yr)	Poland	Standing, Walking: 0-2 m·s- 1, Jogging: 2-4 m·s-1, Running: 4-5.5 m·s-1, High Speed Running: 5.5-7 m·s-1, Sprinting: >7 m·s- 1	SSGS MALE	Walk: (811.4 ± 47.87 m); Jog (997.5 ± 139.01 m); Run (282.6 ± 42.94 m); HSR (84.9 ± 27.55 m), Sprint (5.6 ± 6.23m)	Male > Female in Walking, Running, HSR, and Sprint
2	Jastrzeb ski et al.	201 7	16					Walk: (715.8 ± 5.32 m); Jog (213.3 ± 55.27 m); Run (213.3 ± 55.27 m); HSR (28.0 ± 40.07 m), Sprint -	
1	Mara et al.	201 6	18	Female	Australia	Sprinting Distance; HRZone 4 (>85%Hrmax)	Small SSGS	HSRD/min 24.9 ± 7.2m; HR Zone 4: 69.8 ± 25.9s	L SSGS > Small- Medium SSGS in relative sprint distance;

									HSRD/min 23.0 + 6.5m; HR Zone 4: 62.1 ±31.6s HSRD/min 26.2 ± 8.0m; HR Zone 4: 54.9 ± 27.9s	Small SSGS > L SSGs in time spent HR Zone 4
1 4	Steven et al.	201 5 141	Male & Female	Professio nal Senior, Professio nal Youth, Amateur, Women	Netherla nds	6 v 6 SSG High Speed (m); high acceleration (> 2m/sec); % HRmax	Pro Senior (n=33) Pro Youth (n= 30)  Amateur (n= 62)  Women (n= 16)	HS (693 ± 121m); HR%max (87.7 ± 3.3)  HS (657 ± 140 m); HR%max (90.4 ± 2.8) HS (579 ± 161m); HR%max (89.3 ± 3.7) HS (461 ± 76 m); HR%max (93.3 ± 2.4)	Women < Amateur, Youth, Professional Males in HS Women > Amateur, Youth, Professional Males in SSG intensity	
1 5	Ortiz et al.	201 8 27	Female	Untrained	Brazil	VO2max (ml/kg/min); velocity @ VO2max & Lactate Threshold;	8wk Soccer SSGS (n=17)	VO2 (Pre: 37.0 ± 6.4, Post: 41.4 ± 6 ml/kg/min); vVO2 Pre: 10.6 ± 1.6 Post: 11.4 ± 1.5 km/hr); vLT Pre: 7.24	SSGs = RG in increasing aerobic performance	



Table 4. Summary of studies examining standard of play effect on Female footballers' physical characteristics, technical-skill efficiency, and match activity

Study	Year	Age	Gender	Level	Country	Variables	Comparison	Results
1 Scott & Lovell	2020	22	Female	International and Professional	NWSL	Standing Broad Jump, 30M, vIFT, Total Distance, Total High-Speed Running, Total Very High Speed running, Sprint	International Professional	30M (4.48s), 30M (4.63s)
2 Ramos	2017	45	Female	International, U20, U17	Brazil	Total Distance, TD at High Intensity, TD Spinting, number of accelerations and decelerations, Player load	Senior International U20 U17	
3 Mohr	2008	34	Female	International and Professional	Denmark & Sweden	Total Distance, TD at High Intensity, TD Spinting,	Top Class Elite	Total HID (1.68 ± 0.09km) Total HID (1.33 ± 0.10 km)
4 Andersson	2010	17	Female	International and Professional	Denmark & Sweden	Total Distance, TD at High Intensity, TD Spinting, & Heart Rate	International Domestic	Total HID (1.53 ± 0.1km) Total HID (1.33 ± 0.9km)
5 Mason	2014	51	Female	U17, U20, Senior	New Zealand	vIFT, VO2max	Senior (Starter vs Non-Starters)	vIFT (19.2 ± 1.2 km/hr); VO2max (50.3 ± 2.89 ml/kg/min)



	VO2max (46.5 ± 2.6 ml/kg/min ) pre- LIST1 (67.9 ± 7.9 s) post-List 1 (70.1 ± 5.2 s); Post- List 2 (82.5 ± 6.7 s)
Reserves Sub elite	

## Appendix A

## IRB Approval and Documents



## INSTITUTIONAL REVIEW BOARD

Mail: P.O. Box 3999  
Atlanta, Georgia 30302-3999  
Phone: 404/413-3500

In Person: 3rd Floor  
58 Edgewood  
FWA: 00000129

November 29, 2023

Principal Investigator: James Doyle

Key Personnel: Brandenberger, Kyle; Doyle, James; Ingalls, Christopher; Otis, Jeffrey; Villalobos, Joshua

Study Department: Kinesiology & Health

Study Title: The Effect of Team Competition Level on Youth Female Footballers' Training Activity and Response

Review Type: Expedited Category 4, 7

IRB Number: H24232

Reference Number: 374092

Approval Date: 11/27/2023

Status Check Due By: 11/26/2026

The Georgia State University Institutional Review Board (IRB) reviewed and approved the above referenced study in accordance with 45 CFR 46.111. The IRB has reviewed and approved the study and any informed consent forms, recruitment materials, and other research materials that are marked as approved in the application. The approval period is listed above. Research that has been approved by the IRB may be subject to further appropriate review and approval or disapproval by officials of the Institution.

It is the Principal Investigator's responsibility to ensure that the IRB's requirements as detailed in the Institutional Review Board Policies and Procedures For Faculty, Staff, and Student Researchers (available at [gsu.edu/irb](http://gsu.edu/irb)) are observed, and to ensure that relevant laws and

regulations of any jurisdiction where the research takes place are observed in its conduct.

Federal regulations require researchers to follow specific procedures in a timely manner. For the

protection of all concerned, the IRB calls your attention to the following obligations that you have as Principal Investigator of this study.

1. For any changes to the study (except to protect the safety of participants), an Amendment Form must be submitted to the IRB. The Amendment Form must be reviewed and approved before any changes can take place.
2. Any unanticipated problems occurring as a result of participation in this study must be reported immediately to the IRB using the Unanticipated Problem Form.
3. Principal investigators are responsible for ensuring that informed consent is properly documented in accordance with 45 CFR 46.116.
  - The Informed Consent Form (ICF) used must be the one reviewed and approved by the IRB with the approval dates stamped on each page.
4. A Status Check must be submitted three years from the approval date indicated above.
5. When the study is completed, a Study Closure Form must be submitted to the IRB.

All of the above referenced forms are available online at <http://protocol.gsu.edu>. Please do not hesitate to contact the Office of Research Integrity (404-413-3500) if you have any questions or concerns.

Sincerely,



Katherine Hsieh, IRB Member

Georgia State University Department of Kinesiology and Health

Child Assent Form

Title: The effect of team competition level on youth female footballers' training activity and response

Principal Investigator: Dr. J. Andrew Doyle Student

Principal Investigator: Joshua Villalobos

### **Purpose**

We invite you to take part in a research study. The purpose of the study is to learn about girl soccer players' training. We invite you to take part in this research study because you are a competitive-level girl soccer player aged 15-17.

### **Procedures**

If you decide to take part in this study, you will complete 3 questionnaires about your health, soccer history, and mindset. This will take you 45 minutes. You will wear soccer training gear for testing and practices. You will participate in lab testing for 45- minutes. You will also participate in a 45-minute physical testing session on the soccer field. You will wear chest-strap sensor during a 90-minute team soccer practice. In a month period, you will participate in a total of 3 team soccer practices. You should not do extra soccer training on test and practice days.

Testing session #1 will be at Georgia State University. We will measure height and weight. We will pinch your body 8 times with skinfold calipers to find out how much muscle you have. You will then do 3 jumps to measure jumping power. You will then do an all-out running test on treadmill to measure your running stamina.

Testing session #2 will be at MOBA Soccer Complex. You will sprint 30 meters. Rest for 3 minutes and sprint 30-meters again to determine your fastest sprint speed. You will then perform an agility test. Rest for 3 minutes. Perform the agility test again to measure your fastest agility time.

Testing Session #3-5 will take place at MOBA Soccer Complex (Peachtree City, GA). You will take part in three soccer practices. Each practice will be 90 minutes long. Each practice will be 1 week apart. During practice you will wear a sensor device to measure your heart rate. Your running distance measured. Your running speeds during practice will be recorded. Each practice session will be video recorded to analyze soccer skills.

**Risks**

This study will be physical. You could suffer a muscle injury. You could break a bone. You might feel tired during this study. Since you already play soccer, you will not have any more risks than you would in your regular team's soccer practice.

**Benefits**

This study is not designed to benefit you personally. You can receive your personal fitness information. You can learn your maximal sprint speed and agility time. We hope to gain information about training young female soccer players.

**Voluntary Participation and Withdrawal**

You do not have to be in this study. Your parent/legal guardian and coach cannot make you be in it. If you decide to be in the study, you change your mind. You can drop out at any time. No one will be mad or upset with you if you decide not to be in the study.

**Assent**

We will give you a copy of this Assent Form to keep.

If you are willing to be in this research study, please sign below.

\_\_\_\_\_  
Printed Name of Participant

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Principal Investigator or Researcher Obtaining Assent

\_\_\_\_\_  
Date



## Georgia State University

### Parental Permission Form and Informed Consent Form

Title: The effect of team competition level on youth female footballers' training activity and response

Principal Investigator: Dr. J. Andrew Doyle Student

Principal Investigator: Joshua Villalobos

#### **Introduction and Key Information**

We invite you and your child to take part in a research study. You will decide if you would like for you and your child to take part in the study.

The purpose of this study is to learn about the physical performance of young female soccer players.

Your role in the study will last 6 hours and 45 minutes over a 1-month period.

Your child's role in the study will last 6 hours and 45 minutes over a 1-month period.

We will ask you to do the following:

- To assist your child with 3 questionnaires (45-minutes)
- To be present at 1 laboratory testing session (45-minutes)
- To be present at 1 field-based testing session (45-minutes)
- To be present at 3 soccer practices (90-minutes each)
- If needed, during soccer practice to assist your child with positioning a sensor around their chest
- To not allow your child to do extra training on research days
- We will ask your child to do the following:

- To answer 3 questionnaires at beginning of laboratory testing session
- To stand still while research staff gently pinches skin away from the body at 4 spots using a measuring device
- To perform 3 maximal jumps on a platform during laboratory testing session
- To complete a maximal running endurance test on treadmill during laboratory testing session
- To sprint a 30-meter distance twice during field-based testing session
- To run an agility test twice during field-based testing session
- To wear a sensor around their chest while participating in 3 soccer practices
- To not do extra training on research days

You and your child will not have any more risks than you would have in a typical day of regular soccer practice.

This study is not designed to benefit you and your child. We hope to gain a better understanding of female soccer.

If you do not wish for you and your child to take part in this study, your child can decide not to participate.

### **Purpose**

The purpose of the study is to learn about the physical performance of young female soccer players. We invite you and your child to take part in this research study because your child is competitive female soccer player aged 15-17. We will invite a total of 60 people to be in this study.

### **Procedures**

If you decide for you and your child to take part in this study, you and your child will complete questionnaires. The questionnaires will ask about your child's health, previous soccer history and mindset. If your child meets this study's requirements, she will be invited to be in the study. She will not be allowed to be in this study if your child is injured, not a 15–17-year-old female, or not currently a registered member of a Georgia Youth Soccer, Girls' Academy League, or ECNL level team. Your child will be able to be in this study if she is an uninjured 15- to 17-year-old female currently competing on a United States Youth Soccer Association, Girls' Academy League, or ECNL level team.

If you and your child decide to be in the study, you both will need to attend 1 hour and 30 minutes of laboratory testing, 45 minutes of sprint and agility testing. You and your child will also attend about 4 hours and 30 minutes of soccer practice.

You and your child will complete 3 questionnaires before participating in the laboratory testing.

- Health Questionnaire
- Soccer History Questionnaire
- Grit/Mindset Questionnaire

Session 1 will take place in our lab at Georgia State University. We will measure your child's height and weight. We will take skinfold measurements on the body to find out how much muscle, bone, and fat your child has. The 4 spots to be measured will be abdominal, triceps, middle of thigh and hip regions of body. Your child will do 3 vertical jumps to measure jump height and power. Your child will do a maximal effort running test on a treadmill to measure her breathing and running stamina.

Session 2 will take place at MOBA Soccer Complex (Peachtree City, GA). Your child will do two 30-meter sprints with a 3-minute rest in between to determine your child's fastest sprint speed. Your child will also do two agility sprint tests with a 3- minute rest in between to determine your child's fastest agility time.

Sessions 3-5 will take place at MOBA Soccer Complex (Peachtree City, GA). Your child will take part in three 90-minute soccer practices/training sessions. The practice/training sessions will be at least 1 week apart. During the practice your child will wear a monitor and tracking device to measure heart rate, running distance, and running speed. The training session will be video recorded to analyze soccer skills such as passing, receiving, and dribbling.

### **Future Research**

We may use you and your child's information for future research. We will remove information that may identify you and your child. We will not ask for permission from you if we do this.

### **Risks**

Because your child is a competitive soccer player the risk of injury from doing the sprints, agility tests, and soccer training sessions in this research study is low and is not different from your child's usual soccer activities. If your child is injured during the study notify research personnel. During the lab tests, the skinfold measurement for body composition will require your child to expose their bare skin at 4 locations. The researcher will then use two fingers to softly pinch your child's skin away from the body for less than 2 seconds to perform measurement using calipers. Your child will need to stand still for a total of 5 minutes while the researcher completes skinfold measurement. These calipers are safe and will not hurt your child. During the treadmill exercise test there is a chance that your child may experience shortness of breath, dizziness, fatigue, chest, or muscle pain. If your child experiences any of these things she needs to inform research staff. Trained staff will stop the test. Staff will lead your child through a safe cool-down. If needed staff will call emergency medical personnel.

### **Benefits**

This study is not designed to benefit you or your child personally. You and your child will have the opportunity to receive your child's personal fitness information which may be helpful for her soccer training. We hope to gain information that will help us better understand training young female soccer players.

## **Alternatives**

The alternative to taking part in this study is to not take part in the study.

## **Voluntary Participation and Withdrawal**

You and your child do not have to be in this study. If you decide for you and your child to be in the study and change your mind, you and your child can drop out at any time. You and your child can skip questions. If you and your child do not take part or if you or your child leave the study early, you and your child will not lose any benefits that you are otherwise entitled to.

Your child cannot take part in the study without your participation. If you or your child leave the study early, the other participant will also be removed from the study.

## **Confidentiality**

We will keep your and your child's records private to the extent required by law. The following people and groups will have access to the information you and your child provide:

- Dr. J. Andrew Doyle and Joshua Villalobos
- GSU Institutional Review Board
- Office for Human Research Protection (OHRP)

We will use a participant number rather than your child's name on study records. Video recordings of soccer training sessions will be edited to protect your child's identity and will be deleted when the study is finished. Video recordings and other information will be stored on a computer that has password and firewall protection. Physical study files will be kept in a locked office in the GSU Laboratory. Within 2 months after completing the study video recordings with participant number codes and the file that links participant numbers to names will be destroyed. Your child's name and other facts that might identify your child will not appear in the database or when we present this study or publish its results.

The findings will be summarized and reported in group form. Your child will not be identified personally.

### **Contact Information**

You can contact Dr. J. Andrew Doyle at (404) 413-8478 and [adoyle@gsu.edu](mailto:adoyle@gsu.edu) or Joshua Vilalobos at (470) 409-9393 and [jvillalobos3@gsu.edu](mailto:jvillalobos3@gsu.edu).

- If you have questions about the study or your or your child's part in it
- If you have questions, concerns, or complaints about the study
- If you think you or your child have been harmed by the study

The IRB at Georgia State University reviews all research that involves human participants. You can contact the IRB if you would like to speak to someone who is not involved directly with the study. You can contact the IRB for questions, concerns, problems, information, input, or questions about your and your child's rights as a research participant. Contact the IRB at 404-413-3500 or [irb@gsu.edu](mailto:irb@gsu.edu).

### **Parental Permission and Informed Consent**

We will give you a copy of this Parental Permission Form and Informed Consent Form to keep.

If you are willing for you and your child to be in this research study, please sign below.

---

Printed Name of Minor Participant

---

Printed Name of Adult Participant

---

Signature of Adult Participant

---

Date

---

Principal Investigator or Researcher Obtaining Informed Consent

---

Date

---

## Short Grit Scale

*Directions for taking the Grit Scale: Please respond to the following 8 items. Be honest – there are no right or wrong answers!*

1. New ideas and projects sometimes distract me from previous ones. \*
  - Very much like me
  - Mostly like me
  - Somewhat like me
  - Not much like me
  - Not like me at all
  
2. Setbacks don't discourage me.
  - Very much like me
  - Mostly like me
  - Somewhat like me
  - Not much like me
  - Not like me at all
  
3. I have been obsessed with a certain idea or project for a short time but later lost interest. \*
  - Very much like me
  - Mostly like me
  - Somewhat like me
  - Not much like me
  - Not like me at all
  
4. I am a hard worker.
  - Very much like me
  - Mostly like me
  - Somewhat like me
  - Not much like me
  - Not like me at all
  
5. I often set a goal but later choose to pursue a different one. \*
  - Very much like me
  - Mostly like me
  - Somewhat like me
  - Not much like me
  - Not like me at all
  
6. I have difficulty maintaining my focus on projects that take more than a few months to complete. \*
  - Very much like me
  - Mostly like me
  - Somewhat like me
  - Not much like me
  - Not like me at all

7. I finish whatever I begin.

- Very much like me
- Mostly like me
- Somewhat like me
- Not much like me
- Not like me at all

8. I am diligent.

- Very much like me
  - Mostly like me
  - Somewhat like me
  - Not much like me
  - Not like me at all
- 
-

## Player Soccer History Survey

1. List your Date of Birth?  
\_\_\_\_\_
2. What is your current age?  
\_\_\_\_\_
3. What is the total number of years you have played soccer?  
\_\_\_\_\_
4. What is the total number of years you have played club-level soccer?  
\_\_\_\_\_
5. What is the total number of years playing soccer at current-level of competition?  
\_\_\_\_\_
6. What is the total number of years you have been a member of your current team?  
\_\_\_\_\_
7. What is your current tactical position (forward, midfielder, defender)?  
\_\_\_\_\_
8. What is the total number of years you have played your current tactical position?  
\_\_\_\_\_
9. What is the total number of hours per week you spend training with your current team?  
\_\_\_\_\_
10. What is the total number of hours per week you spend training by yourself or without your team?  
\_\_\_\_\_

## Mindset Survey

1. You have a certain amount of intelligence, and you can't really do much to change it.

1 = strongly agree; 2 = agree, 3 = mostly agree, 4 = mostly disagree; 5 = disagree, 6 = strongly disagree

2. You have a certain amount of soccer ability, and you can't really do much to change it.

1 = strongly agree; 2 = agree, 3 = mostly agree, 4 = mostly disagree; 5 = disagree, 6 = strongly disagree

3. No matter how much soccer ability you have, you can always change it quite a bit.

1 = strongly agree; 2 = agree, 3 = mostly agree, 4 = mostly disagree; 5 = disagree, 6 = strongly disagree

## Appendix B

### Overview of 75-minute Team-based Football Training Session

#### **Experimental TeamBased Training Session**

Duration 75 minutes

##### **Dynamic Warm Up**

Pitch Size: 15 x 10M; Area per player: 7.5 m<sup>2</sup>

Total Duration: (12 min: 3 min recovery) = 15 minutes

##### **Technical Skill Activity: Shape Passing + Shooting**

Pitch Size: 20 x 10M; Area per player: 20 m<sup>2</sup>

Total Duration: (2 x 4 min: 2 min recovery) = 12 minutes

##### **PossessionBased Activity: 4 v 4 +2**

Pitch Size: 35 x 30M; Area per player: 105 m<sup>2</sup>

Total Duration: (2 x 6 min: 3 min recovery) = 18 minutes

##### **Small-sided Game: 5 v5 + GK**

Pitch Size: 35 x 30M; Area per player: 87.5 m<sup>2</sup>

Total Duration: (2 x 5 min: 3 min recovery) = 16 minutes

##### **Scrimmage Game: 11 v 11**

Pitch Size: 120 x 80M; Area per player: 87.5 m<sup>2</sup>

Total Duration: (1 x 12 min: 3 min recovery) = 15 minutes

## Appendix C

## Experimental Team-Based Training Session Warm Up



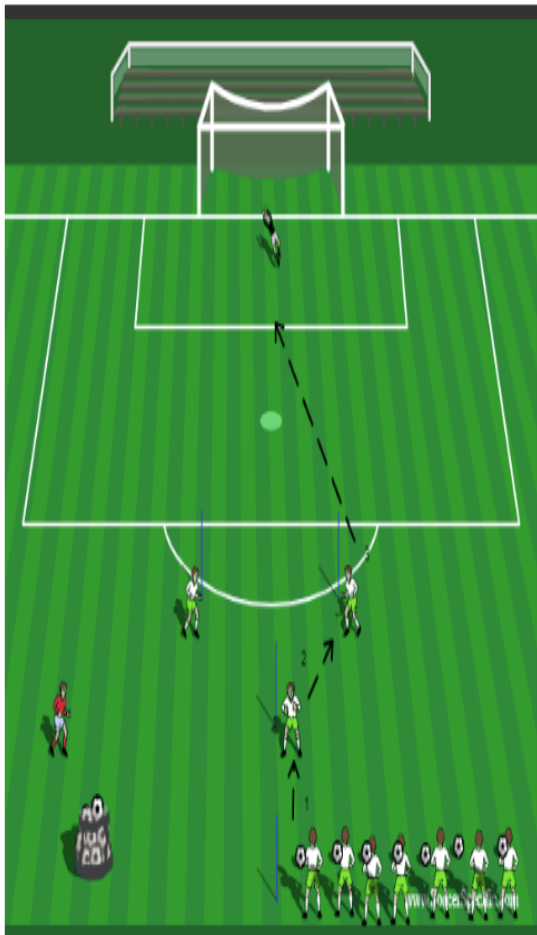
**Setup:** 15 m x 10 m (Duration 12 minutes)

**Instructions:** 1. Forward Jog 2. Backward Jog 3. Side Shuffle 4. Diagonal Side Shuffle (Forward 2 Right + 2 Left) 5. Diagonal Side Shuffle (Backward 2 Right + 2 Left) 6. Quadriceps Hold to Extension 7. Side Lunge 8. Single Leg RDL 9. High Knees to Accel 10. Power Skip to Accel 11. 2 Headers to Accel 12. Side Shuffle to Accel 13. Dribble Accel to COD to Shoot to Accel

**Coaching Points:**

## Appendix D

## Experimental Team-Based Training Session Technical Activity



**Setup:** 4 Poles (10M apart in "Y" Shape)

2 x 4 minutes with 2 minute recovery

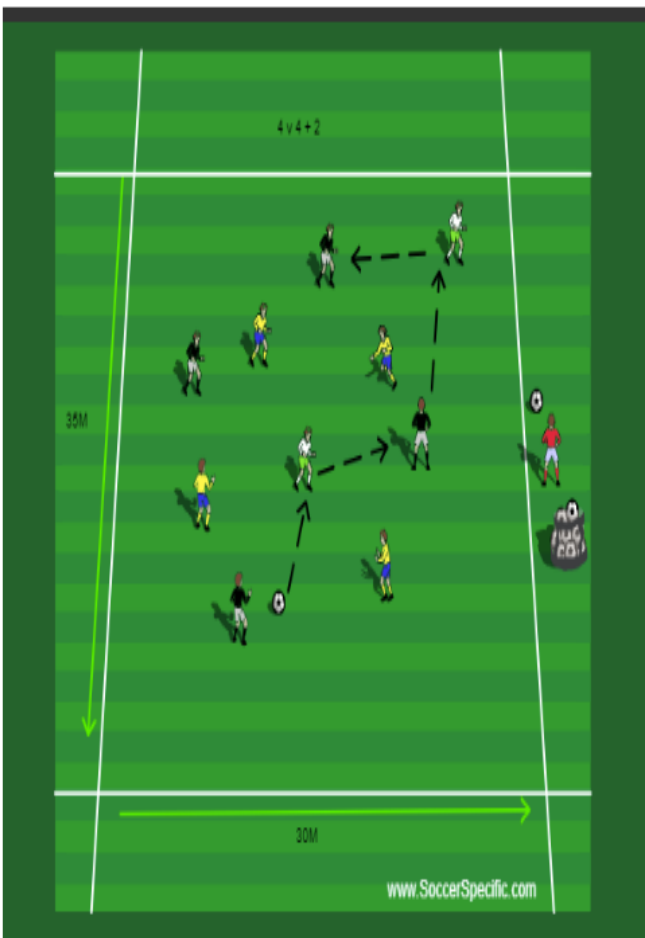
**Instructions:** Variation #1: Player 1 passes to Player 2; Player 2 turns passes to Player 3; Player 3 makes attempt to score

Variation #2: Player 1 passes to Player ; Player 2 returns pass to Player 1; Player 1 passes to Player 3; Player 3 turns and makes goalscoring attempt

**Coaching Points:**

## Appendix E

## Experimental Team-Based Training Session Possession-based Game



**Setup:** 4 v 4 + 2 (Neutrals)

**Instructions:** 2 x 6 minutes (3 minute passive recovery)

10 passes = 1 goal

Neutrals participate with team in ball possession

**Coaching Points:**

## Appendix F

## Experimental Team-Based Training Session Small-sided Game



**Setup:** 5 v 5 + GK

2 x 5 minutes (3 minutes recovery)

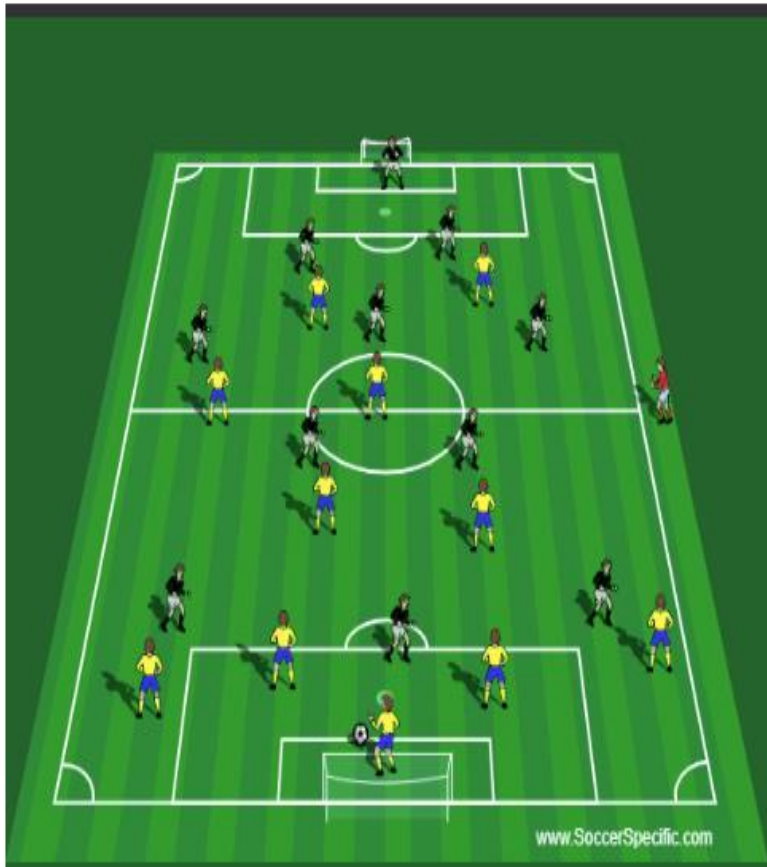
**Instructions:** 35M x 30M

Restarts from Coach

**Coaching Points:**

## Appendix G

## Experimental Team-Based Training Session Full-sided Intersquad Scrimmage



**Setup:** 11 v 11 Scrimmage

**Instructions:** 120M x 80M

1 x 12 minutes (3 minute recovery)

**Coaching Points:**

Appendix H  
The Technical Analysis Parameters  
(Owen et al., 2004)

Technical Skill Definitions for Proposed Study	
Skill	Definition
Pass Attempt	Player in possession attempts to send ball to a teammate
Successful Pass	Player in possession successfully sends ball to a teammate
Reception Attempt	Player attempts to gain control of ball to keep possession
Successful Reception	Player successfully gains control of ball and keeps possession
Dribble Attempt	Player in possession, with ball at feet attempts to run with ball to beat opponent
Successful Dribble	Player in possession, with ball at feet runs with ball and beats opponent
Shot Attempt	Player in possession, makes attempt to scoring a goal
Shot On Target	Player in possession, makes attempt to score a goal, attempt is within framework of goal
Goal Scored	Player in possession, makes attempt to score a goal and scores
Tackle Attempt	An action intending to steal ball possession from opponent
Successful Tackle	Player successful gains ball possession from opponent
Block Attempt	An attempted action where ball strikes defending player and denies pass/shot from intended target
Successful Block	Successful attempted action where ball does strike defending player and denies pass/shot from intended target
Interception Attempt	An attempt to regain possession, by preventing opponent's pass from reaching intended destination
Successful Interception	Regaining of possession by, successful preventing opponent's pass from reaching intended target

Appendix I

## Pre-Training Readiness Survey

GSU Soccer Research

Readiness to Train Survey

Athlete Name:

Date:

Score:

1. How sore do you feel today?
  1. Extremely sore
  2. Very sore
  3. Average sore
  4. A little sore
  5. Not sore at all
  
2. How tired do you feel today?
  1. Extremely tired
  2. Very tired
  3. Average
  4. A little tired
  5. Totally fresh, not tired at all
  
3. Overall, how ready are you for training?
  1. 0%, I should not train.
  2. 25%
  3. 50%
  4. 75%
  5. 100%

## Pre-Training Readiness Raw Data

Player ID	Level	Session 1	Session 2	Session 3
1	1	4.30	3.60	4.33
2	1	4.30		4.30
3	1	3.33	3.60	3.66
4	1	4.60	4.00	
5	1	5.00	4.60	4.30
6	1	4.30	4.30	4.00
7	1	5.00	5.00	4.60
8	1	4.00	3.00	3.33
9	1	4.60	4.00	4.00
10	1	4.60	4.60	5.00
11	1	3.66	4.60	4.60
12	1	4.00	1.00	4.00
13	1	5.00	5.00	4.60
14	1	4.00	4.30	4.60
15	1	4.60	5.00	5.00
16	1	4.00	4.30	4.30
17	1	4.30	4.30	
18	1	5.00	4.60	4.60
19	1	4.00	3.33	3.00
20	1			4.00
21	2	4.60	4.6	5.00
22	2	4.30	4.6	4.00
23	2	4.60	4	4.00
24	2	4.00	3.6	4.60
25	2	4.60	4.6	4.60
26	2	4.30	3.33	4.30
27	2	4.60	4.3	3.33
28	2	5.00	4	4.60
29	2	4.00	4.6	4.60
30	2	3.66	4.3	4.00
31	2	4.60	4.6	
32	2	3.33	4.6	4.00
33	2	4.60	4.6	5.00
34	2	4.30	5	3.60
35	2	4.30	4.6	4.00
36	2	4.30	4.3	4
37	2	3.33		
38	2			4.00

39	2			5.00
40	2			

Values are expressed in percent score (%) with score of 5 = 100% Readiness for Subsequent Training

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Appendix J  
Muscle Load Raw Data

Player ID	Level ID	Position ID	ML S1	ML S2	ML S3	ML Mean
1	1	1	369	211	367	315.6667
2	1	1	305	255	292	284
3	1	3	362	320	348	343.3333
4	1	3	338	222	293	284.3333
5	1	1	273	237	285	265
6	1	3	371	309	342	340.6667
7	1	2	293	236	301	276.6667
8	1	2	302	252	272	275.3333
9	1	2	365	286	353	334.6667
10	1	3	283	245	270	266
11	1	3	314	288	322	308
12	1	2	340	247	312	299.6667
13	1	1	403	312	259	324.6667
14	1	1	280	242	301	274.3333
15	1	3	331	240	289	286.6667
16	1	1	316	184	283	261
17	1	1	329	245	143	239
18	1	3	265	178	262	235
19	1	3	334	233	319	295.3333
20	1	2	125	239	290	264.5
21	2	3	241	270	251	254
22	2	3	295	238	229	254
23	2	3	318	343	232	297.6667
24	2	1	305	264	223	264
25	2	1	300	326	324	316.6667
26	2	3	257	252	254	254.3333
27	2	2	261	160	231	217.3333
28	2	2	261	179	272	237.3333
29	2	1	283	231	228	247.3333
30	2	2	304	237	315	285.3333
31	2	1	327	292	297	305.3333
32	2	1	280	325	164	256.3333
33	2	3	352	272	256	293.3333
34	2	3	279	283	31	281
35	2	1	264	300	241	268.3333
36	2	3	156	249	285	230
37	2	2	128	3	274	201

38	2	2	0	16	176	176
39	2	2	0	23	201	201
40	2	3	0	213	348	280.5

Values are expressed in Arbitrary units (a.u)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

Training Session # Identification: S1 = Training Session #1; S2 = Training Session #2. S3 = Training Session #3

ML = Muscle Load

PLAYER ID	LEVEL ID	POSITION ID	TRAINING ACTIVITY ID	Session 1 ML	Session 2 ML	Session 3 ML
1	1	1	1	39	22	23
2	1	1	1	27	23	21
3	1	3	1	39	23	20
4	1	3	1	31	24	21
5	1	1	1	22	23	23
6	1	3	1	35	15	6
7	1	2	1	18	0	22
8	1	2	1	24	19	22
9	1	2	1	32	19	20
10	1	3	1	26	23	20
11	1	3	1	30	27	29
12	1	2	1	32	22	21
13	1	1	1	38	21	20
14	1	1	1	24	28	19
15	1	3	1	30	16	27
16	1	1	1	28	17	32
17	1	1	1	29	25	24
18	1	3	1	24		25
19	1	3	1	29		22
20	1	2	1	25		21
21	2	3	1	21	9	21
22	2	3	1	35	12	14
23	2	3	1	17	17	15
24	2	1	1	34	26	14
25	2	1	1	21	4	18
26	2	3	1	21	6	32

27	2	2	1	20	29	25
28	2	2	1	22	23	16
29	2	1	1	16	20	19
30	2	2	1	30	24	23
31	2	1	1	22	9	15
32	2	1	1	33	13	15
33	2	3	1	24	18	21
34	2	3	1	29	23	31
35	2	1	1	21	9	17
36	2	3	1	19	17	19
37	2	2	1		3	15
38	2	2	1		16	10
39	2	2	1		23	13
40	2	3	1		20	
1	1	1	2	24	26	30
2	1	1	2	23	19	21
3	1	3	2	24	28	24
4	1	3	2	20	17	15
5	1	1	2	16	17	16
6	1	3	2	28	29	29
7	1	2	2	20	19	18
8	1	2	2	19	17	18
9	1	2	2	28	22	27
10	1	3	2	20	19	17
11	1	3	2	23	22	18
12	1	2	2	24	22	20
13	1	1	2	28	24	17
14	1	1	2	19	20	24
15	1	3	2	22	12	15
16	1	1	2	20	20	20
17	1	1	2	19	18	24
18	1	3	2	19	15	18
19	1	3	2	25	22	23
20	1	2	2		16	18
21	2	3	2	20	21	19
22	2	3	2	21	17	12
23	2	3	2	31	17	12
24	2	1	2	12	15	14
25	2	1	2	26	19	20
26	2	3	2	18	17	17
27	2	2	2	14		21
28	2	2	2	12	15	16
29	2	1	2	19	15	15

30	2	2	2	11	16	19
31	2	1	2	21	11	18
32	2	1	2	15	19	14
33	2	3	2	26	21	25
34	2	3	2	18	16	
35	2	1	2	21	23	18
36	2	3	2	21	18	16
37	2	2	2	10		11
38	2	2	2			15
39	2	2	2			15
40	2	3	2		20	26
1	1	1	3	59	43	52
2	1	1	3	49	39	43
3	1	3	3	60	46	49
4	1	3	3	54	37	42
5	1	1	3	45	37	43
6	1	3	3	61	52	54
7	1	2	3	17	37	43
8	1	2	3	49	36	33
9	1	2	3	55	43	47
10	1	3	3	45	41	42
11	1	3	3	47	46	51
12	1	2	3	51	42	45
13	1	1	3	60	49	38
14	1	1	3	38	37	46
15	1	3	3	52	41	35
16	1	1	3	48	41	42
17	1	1	3	50	36	39
18	1	3	3	38	31	37
19	1	3	3	50	43	49
20	1	2	3		47	46
21	2	3	3	44	51	55
22	2	3	3	46	33	39
23	2	3	3	61	52	40
24	2	1	3	41	42	38
25	2	1	3	55	51	55
26	2	3	3	40	42	44
27	2	2	3	35		39
28	2	2	3	47	5	50
29	2	1	3	36	30	36
30	2	2	3	47	36	50
31	2	1	3	55	52	58
32	2	1	3	39	52	41

33	2	3	3	66	54	70
34	2	3	3	42	37	
35	2	1	3	47	63	39
36	2	3	3	44	37	52
37	2	2	3	47		49
38	2	2	3			42
39	2	2	3			2
40	2	3	3		49	58
1	1	1	4	59	50	57
2	1	1	4	40	43	47
3	1	3	4	55	59	56
4	1	3	4	50	38	46
5	1	1	4	41	42	40
6	1	3	4	58	55	54
7	1	2	4	49	41	46
8	1	2	4	42	39	32
9	1	2	4	46	47	47
10	1	3	4	44	48	40
11	1	3	4	45	44	50
12	1	2	4	45	41	46
13	1	1	4	54	51	43
14	1	1	4	38	43	48
15	1	3	4	48	40	42
16	1	1	4	45	37	34
17	1	1	4	43	39	39
18	1	3	4	37	32	38
19	1	3	4	46	44	43
20	1	2	4		43	44
21	2	3	4	46	55	50
22	2	3	4	40	35	35
23	2	3	4	54	48	37
24	2	1	4	52	36	37
25	2	1	4	42	58	56
26	2	3	4	41	33	44
27	2	2	4	49	0	35
28	2	2	4	32	0	41
29	2	1	4	54	36	38
30	2	2	4	38	33	48
31	2	1	4	61	43	37
32	2	1	4	39	48	39
33	2	3	4	46	53	66
34	2	3	4	37	37	
35	2	1	4		51	36

36	2	3	4		34	50
37	2	2	4			45
38	2	2	4			45
39	2	2	4			12
40	2	3	4		53	61
1	1	1	5	44	30	42
2	1	1	5	35	20	32
3	1	3	5	43	27	42
4	1	3	5	37	25	31
5	1	1	5	34	24	33
6	1	3	5	43	30	39
7	1	2	5	42	27	36
8	1	2	5	37	31	35
9	1	2	5	46	28	38
10	1	3	5	34	21	35
11	1	3	5	39	33	35
12	1	2	5	37	33	35
13	1	1	5	45	39	29
14	1	1	5	35	20	32
15	1	3	5	38	33	34
16	1	1	5	38	34	32
17	1	1	5	38	33	14
18	1	3	5	30	26	27
19	1	3	5	41	35	33
20	1	2	5		33	38
21	2	3	5	39	35	30
22	2	3	5	32	32	23
23	2	3	5	38	46	24
24	2	1	5	34	27	23
25	2	1	5	42	37	35
26	2	3	5	32	35	25
27	2	2	5	28	29	13
28	2	2	5	37	28	36
29	2	1	5	35	23	25
30	2	2	5	37	27	35
31	2	1	5	48	37	28
32	2	1	5	34	43	28
33	2	3	5	49	32	35
34	2	3	5	31	27	
35	2	1	5	37	39	29
36	2	3	5	38	29	29
37	2	2	5	35		27
38	2	2	5			30

39	2	2	5			28
40	2	3	5		36	49
1	1	1	6	39	36	41
2	1	1	6	32	34	32
3	1	3	6	38	43	37
4	1	3	6	38	24	33
5	1	1	6	28	29	31
6	1	3	6	38	43	36
7	1	2	6	35	32	33
8	1	2	6	26	32	27
9	1	2	6	40	37	39
10	1	3	6	26	30	28
11	1	3	6	29	27	35
12	1	2	6	34	11	27
13	1	1	6	40	34	28
14	1	1	6	30	27	30
15	1	3	6	35	29	32
16	1	1	6	39	28	32
17	1	1	6	33	30	3
18	1	3	6	30	20	29
19	1	3	6	36	10	35
20	1	2	6		31	6
21	2	3	6	36	34	28
22	2	3	6	33	29	21
23	2	3	6	39	43	25
24	2	1	6	32	28	25
25	2	1	6	41	38	37
26	2	3	6	27	28	24
27	2	2	6	29	13	7
28	2	2	6	34	22	30
29	2	1	6	30	23	22
30	2	2	6	38	18	32
31	2	1	6	45	32	35
32	2	1	6	27	35	27
33	2	3	6	52	0	39
34	2	3	6	29	25	
35	2	1	6	39	29	26
36	2	3	6	34	23	31
37	2	2	6	36		25
38	2	2	6			34
39	2	2	6			28
40	2	3	6		35	41
1	1	1	7	105	4	122

2	1	1	7	99	77	96
3	1	3	7	103	94	120
4	1	3	7	108	57	105
5	1	1	7	87	65	99
6	1	3	7	108	85	124
7	1	2	7	112	80	103
8	1	2	7	105	78	105
9	1	2	7	118	90	135
10	1	3	7	88	63	88
11	1	3	7	101	89	104
12	1	2	7	117	76	118
13	1	1	7	138	94	84
14	1	1	7	96	67	102
15	1	3	7	106	69	104
16	1	1	7	98	7	91
17	1	1	7	117	64	
18	1	3	7	87	54	88
19	1	3	7	107	79	114
20	1	2	7	100	69	117
21	2	3	7	76	95	88
22	2	3	7	88	80	85
23	2	3	7	78	120	79
24	2	1	7	100	90	72
25	2	1	7	73	119	103
26	2	3	7	78	91	68
27	2	2	7	86	89	91
28	2	2	7	77	86	83
29	2	1	7	93	84	73
30	2	2	7	103	83	108
31	2	1	7	75	108	106
32	2	1	7	93	115	
33	2	3	7	89	94	
34	2	3	7	93	118	
35	2	1	7	99	86	76
36	2	3	7		91	88
37	2	2	7			102
38	2	2	7			
39	2	2	7			103
40	2	3	7			113

Values are expressed in Arbitrary units (a.u)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

Training Activity Identification: 1 = Shooting Activity 1; 2 = Shooting Activity

3 = Possession-Based Activity 1; 4 = Possession-Based Activity 2

5 = 5 v 5 + GK Activity 1; 6 = 5 v 5 + GK Activity 2

7 = 11 v 11 Scrimmage Activity

ML = Muscle Load

Appendix J2  
Muscle Load Data Descriptives

			Descriptive Statistics			
	LevelID	PositionID	TrainingTypeID	Mean	Std. Deviation	N
Session1MuscleLoad	Advanced	Forward	Shooting Activity 1	29.5714	6.55381	7
			Shooting Activity 2	21.2857	3.98808	7
			Possession 1	49.8571	7.69044	7
			Possession 2	45.7143	7.82548	7
			5 v 5 #1	38.4286	4.42934	7
			5 v 5 #2	34.4286	4.85994	7
			11 v 11 + GK Scrimmage	103.8333	17.72475	6
			Total	44.9583	25.48672	48
	Midfielder	Midfielder	Shooting Activity 1	26.5000	6.80686	4
			Shooting Activity 2	22.7500	4.11299	4
			Possession 1	43.0000	17.51190	4
			Possession 2	45.5000	2.88675	4
			5 v 5 #1	40.5000	4.35890	4
			5 v 5 #2	33.7500	5.79511	4
			11 v 11 + GK Scrimmage	110.4000	7.76531	5
			Total	48.2759	30.79993	29
	Defender	Defender	Shooting Activity 1	31.8333	4.53505	6
			Shooting Activity 2	22.6250	3.02076	8
			Possession 1	50.8750	7.67998	8
			Possession 2	47.8750	6.57783	8
			5 v 5 #1	38.1250	4.48609	8
			5 v 5 #2	33.7500	4.74342	8
			11 v 11 + GK Scrimmage	101.0000	8.68496	8
			Total	47.1296	25.07727	54
	Total	Total	Shooting Activity 1	29.6471	5.95757	17
			Shooting Activity 2	22.1579	3.48430	19
			Possession 1	48.8421	10.17766	19
			Possession 2	46.5789	6.31854	19
			5 v 5 #1	38.7368	4.29266	19
			5 v 5 #2	34.0000	4.72582	19
			11 v 11 + GK Scrimmage	104.3684	12.05179	19
Total			46.5878	26.40626	131	

Competitive	Forward	Shooting Activity 1	24.5000	7.28697	6
		Shooting Activity 2	19.0000	4.93964	6
		Possession 1	45.5000	8.19146	6
		Possession 2	49.6000	9.01665	5
		5 v 5 #1	38.3333	5.60952	6
		5 v 5 #2	35.6667	7.03325	6
		11 v 11 + GK Scrimmage	88.0000	13.07670	5
		Total	41.6500	21.72503	40
	Midfielder	Shooting Activity 1	24.0000	5.29150	3
		Shooting Activity 2	11.5000	.70711	2
		Possession 1	47.0000	.00000	2
		Possession 2	39.6667	8.62168	3
		5 v 5 #1	34.0000	5.19615	3
		5 v 5 #2	33.6667	4.50925	3
		11 v 11 + GK Scrimmage	88.6667	13.20353	3
		Total	40.8947	24.10370	19
	Defender	Shooting Activity 1	23.7143	6.29058	7
		Shooting Activity 2	22.8333	4.79236	6
		Possession 1	50.1667	10.62858	6
		Possession 2	45.4000	5.54977	5
		5 v 5 #1	38.0000	6.22896	6
		5 v 5 #2	36.8333	8.42417	6
		11 v 11 + GK Scrimmage	80.0000	5.41603	4
		Total	40.0000	17.94007	40
	Total	Shooting Activity 1	24.0625	6.11521	16
		Shooting Activity 2	19.5714	5.77414	14
		Possession 1	47.7143	8.62401	14
		Possession 2	45.6923	8.07656	13
5 v 5 #1		37.3333	5.65264	15	
5 v 5 #2		35.7333	6.88131	15	
11 v 11 + GK Scrimmage		85.5000	10.88368	12	
Total		40.8384	20.57128	99	
Total	Forward	Shooting Activity 1	27.2308	7.10814	13
		Shooting Activity 2	20.2308	4.41878	13
		Possession 1	47.8462	7.91461	13
		Possession 2	47.3333	8.18350	12
		5 v 5 #1	38.3846	4.78781	13
		5 v 5 #2	35.0000	5.73004	13

			11 v 11 + GK Scrimmage	96.6364	17.14219	11
			Total	43.4545	23.77476	88
	Midfielder		Shooting Activity 1	25.4286	5.85540	7
			Shooting Activity 2	19.0000	6.63325	6
			Possession 1	44.3333	13.72103	6
			Possession 2	43.0000	6.21825	7
			5 v 5 #1	37.7143	5.52914	7
			5 v 5 #2	33.7143	4.85504	7
			11 v 11 + GK Scrimmage	102.2500	14.51846	8
			Total	45.3542	28.30118	48
	Defender		Shooting Activity 1	27.4615	6.78989	13
			Shooting Activity 2	22.7143	3.70921	14
			Possession 1	50.5714	8.67990	14
			Possession 2	46.9231	6.08908	13
			5 v 5 #1	38.0714	5.07580	14
			5 v 5 #2	35.0714	6.47438	14
			11 v 11 + GK Scrimmage	94.0000	12.76358	12
			Total	44.0957	22.49256	94
	Total		Shooting Activity 1	26.9394	6.58094	33
			Shooting Activity 2	21.0606	4.69667	33
			Possession 1	48.3636	9.42344	33
			Possession 2	46.2188	6.97338	32
			5 v 5 #1	38.1176	4.90988	34
			5 v 5 #2	34.7647	5.74751	34
			11 v 11 + GK Scrimmage	97.0645	14.76016	31
			Total	44.1130	24.18840	230
Session2MuscleLoad	Advanced	Forward	Shooting Activity 1	22.7143	3.40168	7
			Shooting Activity 2	20.5714	3.25869	7
			Possession 1	40.2857	4.57217	7
			Possession 2	43.5714	5.22357	7
			5 v 5 #1	28.5714	7.39047	7
			5 v 5 #2	31.1429	3.48466	7
			11 v 11 + GK Scrimmage	52.3333	37.71295	6
			Total	33.7917	16.81180	48
	Midfielder		Shooting Activity 1	15.0000	10.09950	4
			Shooting Activity 2	20.0000	2.44949	4
			Possession 1	39.5000	3.51188	4
			Possession 2	42.0000	3.46410	4

		5 v 5 #1	29.7500	2.75379	4
		5 v 5 #2	28.0000	11.57584	4
		11 v 11 + GK Scrimmage	78.6000	7.60263	5
		Total	37.5862	21.91464	29
	Defender	Shooting Activity 1	21.3333	4.76095	6
		Shooting Activity 2	20.5000	5.97614	8
		Possession 1	42.1250	6.33443	8
		Possession 2	45.0000	8.86405	8
		5 v 5 #1	28.7500	4.80327	8
		5 v 5 #2	28.2500	11.08087	8
		11 v 11 + GK Scrimmage	73.7500	15.14454	8
		Total	37.6852	19.48858	54
	Total	Shooting Activity 1	20.4118	6.36454	17
		Shooting Activity 2	20.4211	4.29878	19
		Possession 1	40.8947	5.08696	19
		Possession 2	43.8421	6.55967	19
		5 v 5 #1	28.8947	5.35303	19
		5 v 5 #2	29.2632	8.73589	19
		11 v 11 + GK Scrimmage	68.2632	24.99520	19
		Total	36.2366	19.07751	131
Competitive	Forward	Shooting Activity 1	13.5000	8.11788	6
		Shooting Activity 2	17.0000	4.19524	6
		Possession 1	48.3333	11.18332	6
		Possession 2	44.2000	9.23038	5
		5 v 5 #1	34.3333	7.65942	6
		5 v 5 #2	30.8333	5.34478	6
		11 v 11 + GK Scrimmage	97.4000	15.35578	5
		Total	39.3000	26.70177	40
	Midfielder	Shooting Activity 1	25.3333	3.21455	3
		Shooting Activity 2	15.5000	.70711	2
		Possession 1	20.5000	21.92031	2
		Possession 2	11.0000	19.05256	3
		5 v 5 #1	28.0000	1.00000	3
		5 v 5 #2	17.6667	4.50925	3
		11 v 11 + GK Scrimmage	86.0000	3.00000	3
		Total	30.3158	26.78319	19
	Defender	Shooting Activity 1	14.5714	5.85540	7
		Shooting Activity 2	18.5000	1.97484	6

		Possession 1	44.8333	8.75024	6
		Possession 2	44.8000	10.20784	5
		5 v 5 #1	34.8333	5.91326	6
		5 v 5 #2	26.1667	14.49713	6
		11 v 11 + GK Scrimmage	96.5000	16.90168	4
		Total	36.4500	24.92856	40
	Total	Shooting Activity 1	16.1875	7.60893	16
		Shooting Activity 2	17.4286	3.08132	14
		Possession 1	42.8571	14.38940	14
		Possession 2	36.7692	18.42622	13
		5 v 5 #1	33.2667	6.40833	15
		5 v 5 #2	26.3333	10.62791	15
		11 v 11 + GK Scrimmage	94.2500	13.79147	12
		Total	36.4242	25.95014	99
Total	Forward	Shooting Activity 1	18.4615	7.49016	13
		Shooting Activity 2	18.9231	4.00960	13
		Possession 1	44.0000	8.94427	13
		Possession 2	43.8333	6.78010	12
		5 v 5 #1	31.2308	7.79053	13
		5 v 5 #2	31.0000	4.24264	13
		11 v 11 + GK Scrimmage	72.8182	36.86955	11
		Total	36.2955	21.90689	88
	Midfielder	Shooting Activity 1	19.4286	9.21696	7
		Shooting Activity 2	18.5000	3.01662	6
		Possession 1	33.1667	14.13388	6
		Possession 2	28.7143	20.03925	7
		5 v 5 #1	29.0000	2.23607	7
		5 v 5 #2	23.5714	10.21204	7
		11 v 11 + GK Scrimmage	81.3750	7.08998	8
		Total	34.7083	23.95293	48
	Defender	Shooting Activity 1	17.6923	6.23678	13
		Shooting Activity 2	19.6429	4.66752	14
		Possession 1	43.2857	7.27936	14
		Possession 2	44.9231	8.97646	13
		5 v 5 #1	31.3571	5.96924	14
		5 v 5 #2	27.3571	12.16936	14
		11 v 11 + GK Scrimmage	81.3333	18.69046	12
		Total	37.1596	21.85008	94

		Total	Shooting Activity 1	18.3636	7.21031	33
			Shooting Activity 2	19.1515	4.06295	33
			Possession 1	41.7273	9.98209	33
			Possession 2	40.9688	12.99500	32
			5 v 5 #1	30.8235	6.15689	34
			5 v 5 #2	27.9706	9.57739	34
			11 v 11 + GK Scrimmage	78.3226	24.70140	31
			Total	36.3174	22.24416	230
Session3MuscleLoad	Advanced	Forward	Shooting Activity 1	23.1429	4.29839	7
			Shooting Activity 2	21.7143	4.78589	7
			Possession 1	43.2857	4.68025	7
			Possession 2	44.0000	7.48331	7
			5 v 5 #1	30.5714	8.36375	7
			5 v 5 #2	28.1429	11.82411	7
			11 v 11 + GK Scrimmage	99.0000	12.93058	6
			Total	40.2083	25.18777	48
		Midfielder	Shooting Activity 1	21.2500	.95743	4
			Shooting Activity 2	20.7500	4.27200	4
			Possession 1	42.0000	6.21825	4
			Possession 2	42.7500	7.18215	4
			5 v 5 #1	36.0000	1.41421	4
			5 v 5 #2	31.5000	5.74456	4
			11 v 11 + GK Scrimmage	115.6000	12.79844	5
			Total	46.7241	33.61643	29
		Defender	Shooting Activity 1	20.5000	8.06846	6
			Shooting Activity 2	19.8750	4.96955	8
			Possession 1	44.8750	6.87516	8
			Possession 2	46.1250	6.59951	8
			5 v 5 #1	34.5000	4.59814	8
			5 v 5 #2	33.1250	3.27054	8
			11 v 11 + GK Scrimmage	105.8750	13.31420	8
			Total	44.4074	28.44957	54
		Total	Shooting Activity 1	21.7647	5.37970	17
			Shooting Activity 2	20.7368	4.58066	19
			Possession 1	43.6842	5.78362	19
			Possession 2	44.6316	6.79224	19
			5 v 5 #1	33.3684	6.08469	19
			5 v 5 #2	30.9474	7.84201	19

		11 v 11 + GK Scrimmage	106.2632	13.91579	19
		Total	43.3817	28.44981	131
Competitive	Forward	Shooting Activity 1	16.3333	1.96638	6
		Shooting Activity 2	16.5000	2.50998	6
		Possession 1	44.5000	9.48156	6
		Possession 2	41.4000	8.20366	5
		5 v 5 #1	28.0000	4.09878	6
		5 v 5 #2	28.6667	5.95539	6
		11 v 11 + GK Scrimmage	86.0000	16.98529	5
		Total	36.0250	22.96763	40
	Midfielder	Shooting Activity 1	21.3333	4.72582	3
		Shooting Activity 2	17.5000	2.12132	2
		Possession 1	50.0000	.00000	2
		Possession 2	41.3333	6.50641	3
		5 v 5 #1	28.0000	13.00000	3
		5 v 5 #2	23.0000	13.89244	3
11 v 11 + GK Scrimmage		94.0000	12.76715	3	
Total		39.8947	27.37983	19	
Defender	Shooting Activity 1	21.8571	7.12808	7	
	Shooting Activity 2	16.8333	4.87511	6	
	Possession 1	50.0000	11.71324	6	
	Possession 2	46.4000	12.46194	5	
	5 v 5 #1	27.6667	4.54606	6	
	5 v 5 #2	28.0000	6.38749	6	
	11 v 11 + GK Scrimmage	80.0000	8.83176	4	
	Total	36.0000	20.34195	40	
Total	Shooting Activity 1	19.6875	5.64173	16	
	Shooting Activity 2	16.7857	3.46806	14	
	Possession 1	47.6429	9.76341	14	
	Possession 2	43.3077	9.36647	13	
	5 v 5 #1	27.8667	6.12800	15	
	5 v 5 #2	27.2667	7.73181	15	
	11 v 11 + GK Scrimmage	86.0000	13.65151	12	
	Total	36.7576	22.68601	99	
Total	Forward	Shooting Activity 1	20.0000	4.83046	13
		Shooting Activity 2	19.3077	4.62574	13
		Possession 1	43.8462	6.98625	13
		Possession 2	42.9167	7.53728	12

	5 v 5 #1	29.3846	6.61486	13
	5 v 5 #2	28.3846	9.20632	13
	11 v 11 + GK Scrimmage	93.0909	15.65538	11
	Total	38.3068	24.15770	88
Midfielder	Shooting Activity 1	21.2857	2.81154	7
	Shooting Activity 2	19.6667	3.82971	6
	Possession 1	44.6667	6.34560	6
	Possession 2	42.1429	6.36209	7
	5 v 5 #1	32.5714	8.69592	7
	5 v 5 #2	27.8571	10.07354	7
	11 v 11 + GK Scrimmage	107.5000	16.28321	8
	Total	44.0208	31.17247	48
Defender	Shooting Activity 1	21.2308	7.28187	13
	Shooting Activity 2	18.5714	4.98790	14
	Possession 1	47.0714	9.22759	14
	Possession 2	46.2308	8.78592	13
	5 v 5 #1	31.5714	5.62569	14
	5 v 5 #2	30.9286	5.32721	14
	11 v 11 + GK Scrimmage	97.2500	17.21588	12
	Total	40.8298	25.53919	94
Total	Shooting Activity 1	20.7576	5.52285	33
	Shooting Activity 2	19.0606	4.54106	33
	Possession 1	45.3636	7.84147	33
	Possession 2	44.0938	7.82205	32
	5 v 5 #1	30.9412	6.61926	34
	5 v 5 #2	29.3235	7.89599	34
	11 v 11 + GK Scrimmage	98.4194	16.88742	31
	Total	40.5304	26.27793	230

## Appendix J3

## Muscle Load Independent t-test

## Group Statistics

	LevelID	N	Mean	Std. Deviation	Std. Error Mean
AverageMuscleLoad	Advanced	20	288.6917	31.38444	7.01777
	Competitive	20	256.0417	37.41758	8.36683

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
AverageMuscleLoad	Equal variances assumed	.302	.586	2.990	38	.002	.005	32.65000	10.92030	10.54301	54.75699
	Equal variances not assumed			2.990	36.883	.002	.005	32.65000	10.92030	10.52100	54.77900

## Muscle Load 4-Factor ANOVA with Repeated Measures

## Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	6098.460	2	3049.230	49.962	<.001	.210	99.925	1.000
	Greenhouse-Geisser	6098.460	1.919	3177.808	49.962	<.001	.210	95.882	1.000
	Huynh-Feldt	6098.460	2.000	3049.230	49.962	<.001	.210	99.925	1.000
	Lower-bound	6098.460	1.000	6098.460	49.962	<.001	.210	49.962	1.000
Time * LevelID	Sphericity Assumed	992.715	2	496.358	8.133	<.001	.041	16.266	.958
	Greenhouse-Geisser	992.715	1.919	517.288	8.133	<.001	.041	15.608	.953
	Huynh-Feldt	992.715	2.000	496.358	8.133	<.001	.041	16.266	.958
	Lower-bound	992.715	1.000	992.715	8.133	.005	.041	8.133	.810
Time * PositionID	Sphericity Assumed	934.264	4	233.566	3.827	.005	.039	15.308	.894
	Greenhouse-Geisser	934.264	3.838	243.415	3.827	.005	.039	14.689	.884
	Huynh-Feldt	934.264	4.000	233.566	3.827	.005	.039	15.308	.894
	Lower-bound	934.264	2.000	467.132	3.827	.023	.039	7.654	.690
Time * TrainingTypeID	Sphericity Assumed	3172.109	12	264.342	4.331	<.001	.121	51.976	1.000
	Greenhouse-Geisser	3172.109	11.514	275.489	4.331	<.001	.121	49.873	1.000
	Huynh-Feldt	3172.109	12.000	264.342	4.331	<.001	.121	51.976	1.000
	Lower-bound	3172.109	6.000	528.685	4.331	<.001	.121	25.988	.980
Time * LevelID * PositionID	Sphericity Assumed	699.147	4	174.787	2.864	.023	.030	11.456	.775
	Greenhouse-Geisser	699.147	3.838	182.157	2.864	.025	.030	10.992	.762
	Huynh-Feldt	699.147	4.000	174.787	2.864	.023	.030	11.456	.775
	Lower-bound	699.147	2.000	349.574	2.864	.060	.030	5.728	.556
Time * LevelID * TrainingTypeID	Sphericity Assumed	9627.023	12	802.252	13.145	<.001	.296	157.741	1.000
	Greenhouse-Geisser	9627.023	11.514	836.081	13.145	<.001	.296	151.358	1.000
	Huynh-Feldt	9627.023	12.000	802.252	13.145	<.001	.296	157.741	1.000
	Lower-bound	9627.023	6.000	1604.504	13.145	<.001	.296	78.870	1.000
Time * PositionID * TrainingTypeID	Sphericity Assumed	1803.241	24	75.135	1.231	.210	.073	29.546	.903
	Greenhouse-Geisser	1803.241	23.029	78.303	1.231	.214	.073	28.351	.893
	Huynh-Feldt	1803.241	24.000	75.135	1.231	.210	.073	29.546	.903
	Lower-bound	1803.241	12.000	150.270	1.231	.264	.073	14.773	.686
Time * LevelID * PositionID * TrainingTypeID	Sphericity Assumed	2081.028	24	86.709	1.421	.092	.083	34.098	.948
	Greenhouse-Geisser	2081.028	23.029	90.366	1.421	.096	.083	32.718	.941
	Huynh-Feldt	2081.028	24.000	86.709	1.421	.092	.083	34.098	.948
	Lower-bound	2081.028	12.000	173.419	1.421	.159	.083	17.049	.763
Error(Time)	Sphericity Assumed	22947.515	376	61.031					
	Greenhouse-Geisser	22947.515	360.787	63.604					
	Huynh-Feldt	22947.515	376.000	61.031					
	Lower-bound	22947.515	188.000	122.061					

a. Computed using alpha = .05

### Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Intercept	977942.197	1	977942.197	9300.809	<.001	.980	9300.809	1.000
LevelID	1156.820	1	1156.820	11.002	.001	.055	11.002	.910
PositionID	471.990	2	235.995	2.244	.109	.023	4.489	.453
TrainingTypeID	298562.805	6	49760.467	473.251	<.001	.938	2839.509	1.000
LevelID * PositionID	760.925	2	380.463	3.618	.029	.037	7.237	.664
LevelID * TrainingTypeID	427.524	6	71.254	.678	.668	.021	4.066	.265
PositionID * TrainingTypeID	2364.585	12	197.049	1.874	.040	.107	22.489	.891
LevelID * PositionID * TrainingTypeID	1861.377	12	155.115	1.475	.136	.086	17.703	.783
Error	19767.435	188	105.146					

a. Computed using alpha = .05

## Appendix K

## Total Distance Raw Data

Player ID	Level ID	Position ID	TD S1	TD S2	TD S3	TD AVERAGE
1	1	1	3949	2095	3978	3340.666667
2	1	1	3957	3125	3719	3600.333333
3	1	3	3462	2935	3437	3278
4	1	3	4066	3117	3514	3565.666667
5	1	1	3922	3170	4330	3807.333333
6	1	3	3456	2896	3470	3274
7	1	2	3817	3174	3866	3619
8	1	2	3424	2799	3108	3110.333333
9	1	2	3687	2841	3618	3382
10	1	3	3848	3120	3827	3598.333333
11	1	3	3485	3195	3577	3419
12	1	2	3439	2525	3164	3042.666667
13	1	1	3790	3055	3736	3527
14	1	1	4285	2779	3766	3610
15	1	3	3669	2741	3164	3191.333333
16	1	1	3991	2401	3453	3281.666667
17	1	1	3934	3213	1669	2938.666667
18	1	3	3786	2851	3697	3444.666667
19	1	3	3739	2832	3594	3388.333333
20	1	2	0	3411	3672	3541.5
21	2	3	3633	3578	3409	3540
22	2	3	3440	3215	2988	3214.333333
23	2	3	3392	3290	3280	3320.666667
24	2	1	3194	3166	3022	3127.333333
25	2	1	3710	3626	3408	3581.333333
26	2	3	3378	3058	3325	3253.666667
27	2	2	3408	1764	3380	2850.666667
28	2	2	3380	2307	3377	3021.333333
29	2	1	3482	3083	3084	3216.333333
30	2	2	3274	3125	3488	3295.666667
31	2	1	3506	3411	2980	3299
32	2	1	3225	3152	2119	2832
33	2	3	3707	2885	2653	3081.666667
34	2	3	3366	3288		3327
35	2	1	2894	3401	2716	3003.666667
36	2	3	3149	2946	3501	3198.666667
37	2	2	1891	0	3299	2595
38	2	2			2227	2227
39	2	2			2509	2509

40	2	3	0	2741	3583	3162
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Values are expressed in meters (m)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

Training Session # Identification: S1 = Training Session #1; S2 = Training Session #2; S3 = Training Session #3

TD = Total Distance

PLAYER ID	LEVEL ID	POSITION ID	TRAINING ACTIVITY ID	Session 1 TD	Session 2 TD	Session 3 TD
1	1	1	1	408	98	308
2	1	1	1	355	124	274
3	1	3	1	362	123	281
4	1	3	1	374	298	290
5	1	1	1	331	92	333
6	1	3	1	312	167	307
7	1	2	1	234	122	271
8	1	2	1	268	144	237
9	1	2	1	326	169	260
10	1	3	1	364	69	325
11	1	3	1	342	297	272
12	1	2	1	315	238	224
13	1	1	1	351	282	314
14	1	1	1	370	45	302
15	1	3	1	336	260	227
16	1	1	1	349	296	260
17	1	1	1	342	281	81
18	1	3	1	341	262	298
19	1	3	1	323	258	257
20	1	2	1		228	263
21	2	3	1	298	246	254
22	2	3	1	271	308	189
23	2	3	1	340	224	247
24	2	1	1	215	295	256
25	2	1	1	361	253	158

26	2	3	1	282	198	339
27	2	2	1	288	0	319
28	2	2	1	254	208	210
29	2	1	1	303	261	262
30	2	2	1	179	259	258
31	2	1	1	297	267	149
32	2	1	1	285	271	203
33	2	3	1	335	220	319
34	2	3	1	298	274	
35	2	1	1	322	294	221
36	2	3	1	257	204	165
37	2	2	1	255		134
38	2	2	1			203
39	2	2	1			189
40	2	3	1		322	316
1	1	1	2	253	272	333
2	1	1	2	297	251	275
3	1	3	2	231	270	235
4	1	3	2	250	248	185
5	1	1	2	233	249	253
6	1	3	2	261	264	276
7	1	2	2	263	251	237
8	1	2	2	218	208	217
9	1	2	2	283	224	273
10	1	3	2	284	277	255
11	1	3	2	259	251	220
12	1	2	2	241	227	201
13	1	1	2	255	239	251
14	1	1	2	293	264	296
15	1	3	2	247	136	173
16	1	1	2	258	256	258
17	1	1	2	226	246	314
18	1	3	2	281	229	266
19	1	3	2	283	254	260
20	1	2	2		222	235
21	2	3	2	237	251	237
22	2	3	2	277	230	172
23	2	3	2	309	161	177
24	2	1	2	158	195	201
25	2	1	2	285	206	221
26	2	3	2	244	198	244
27	2	2	2	194	0	330
28	2	2	2	156	206	205

29	2	1	2	264	207	207
30	2	2	2	126	234	215
31	2	1	2	208	137	172
32	2	1	2	194	188	195
33	2	3	2	273	205	259
34	2	3	2	229	225	
35	2	1	2	231	239	210
36	2	3	2	253	225	211
37	2	2	2	136		149
38	2	2	2			196
39	2	2	2			184
40	2	3	2		262	256
1	1	1	3	618	452	560
2	1	1	3	639	493	551
3	1	3	3	558	433	470
4	1	3	3	624	523	493
5	1	1	3	622	531	666
6	1	3	3	555	477	511
7	1	2	3	224	469	559
8	1	2	3	551	411	382
9	1	2	3	535	431	470
10	1	3	3	602	555	596
11	1	3	3	510	516	563
12	1	2	3	506	418	453
13	1	1	3	551	462	553
14	1	1	3	583	449	559
15	1	3	3	564	455	389
16	1	1	3	606	514	531
17	1	1	3	594	486	513
18	1	3	3	536	447	527
19	1	3	3	556	470	555
20	1	2	3		619	581
21	2	3	3	522	579	628
22	2	3	3	570	414	487
23	2	3	3	581	479	530
24	2	1	3	492	494	483
25	2	1	3	572	527	565
26	2	3	3	522	462	573
27	2	2	3	456	0	555
28	2	2	3	565	84	595
29	2	1	3	491	387	485
30	2	2	3	528	475	524
31	2	1	3	533	570	542

32	2	1	3	498	481	508
33	2	3	3	648	466	657
34	2	3	3	513	474	
35	2	1	3	516	617	422
36	2	3	3	514	449	645
37	2	2	3	591		573
38	2	2	3			497
39	2	2	3			27
40	2	3	3		598	527
1	1	1	4	611	529	613
2	1	1	4	522	559	594
3	1	3	4	521	548	547
4	1	3	4	577	543	537
5	1	1	4	586	606	629
6	1	3	4	538	505	500
7	1	2	4	628	531	586
8	1	2	4	473	430	362
9	1	2	4	459	458	472
10	1	3	4	581	640	559
11	1	3	4	501	477	559
12	1	2	4	452	417	471
13	1	1	4	503	474	632
14	1	1	4	576	543	583
15	1	3	4	513	440	472
16	1	1	4	570	470	442
17	1	1	4	516	512	509
18	1	3	4	507	460	545
19	1	3	4	514	479	486
20	1	2	4		575	563
21	2	3	4	546	619	570
22	2	3	4	500	441	440
23	2	3	4	522	461	527
24	2	1	4	552	430	492
25	2	1	4	562	589	579
26	2	3	4	557	367	573
27	2	2	4	614	0	518
28	2	2	4	441	0	506
29	2	1	4	530	463	501
30	2	2	4	483	435	536
31	2	1	4	609	458	492
32	2	1	4	487	412	489
33	2	3	4	509	483	661
34	2	3	4	445	460	

35	2	1	4		493	403
36	2	3	4		417	606
37	2	2	4			548
38	2	2	4			551
39	2	2	4			147
40	2	3	4		666	564
1	1	1	5	462	322	437
2	1	1	5	447	267	397
3	1	3	5	408	255	403
4	1	3	5	445	351	372
5	1	1	5	471	351	483
6	1	3	5	400	284	359
7	1	2	5	526	357	446
8	1	2	5	413	361	382
9	1	2	5	450	288	375
10	1	3	5	459	286	476
11	1	3	5	414	361	388
12	1	2	5	377	331	345
13	1	1	5	418	362	407
14	1	1	5	522	261	387
15	1	3	5	417	357	378
16	1	1	5	482	427	405
17	1	1	5	436	421	196
18	1	3	5	415	372	384
19	1	3	5	435	379	359
20	1	2	5		430	463
21	2	3	5	448	392	353
22	2	3	5	400	416	303
23	2	3	5	372	415	341
24	2	1	5	407	317	311
25	2	1	5	442	392	373
26	2	3	5	422	369	335
27	2	2	5	372	385	210
28	2	2	5	453	370	439
29	2	1	5	457	305	336
30	2	2	5	424	355	381
31	2	1	5	455	394	269
32	2	1	5	430	393	375
33	2	3	5	475	294	365
34	2	3	5	387	349	
35	2	1	5	401	378	321
36	2	3	5	444	363	366
37	2	2	5	450		335

38	2	2	5			367
39	2	2	5			348
40	2	3	5		453	456
1	1	1	6	418	380	442
2	1	1	6	409	425	388
3	1	3	6	365	408	345
4	1	3	6	463	337	389
5	1	1	6	401	407	454
6	1	3	6	354	395	338
7	1	2	6	447	412	416
8	1	2	6	295	357	303
9	1	2	6	397	359	389
10	1	3	6	361	414	388
11	1	3	6	322	304	395
12	1	2	6	337	117	270
13	1	1	6	381	328	385
14	1	1	6	461	340	356
15	1	3	6	395	325	357
16	1	1	6	480	350	396
17	1	1	6	394	391	45
18	1	3	6	429	285	404
19	1	3	6	406	119	389
20	1	2	6		413	81
21	2	3	6	420	394	330
22	2	3	6	425	350	280
23	2	3	6	386	404	347
24	2	1	6	396	333	325
25	2	1	6	422	393	396
26	2	3	6	352	305	328
27	2	2	6	392	179	108
28	2	2	6	416	296	372
29	2	1	6	396	306	305
30	2	2	6	429	254	352
31	2	1	6	415	350	329
32	2	1	6	346	322	349
33	2	3	6	495	5	392
34	2	3	6	354	321	
35	2	1	6	427	289	283
36	2	3	6	406	293	395
37	2	2	6	459		316
38	2	2	6			413
39	2	2	6			327
40	2	3	6		440	383

1	1	1	7	1179	42	1285
2	1	1	7	1288	1006	1240
3	1	3	7	1017	898	1156
4	1	3	7	1333	817	1248
5	1	1	7	1278	934	1512
6	1	3	7	1036	804	1179
7	1	2	7	1495	1032	1351
8	1	2	7	1206	888	1225
9	1	2	7	1237	912	1379
10	1	3	7	1197	879	1228
11	1	3	7	1137	989	1180
12	1	2	7	1211	777	1200
13	1	1	7	1331	908	1194
14	1	1	7	1480	877	1283
15	1	3	7	1197	768	1168
16	1	1	7	1246	88	1161
17	1	1	7	1426	876	11
18	1	3	7	1277	796	1273
19	1	3	7	1222	873	1288
20	1	2	7		924	1486
21	2	3	7	1162	1097	1037
22	2	3	7	997	1056	1117
23	2	3	7	882	1146	1111
24	2	1	7	974	1102	954
25	2	1	7	1066	1266	1116
26	2	3	7	999	1159	933
27	2	2	7	1092	1200	1340
28	2	2	7	1095	1143	1050
29	2	1	7	1041	1154	988
30	2	2	7	1105	1113	1222
31	2	1	7	989	1235	1027
32	2	1	7	985	1085	0
33	2	3	7	972	1212	0
34	2	3	7	1140	1185	
35	2	1	7	997	1091	856
36	2	3	7	1275	995	1113
37	2	2	7			1244
38	2	2	7			0
39	2	2	7			1287
40	2	3	7			1081

Values are expressed in meters (m)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

Training Activity Identification: 1 = Shooting Activity 1; 2 = Shooting Activity

3 = Possession-Based Activity 1; 4 = Possession-Based Activity 2

5 = 5 v 5 + GK Activity 1; 6 = 5 v 5 + GK Activity 2

7 = 11 v 11 Scrimmage Activity

TD = Total Distance

## Appendix K2

### Total Distance Data Descriptives

Descriptive Statistics								
LevelID	PositionID	TrainingActivityTypeID	Mean	Std. Deviation	N			
Session1TD	Advanced	Forward	Shooting 1	358.0000	25.05993	7		
			Shooting 2	259.2857	27.13371	7		
			Possession 1	601.8571	29.05987	7		
			Possession 2	554.8571	40.98141	7		
			5 v 5 #1	462.5714	33.95024	7		
			5 v 5 #2	420.5714	36.42736	7		
			11 v 11 + GK Scrimmage	1318.2857	104.14847	7		
			Total	567.9184	330.99615	49		
	Midfielder			Shooting 1	285.7500	42.69563	4	
				Shooting 2	251.2500	28.02826	4	
				Possession 1	454.0000	154.46035	4	
				Possession 2	503.0000	83.78942	4	
				5 v 5 #1	441.5000	63.73121	4	
				5 v 5 #2	369.0000	66.75328	4	
				11 v 11 + GK Scrimmage	1287.2500	139.16507	4	
				Total	513.1071	343.20422	28	
	Defender			Shooting 1	344.2500	21.26533	8	
				Shooting 2	262.0000	19.36860	8	
				Possession 1	563.1250	35.69489	8	
				Possession 2	531.5000	31.28669	8	
				5 v 5 #1	424.1250	20.17380	8	
				5 v 5 #2	386.8750	45.41692	8	
				11 v 11 + GK Scrimmage	1177.0000	109.70219	8	
				Total	526.9821	288.70938	56	
	Total			Shooting 1	337.0000	38.30869	19	
				Shooting 2	258.7368	23.22796	19	
				Possession 1	554.4211	88.89902	19	
				Possession 2	534.1053	49.96098	19	
				5 v 5 #1	441.9474	39.06472	19	
				5 v 5 #2	395.5263	49.20069	19	
				11 v 11 + GK Scrimmage	1252.2632	126.52397	19	
				Total	539.1429	314.92385	133	
	Competitive	Forward	Shooting 1	297.1667	48.21791	6		

		Shooting 2	223.3333	46.64619	6
		Possession 1	517.0000	31.44519	6
		Possession 2	548.0000	44.65983	5
		5 v 5 #1	432.0000	23.84953	6
		5 v 5 #2	400.3333	29.61531	6
		11 v 11 + GK Scrimmage	1008.6667	36.37948	6
		Total	488.0732	245.08186	41
	Midfielder	Shooting 1	240.3333	55.77036	3
		Shooting 2	158.6667	34.07834	3
		Possession 1	516.3333	55.42863	3
		Possession 2	512.6667	90.23488	3
		5 v 5 #1	416.3333	41.04063	3
		5 v 5 #2	412.3333	18.77054	3
		11 v 11 + GK Scrimmage	1097.3333	6.80686	3
		Total	479.1429	290.99558	21
	Defender	Shooting 1	297.1667	34.04360	6
		Shooting 2	265.5000	26.50094	6
		Possession 1	559.5000	51.55095	6
		Possession 2	526.8000	24.18057	5
		5 v 5 #1	426.8333	36.91296	6
		5 v 5 #2	414.0000	47.77028	6
		11 v 11 + GK Scrimmage	1047.8333	143.42861	6
		Total	504.8537	256.11985	41
	Total	Shooting 1	285.8000	47.35308	15
		Shooting 2	227.2667	53.24803	15
		Possession 1	533.8667	47.01651	15
		Possession 2	531.6923	49.27539	13
		5 v 5 #1	426.8000	31.07181	15
		5 v 5 #2	408.2000	34.97387	15
		11 v 11 + GK Scrimmage	1042.0667	94.72703	15
		Total	492.9320	256.88283	103
Total	Forward	Shooting 1	329.9231	47.73968	13
		Shooting 2	242.6923	40.28313	13
		Possession 1	562.6923	52.65831	13
		Possession 2	552.0000	40.66716	12
		5 v 5 #1	448.4615	32.63336	13
		5 v 5 #2	411.2308	33.75192	13
		11 v 11 + GK Scrimmage	1175.3846	178.28186	13

			Total	531.5444	296.11189	90
		Midfielder	Shooting 1	266.2857	50.37431	7
			Shooting 2	211.5714	56.82387	7
			Possession 1	480.7143	118.58852	7
			Possession 2	507.1429	79.06417	7
			5 v 5 #1	430.7143	52.66154	7
			5 v 5 #2	387.5714	53.68382	7
			11 v 11 + GK Scrimmage	1205.8571	141.43600	7
			Total	498.5510	319.10415	49
		Defender	Shooting 1	324.0714	35.69198	14
			Shooting 2	263.5000	21.80243	14
			Possession 1	561.5714	41.37207	14
			Possession 2	529.6923	27.77704	13
			5 v 5 #1	425.2857	27.29730	14
			5 v 5 #2	398.5000	46.71641	14
			11 v 11 + GK Scrimmage	1121.6429	137.08594	14
			Total	517.6289	274.23960	97
		Total	Shooting 1	314.4118	49.16954	34
			Shooting 2	244.8529	41.81788	34
			Possession 1	545.3529	73.18382	34
			Possession 2	533.1250	48.89472	32
			5 v 5 #1	435.2647	36.05913	34
			5 v 5 #2	401.1176	43.36020	34
			11 v 11 + GK Scrimmage	1159.5294	154.14756	34
			Total	518.9746	291.33719	236
Sessions2TD	Advanced	Forward	Shooting 1	174.0000	107.73269	7
			Shooting 2	253.8571	11.18673	7
			Possession 1	483.8571	31.42944	7
			Possession 2	527.5714	47.96824	7
			5 v 5 #1	344.4286	66.44762	7
			5 v 5 #2	374.4286	36.19787	7
			11 v 11 + GK Scrimmage	675.8571	419.79933	7
			Total	404.8571	224.06119	49
		Midfielder	Shooting 1	168.2500	50.30822	4
			Shooting 2	227.5000	17.74824	4
			Possession 1	432.2500	25.86342	4
			Possession 2	459.0000	50.95750	4
			5 v 5 #1	334.2500	33.57951	4

		5 v 5 #2	311.2500	131.98074	4
		11 v 11 + GK Scrimmage	902.2500	104.59565	4
		Total	404.9643	236.94545	28
	Defender	Shooting 1	216.7500	85.98629	8
		Shooting 2	241.1250	44.96487	8
		Possession 1	484.5000	42.49370	8
		Possession 2	511.5000	64.24284	8
		5 v 5 #1	330.6250	47.76412	8
		5 v 5 #2	323.3750	95.84949	8
		11 v 11 + GK Scrimmage	853.0000	71.48227	8
		Total	422.9821	215.24654	56
	Total	Shooting 1	190.7895	87.68097	19
		Shooting 2	242.9474	31.32531	19
		Possession 1	473.2632	40.20619	19
		Possession 2	506.3684	59.07548	19
		5 v 5 #1	336.4737	50.87061	19
		5 v 5 #2	339.6316	87.63574	19
		11 v 11 + GK Scrimmage	798.1053	268.54358	19
		Total	412.5113	221.64063	133
Competitive	Forward	Shooting 1	273.5000	17.36376	6
		Shooting 2	195.3333	33.50622	6
		Possession 1	512.6667	79.39941	6
		Possession 2	470.4000	69.49317	5
		5 v 5 #1	363.1667	41.00447	6
		5 v 5 #2	332.1667	36.52625	6
		11 v 11 + GK Scrimmage	1155.5000	78.13514	6
		Total	471.8537	308.24500	41
	Midfielder	Shooting 1	155.6667	137.20180	3
		Shooting 2	146.6667	127.78628	3
		Possession 1	186.3333	253.49622	3
		Possession 2	145.0000	251.14737	3
		5 v 5 #1	370.0000	15.00000	3
		5 v 5 #2	243.0000	59.27057	3
		11 v 11 + GK Scrimmage	1152.0000	44.19276	3
		Total	342.6667	370.41562	21
	Defender	Shooting 1	233.3333	40.27241	6
		Shooting 2	211.6667	31.17478	6
		Possession 1	474.8333	55.63961	6

		Possession 2	474.2000	91.94129	5
		5 v 5 #1	374.8333	45.41109	6
		5 v 5 #2	291.8333	147.54717	6
		11 v 11 + GK Scrimmage	1110.8333	77.98312	6
		Total	452.5610	301.86405	41
Total		Shooting 1	233.8667	73.21092	15
		Shooting 2	192.1333	60.75932	15
		Possession 1	432.2667	170.42529	15
		Possession 2	396.7692	188.53123	13
		5 v 5 #1	369.2000	37.39595	15
		5 v 5 #2	298.2000	99.59002	15
		11 v 11 + GK Scrimmage	1136.9333	71.55165	15
		Total	437.8350	319.86771	103
Total	Forward	Shooting 1	219.9231	92.70514	13
		Shooting 2	226.8462	38.11134	13
		Possession 1	497.1538	57.82855	13
		Possession 2	503.7500	62.27231	12
		5 v 5 #1	353.0769	54.79730	13
		5 v 5 #2	354.9231	41.13284	13
		11 v 11 + GK Scrimmage	897.2308	390.63797	13
		Total	435.3778	266.28018	90
	Midfielder	Shooting 1	162.8571	87.09464	7
		Shooting 2	192.8571	86.41456	7
		Possession 1	326.8571	197.56807	7
		Possession 2	324.4286	224.70785	7
		5 v 5 #1	349.5714	31.68521	7
		5 v 5 #2	282.0000	105.88358	7
		11 v 11 + GK Scrimmage	1009.2857	154.73387	7
		Total	378.2653	299.53407	49
	Defender	Shooting 1	223.8571	68.39237	14
		Shooting 2	228.5000	41.12598	14
		Possession 1	480.3571	46.77213	14
		Possession 2	497.1538	74.71261	13
		5 v 5 #1	349.5714	50.36897	14
		5 v 5 #2	309.8571	116.54372	14
		11 v 11 + GK Scrimmage	963.5000	150.40957	14
		Total	435.4845	254.41506	97
Total		Shooting 1	209.7941	83.29858	34

			Shooting 2	220.5294	52.50988	34
			Possession 1	455.1765	116.75057	34
			Possession 2	461.8438	137.02651	32
			5 v 5 #1	350.9118	47.71657	34
			5 v 5 #2	321.3529	93.98320	34
			11 v 11 + GK Scrimmage	947.5882	265.83706	34
			Total	423.5636	268.62799	236
Session3TD	Advanced	Forward	Shooting 1	267.4286	85.79405	7
			Shooting 2	282.8571	32.25641	7
			Possession 1	561.8571	48.97764	7
			Possession 2	571.7143	70.71472	7
			5 v 5 #1	387.4286	90.38779	7
			5 v 5 #2	352.2857	139.69576	7
			11 v 11 + GK Scrimmage	1098.0000	492.52885	7
			Total	503.0816	330.15444	49
		Midfielder	Shooting 1	248.0000	21.36976	4
			Shooting 2	232.0000	31.04835	4
			Possession 1	466.0000	72.77820	4
			Possession 2	472.7500	91.45992	4
			5 v 5 #1	387.0000	42.48137	4
			5 v 5 #2	344.5000	69.19778	4
			11 v 11 + GK Scrimmage	1288.7500	89.36955	4
			Total	491.2857	348.12033	28
		Defender	Shooting 1	282.1250	30.57748	8
			Shooting 2	233.7500	38.21649	8
			Possession 1	513.0000	64.34061	8
			Possession 2	525.6250	34.41734	8
			5 v 5 #1	389.8750	37.78676	8
			5 v 5 #2	375.6250	25.04817	8
			11 v 11 + GK Scrimmage	1215.0000	50.93694	8
			Total	505.0000	311.86343	56
		Total	Shooting 1	269.5263	55.39391	19
			Shooting 2	251.4737	41.01676	19
			Possession 1	521.1053	68.13295	19
			Possession 2	531.4737	70.23482	19
			5 v 5 #1	388.3684	59.84258	19
			5 v 5 #2	360.4737	87.93076	19
			11 v 11 + GK Scrimmage	1187.4211	298.21307	19

		Total	501.4060	324.00344	133
Competitive	Forward	Shooting 1	208.1667	47.73852	6
		Shooting 2	201.0000	16.69731	6
		Possession 1	500.8333	50.29281	6
		Possession 2	510.6000	38.50065	5
		5 v 5 #1	330.8333	40.17171	6
		5 v 5 #2	331.1667	38.90715	6
		11 v 11 + GK Scrimmage	823.5000	412.37544	6
		Total	412.8293	255.16366	41
	Midfielder	Shooting 1	262.3333	54.62905	3
		Shooting 2	250.0000	69.46222	3
		Possession 1	558.0000	35.59494	3
		Possession 2	520.0000	15.09967	3
		5 v 5 #1	343.3333	119.05601	3
		5 v 5 #2	277.3333	146.98753	3
		11 v 11 + GK Scrimmage	1204.0000	145.83552	3
	Total	487.8571	332.19562	21	
	Defender	Shooting 1	252.1667	68.73839	6
		Shooting 2	216.6667	36.20313	6
		Possession 1	586.6667	68.39493	6
Possession 2		554.2000	80.29757	5	
5 v 5 #1		343.8333	23.56622	6	
5 v 5 #2		345.3333	43.47720	6	
11 v 11 + GK Scrimmage		885.1667	439.43528	6	
Total	452.4390	276.32807	41		
Total	Total	Shooting 1	236.6000	59.32935	15
		Shooting 2	217.0667	40.00083	15
		Possession 1	546.6000	66.09495	15
		Possession 2	529.5385	55.73990	13
		5 v 5 #1	338.5333	53.31023	15
		5 v 5 #2	326.0667	70.57870	15
		11 v 11 + GK Scrimmage	924.2667	393.08023	15
		Total	443.8932	279.15934	103
Total	Forward	Shooting 1	240.0769	74.66867	13
		Shooting 2	245.0769	49.40051	13
		Possession 1	533.6923	57.06047	13
		Possession 2	546.2500	65.24517	12
		5 v 5 #1	361.3077	74.96486	13

	5 v 5 #2	342.5385	102.50985	13
	11 v 11 + GK Scrimmage	971.3077	460.90624	13
	Total	461.9667	300.15462	90
Midfielder	Shooting 1	254.1429	35.80237	7
	Shooting 2	239.7143	46.72157	7
	Possession 1	505.4286	74.08746	7
	Possession 2	493.0000	69.97380	7
	5 v 5 #1	368.2857	78.56147	7
	5 v 5 #2	315.7143	104.33075	7
	11 v 11 + GK Scrimmage	1252.4286	114.60782	7
	Total	489.8163	337.86367	49
Defender	Shooting 1	269.2857	50.57124	14
	Shooting 2	226.4286	36.97965	14
	Possession 1	544.5714	73.88839	14
	Possession 2	536.6154	55.22309	13
	5 v 5 #1	370.1429	39.26215	14
	5 v 5 #2	362.6429	36.15056	14
	11 v 11 + GK Scrimmage	1073.6429	323.04718	14
	Total	482.7835	297.01491	97
Total	Shooting 1	255.0000	58.67218	34
	Shooting 2	236.2941	43.55667	34
	Possession 1	532.3529	67.45723	34
	Possession 2	530.6875	63.78008	32
	5 v 5 #1	366.3824	61.56200	34
	5 v 5 #2	345.2941	81.43320	34
	11 v 11 + GK Scrimmage	1071.3235	362.83427	34
	Total	476.3051	305.95495	236

## Appendix K3

## Total Distance Independent t-test

## Group Statistics

	LevelID	N	Mean	Std. Deviation	Std. Error Mean
MeanTD	Advanced	20	3398.0250	220.05182	49.20508
	Competitive	20	3082.8167	338.59319	75.71174

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
MeanTD	Equal variances assumed	1.989	.167	3.491	38	<.001	.001	315.20833	90.29622	132.41319	498.00348
	Equal variances not assumed			3.491	32.620	<.001	.001	315.20833	90.29622	131.41801	498.99865

## Total Distance 4-Factor ANOVA with Repeated Measures

## Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	1008763.344	2	504381.672	43.679	<.001	.184	87.359	1.000
	Greenhouse-Geisser	1008763.344	1.595	632317.681	43.679	<.001	.184	69.684	1.000
	Huynh-Feldt	1008763.344	1.946	518265.210	43.679	<.001	.184	85.019	1.000
	Lower-bound	1008763.344	1.000	1008763.344	43.679	<.001	.184	43.679	1.000
Time * LevelID	Sphericity Assumed	116458.198	2	58229.099	5.043	.007	.025	10.085	.816
	Greenhouse-Geisser	116458.198	1.595	72998.863	5.043	.012	.025	8.045	.748
	Huynh-Feldt	116458.198	1.946	59831.905	5.043	.007	.025	9.815	.808
	Lower-bound	116458.198	1.000	116458.198	5.043	.026	.025	5.043	.608
Time * PositionID	Sphericity Assumed	161036.904	4	40259.226	3.486	.008	.035	13.946	.860
	Greenhouse-Geisser	161036.904	3.191	50470.947	3.486	.014	.035	11.124	.795
	Huynh-Feldt	161036.904	3.893	41367.396	3.486	.009	.035	13.572	.853
	Lower-bound	161036.904	2.000	80518.452	3.486	.033	.035	6.973	.646
Time * TrainingActivityTypeID	Sphericity Assumed	303017.484	12	25251.457	2.187	.012	.063	26.241	.947
	Greenhouse-Geisser	303017.484	9.572	31656.469	2.187	.020	.063	20.932	.902
	Huynh-Feldt	303017.484	11.679	25946.525	2.187	.013	.063	25.538	.943
	Lower-bound	303017.484	6.000	50502.914	2.187	.046	.063	13.121	.766
Time * LevelID * PositionID	Sphericity Assumed	211504.820	4	52876.205	4.579	.001	.045	18.316	.944
	Greenhouse-Geisser	211504.820	3.191	66288.212	4.579	.003	.045	14.610	.900
	Huynh-Feldt	211504.820	3.893	54331.668	4.579	.001	.045	17.826	.940
	Lower-bound	211504.820	2.000	105752.410	4.579	.011	.045	9.158	.772
Time * LevelID * TrainingActivityTypeID	Sphericity Assumed	1619711.635	12	134975.970	11.689	<.001	.266	140.267	1.000
	Greenhouse-Geisser	1619711.635	9.572	169212.517	11.689	<.001	.266	111.887	1.000
	Huynh-Feldt	1619711.635	11.679	138691.299	11.689	<.001	.266	136.510	1.000
	Lower-bound	1619711.635	6.000	269951.939	11.689	<.001	.266	70.134	1.000
Time * PositionID * TrainingActivityTypeID	Sphericity Assumed	238452.717	24	9935.530	.860	.657	.051	20.650	.727
	Greenhouse-Geisser	238452.717	19.144	12455.669	.860	.634	.051	16.472	.648
	Huynh-Feldt	238452.717	23.357	10209.014	.860	.654	.051	20.097	.718
	Lower-bound	238452.717	12.000	19871.060	.860	.588	.051	10.325	.494
Time * LevelID * PositionID * TrainingActivityTypeID	Sphericity Assumed	277285.224	24	11553.551	1.001	.464	.058	24.013	.810
	Greenhouse-Geisser	277285.224	19.144	14484.100	1.001	.460	.058	19.154	.734
	Huynh-Feldt	277285.224	23.357	11871.572	1.001	.464	.058	23.370	.802
	Lower-bound	277285.224	12.000	23107.102	1.001	.450	.058	12.006	.573
Error(Time)	Sphericity Assumed	4480365.875	388	11547.335					
	Greenhouse-Geisser	4480365.875	309.496	14476.307					
	Huynh-Feldt	4480365.875	377.606	11865.185					
	Lower-bound	4480365.875	194.000	23094.669					

a. Computed using alpha = .05

### Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Intercept	139188239.22	1	139188239.22	11722.275	<.001	.984	11722.275	1.000
LevelID	113236.032	1	113236.032	9.537	.002	.047	9.537	.867
PositionID	64471.669	2	32235.835	2.715	.069	.027	5.430	.532
TrainingActivityTypeID	44775395.551	6	7462565.925	628.489	<.001	.951	3770.933	1.000
LevelID * PositionID	15591.086	2	7795.543	.657	.520	.007	1.313	.159
LevelID * TrainingActivityTypeID	25693.681	6	4282.280	.361	.903	.011	2.164	.152
PositionID * TrainingActivityTypeID	553989.135	12	46165.761	3.888	<.001	.194	46.656	.999
LevelID * PositionID * TrainingActivityTypeID	55483.903	12	4623.659	.389	.966	.024	4.673	.218
Error	2303522.056	194	11873.825					

a. Computed using alpha = .05

## Appendix L

## Total Distance @ High Intensity Raw Data

Player ID	Level ID	Position ID	S1 TD HIT	S2 TD HIT	S3 TD HIT	Average TD HIT
1	1	1	1239	389	813	813.6666667
2	1	1	1166	648	792	868.6666667
3	1	3	749	505	499	584.3333333
4	1	3	1337	512	769	872.6666667
5	1	1	1080	631	1333	1014.6666667
6	1	3	613	364	563	513.3333333
7	1	2	1326	599	851	925.3333333
8	1	2	767	391	530	562.6666667
9	1	2	993	457	896	782
10	1	3	1064	571	775	803.3333333
12	1	2	746	243	478	489
13	1	1	996	380	801	725.6666667
14	1	1	1298	376	729	801
15	1	3	921	297	157	458.3333333
16	1	1	1046	265	579	630
17	1	1	1244	585	275	701.3333333
18	1	3	964	317	788	689.6666667
19	1	3	778	316	688	594
20	1	2	0	547	805	676
21	2	3	663	669	580	637.3333333
22	2	3	509	382	370	420.3333333
23	2	3	413	485	409	435.6666667
24	2	1	524	508	341	457.6666667
25	2	1	756	673	564	664.3333333
26	2	3	565	499	515	526.3333333
27	2	2	642	330	793	588.3333333
28	2	2	594	353	525	490.6666667
29	2	1	625	643	430	566
30	2	2	369	519	549	479
31	2	1	563	460	337	453.3333333
32	2	1	607	443	240	430
33	2	3	753	541	472	588.6666667
34	2	3	721	446	0	389
35	2	1	512	595	132	413
36	2	3	642	492	591	575
37	2	2	260	0	609	434.5
38	2	2	0	0	289	289

39	2	2	0	0	645	645
40	2	3	0	441	547	494

Values are expressed in meters (m)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

Training Session # Identification: S1 = Training Session #1; S2 = Training Session #2; S3 = Training Session #3

TD HIT = Total Distance at High Intensity

PLAYER ID	LEVEL ID	POSITION ID	Session 1 Hi TD	Session 2 Hi TD	Session 3 Hi TD
1	1	1	1239	389	813
2	1	1	1166	648	792
3	1	3	749	505	499
4	1	3	1337	512	769
5	1	1	1080	631	1333
6	1	3	613	364	563
7	1	2	1326	599	851
8	1	2	767	391	530
9	1	2	993	457	896
10	1	3	1064	571	775
12	1	2	746	243	478
13	1	1	996	380	801
14	1	1	1298	376	729
15	1	3	921	297	157
16	1	1	1046	265	579
17	1	1	1244	585	275
18	1	3	964	317	788
19	1	3	778	316	688
20	1	2	0	547	805
21	2	3	663	669	580
22	2	3	509	382	370
23	2	3	413	485	409
24	2	1	524	508	341
25	2	1	756	673	564
26	2	3	565	499	515
27	2	2	642	330	793
28	2	2	594	353	525
29	2	1	625	643	430

30	2	2	369	519	549
31	2	1	563	460	337
32	2	1	607	443	240
33	2	3	753	541	472
34	2	3	721	446	0
35	2	1	512	595	132
36	2	3	642	492	591
37	2	2	260	0	609
38	2	2	0	0	289
39	2	2	0	0	645
40	2	3	0	441	547

Values are expressed in meters (m)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

Hi TD = Total Distance @ High Intensity

## Appendix L2

## Total Distance @ High Intensity Data Descriptives

Descriptive Statistics					
	LevelID	PositionID	Mean	Std. Deviation	N
Session1	Advanced	Forward	1152.7143	114.23472	7
		Midfielder	766.4000	487.92551	5
		Defender	918.0000	238.11342	7
		Total	964.5789	318.86053	19
	Competitive	Forward	597.8333	89.29819	6
		Midfielder	310.8333	278.94689	6
		Defender	533.2500	242.78547	8
		Total	485.9000	242.63269	20
	Total	Forward	896.6154	304.53504	13
		Midfielder	517.9091	436.73366	11
		Defender	712.8000	305.36353	15
		Total	719.1026	369.25321	39
Session2	Advanced	Forward	467.7143	150.72902	7
		Midfielder	447.4000	139.60229	5
		Defender	411.7143	113.79765	7
		Total	441.7368	129.77838	19
	Competitive	Forward	553.6667	96.99003	6
		Midfielder	200.3333	228.94075	6
		Defender	494.3750	85.02090	8
		Total	423.9500	205.24273	20
	Total	Forward	507.3846	131.40874	13
		Midfielder	312.6364	225.05611	11
		Defender	455.8000	104.81562	15
		Total	432.6154	170.64994	39
Session3	Advanced	Forward	760.2857	316.96199	7
		Midfielder	712.0000	193.45930	5
		Defender	605.5714	227.25746	7
		Total	690.5789	252.68147	19
	Competitive	Forward	340.6667	149.36354	6
		Midfielder	568.3333	166.30414	6
		Defender	435.5000	192.64994	8
		Total	446.9000	187.34429	20

Total	Forward	566.6154	327.00804	13
	Midfielder	633.6364	185.54852	11
	Defender	514.8667	220.00937	15
	Total	565.6154	251.03424	39

## Appendix L3

## Total Distance @ High Intensity Independent t-test

## Group Statistics

	LevelID	N	Mean	Std. Deviation	Std. Error Mean
AverageTDHIT	Advanced	19	710.8246	155.24816	35.61637
	Competitive	20	498.8583	97.82493	21.87432

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
AverageTDHIT	Equal variances assumed	4.493	.041	5.129	37	<.001	<.001	211.96623	41.32475	128.23432	295.69813
	Equal variances not assumed			5.071	30.085	<.001	<.001	211.96623	41.79727	126.61493	297.31753

## Total Distance @ High Intensity 3 Factor ANOVA with Repeated Measures

## Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	1537559.069	2	768779.534	21.969	<.001	.400	43.938	1.000
	Greenhouse-Geisser	1537559.069	1.607	956591.253	21.969	<.001	.400	35.311	1.000
	Huynh-Feldt	1537559.069	1.933	795375.298	21.969	<.001	.400	42.468	1.000
	Lower-bound	1537559.069	1.000	1537559.069	21.969	<.001	.400	21.969	.995
Time * LevelID	Sphericity Assumed	918296.330	2	459148.165	13.121	<.001	.284	26.241	.997
	Greenhouse-Geisser	918296.330	1.607	571317.392	13.121	<.001	.284	21.089	.989
	Huynh-Feldt	918296.330	1.933	475032.297	13.121	<.001	.284	25.364	.996
	Lower-bound	918296.330	1.000	918296.330	13.121	<.001	.284	13.121	.940
Time * PositionID	Sphericity Assumed	602471.261	4	150617.815	4.304	.004	.207	17.216	.912
	Greenhouse-Geisser	602471.261	3.215	187413.528	4.304	.007	.207	13.836	.858
	Huynh-Feldt	602471.261	3.866	155828.406	4.304	.004	.207	16.641	.905
	Lower-bound	602471.261	2.000	301235.631	4.304	.022	.207	8.608	.709
Time * LevelID * PositionID	Sphericity Assumed	291305.802	4	72826.450	2.081	.093	.112	8.324	.589
	Greenhouse-Geisser	291305.802	3.215	90617.846	2.081	.110	.112	6.690	.521
	Huynh-Feldt	291305.802	3.866	75345.866	2.081	.096	.112	8.046	.578
	Lower-bound	291305.802	2.000	145652.901	2.081	.141	.112	4.162	.397
Error(Time)	Sphericity Assumed	2309614.582	66	34994.160					
	Greenhouse-Geisser	2309614.582	53.042	43543.183					
	Huynh-Feldt	2309614.582	63.793	36204.776					
	Lower-bound	2309614.582	33.000	69988.321					

a. Computed using alpha = .05

## Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Intercept	37289198.183	1	37289198.183	578.705	<.001	.946	578.705	1.000
LevelID	1719858.789	1	1719858.789	26.691	<.001	.447	26.691	.999
PositionID	375623.618	2	187811.809	2.915	.068	.150	5.829	.530
LevelID * PositionID	121488.977	2	60744.489	.943	.400	.054	1.885	.199
Error	2126373.622	33	64435.564					

a. Computed using alpha = .05

Appendix M  
Cardio Load Raw Data

Player ID	Level ID	Position ID	S1 CL	S2 CL	S3 CL	Average CL
1	1	1	126	72	100	99.33333333
2	1	1	111	74	106	97
3	1	3	97	74	69	80
4	1	3	108	85	100	97.66666667
5	1	1	77	70	159	102
6	1	3	128	112	53	97.66666667
7	1	2	93	88	99	93.33333333
8	1	2	120	99	104	107.66666667
9	1	2	101	71	108	93.33333333
10	1	3	91	56	82	76.33333333
11	1	3	84	94	95	91
12	1	2	88	59	71	72.66666667
13	1	1	123	87	114	108
14	1	1	156	113	86	118.33333333
15	1	3	153	117	122	130.66666667
16	1	1	145	84	123	117.33333333
17	1	1	110	90	38	79.33333333
18	1	3	129	97	133	119.66666667
19	1	3	101	92	103	98.66666667
20	1	2	8	131	137	134
21	2	3	151	118	104	124.33333333
22	2	3	137	105	81	107.66666667
23	2	3	126	94	123	114.33333333
24	2	1	151	135	120	135.33333333
25	2	1	113	108	104	108.33333333
26	2	3	122	103	90	105
27	2	2	104	65	138	102.33333333
28	2	2	114	92	95	100.33333333
29	2	1	118	78	78	91.33333333
30	2	2	162	111	156	143
31	2	1	143	133	82	119.33333333
32	2	1	154	74	114	114
33	2	3	117	130	71	106
34	2	3	70	124	0	97
35	2	1	86	79	66	77
36	2	3	113	50	112	91.66666667
37	2	2	69	0	105	87

38	2	2	0	0	78	78
39	2	2	0	0	60	60
40	2	3	0	101	99	100

Values are expressed in meters (a.u.)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

Training Session # Identification: S1 = Training Session #1; S2 = Training Session #2; S3 = Training Session #3

CL = Cardio Load

PLAYER ID	LEVEL ID	POSITION ID	Training Activity ID	Session 1 CL	Session 2 CL	Session 3 CL
1	1	1	1	11	3	7
1	1	1	1	11	3	7
2	1	1	1	9	3	7
3	1	3	1	9	2	4
4	1	3	1	10	7	7
5	1	1	1	8	1	13
6	1	3	1	12	6	5
7	1	2	1	3	3	6
8	1	2	1	9	5	5
9	1	2	1	8	4	8
10	1	3	1	7	1	5
11	1	3	1	7	9	6
12	1	2	1	7	3	4
13	1	1	1	10	6	8
14	1	1	1	13	4	8
15	1	3	1	13	9	10
16	1	1	1	11	8	8
17	1	1	1	10	7	1
18	1	3	1	10	7	9
19	1	3	1	7	7	6
20	1	2	1		12	11
21	2	3	1	10	8	8
22	2	3	1	8	9	6
23	2	3	1	19	7	7
24	2	1	1	8	11	9
25	2	1	1	5	8	7
26	2	3	1	10	9	11
27	2	2	1	8	0	12
28	2	2	1	7	9	5
29	2	1	1	9	6	10
30	2	2	1	7	10	14
31	2	1	1	10	11	5
32	2	1	1	17	6	12

33	2	3	1	8	10	10
34	2	3	1	9	12	
35	2	1	1	9	6	6
36	2	3	1	7	4	8
37	2	2	1	11		6
38	2	2	1			8
39	2	2	1			7
40	2	3	1		12	8
1	1	1	2	9	8	6
2	1	1	2	11	6	7
3	1	3	2	6	6	3
4	1	3	2	8	5	5
5	1	1	2	5	3	10
6	1	3	2	11	11	4
7	1	2	2	7	5	5
8	1	2	2	7	6	5
9	1	2	2	6	5	8
10	1	3	2	6	3	4
11	1	3	2	6	7	4
12	1	2	2	5	4	3
13	1	1	2	9	4	8
14	1	1	2	11	9	6
15	1	3	2	12	6	7
16	1	1	2	9	6	8
17	1	1	2	7	7	5
18	1	3	2	11	6	9
19	1	3	2	6	6	7
20	1	2	2	8	13	8
21	2	3	2	9	7	8
22	2	3	2	19	7	5
23	2	3	2	6	4	6
24	2	1	2	6	8	8
25	2	1	2	10	7	7
26	2	3	2	5	5	7
27	2	2	2	3	0	12
28	2	2	2	9	8	5
29	2	1	2	8	6	6
30	2	2	2	8	7	11
31	2	1	2	15	5	5
32	2	1	2	8	3	12
33	2	3	2	8	11	8
34	2	3	2	8	10	
35	2	1	2	9	6	5

36	2	3	2	8	3	8
37	2	2	2			6
38	2	2	2			8
39	2	2	2			8
40	2	3	2		10	6
1	1	1	3	19	13	13
2	1	1	3	20	12	17
3	1	3	3	18	9	10
4	1	3	3	18	17	13
5	1	1	3	10	12	23
6	1	3	3	22	18	6
7	1	2	3	3	12	15
8	1	2	3	19	16	11
9	1	2	3	17	11	15
10	1	3	3	16	5	12
11	1	3	3	16	16	18
12	1	2	3	14	10	10
13	1	1	3	19	15	17
14	1	1	3	21	17	20
15	1	3	3	25	18	14
16	1	1	3	24	18	22
17	1	1	3	17	12	12
18	1	3	3	24	17	20
19	1	3	3	17	13	14
20	1	2	3		27	21
21	2	3	3	23	19	25
22	2	3	3	21	15	16
23	2	3	3	34	14	23
24	2	1	3	23	19	24
25	2	1	3	10	17	19
26	2	3	3	24	16	17
27	2	2	3	19	0	24
28	2	2	3	19	3	17
29	2	1	3	19	7	15
30	2	2	3	28	16	26
31	2	1	3	21	23	16
32	2	1	3	28	10	28
33	2	3	3	22	11	12
34	2	3	3	12	21	
35	2	1	3	18	16	13
36	2	3	3	18	8	20
37	2	2	3	25		18
38	2	2	3			17

39	2	2	3			4
40	2	3	3		21	17
1	1	1	4	18	18	14
2	1	1	4	12	12	18
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4	1	3	4	17	17	16
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6	1	3	4	23	23	7
7	1	2	4	16	16	17
8	1	2	4	19	19	11
9	1	2	4	15	15	15
10	1	3	4	15	15	14
11	1	3	4	14	14	17
12	1	2	4	12	12	10
13	1	1	4	18	18	18
14	1	1	4	24	24	13
15	1	3	4	26	26	15
16	1	1	4	23	23	17
17	1	1	4	17	17	8
18	1	3	4	22	22	19
19	1	3	4	17	17	12
20	1	2	4			21
21	2	3	4	24	20	12
22	2	3	4	23	16	16
23	2	3	4	14	13	22
24	2	1	4	22	17	23
25	2	1	4	24	17	19
26	2	3	4	18	10	20
27	2	2	4	17	0	22
28	2	2	4	17	0	15
29	2	1	4	20	9	15
30	2	2	4	26	15	25
31	2	1	4	23	18	23
32	2	1	4	10	8	28
33	2	3	4	16	12	20
34	2	3	4		21	
35	2	1	4		13	11
36	2	3	4		7	22
37	2	2	4			19
38	2	2	4			18
39	2	2	4			0
40	2	3	4		22	17
1	1	1	5	13	8	12

2	1	1	5	15	7	13
3	1	3	5	16	10	8
4	1	3	5	12	7	12
5	1	1	5	12	11	21
6	1	3	5	12	8	6
7	1	2	5	15	13	12
8	1	2	5	15	8	18
9	1	2	5	18	2	13
10	1	3	5	15	14	12
11	1	3	5	13	8	11
12	1	2	5	20	11	9
13	1	1	5	18	11	14
14	1	1	5	21	17	8
15	1	3	5	14	17	18
16	1	1	5	17	13	16
17	1	1	5	13	14	4
18	1	3	5	8	11	16
19	1	3	5	15	23	16
20	1	2	5		17	19
21	2	3	5	19	13	12
22	2	3	5	17	12	7
23	2	3	5	15	17	13
24	2	1	5	20	15	10
25	2	1	5	16	7	12
26	2	3	5	18	13	8
27	2	2	5	15	19	6
28	2	2	5	17	10	12
29	2	1	5	16	15	8
30	2	2	5	20	19	16
31	2	1	5	18	8	7
32	2	1	5	20	9	17
33	2	3	5	18	19	9
34	2	3	5	7	11	
35	2	1	5	14	8	7
36	2	3	5	15		13
37	2	2	5	16		10
38	2	2	5			11
39	2	2	5			12
40	2	3	5		19	12
1	1	1	6	13	11	12
2	1	1	6	10	11	13
3	1	3	6	11	11	9
4	1	3	6	12	10	11

5	1	1	6	7	9	20
6	1	3	6	15	16	5
7	1	2	6	14	12	13
8	1	2	6	16	15	12
9	1	2	6	11	10	16
10	1	3	6	8	8	9
11	1	3	6	9	10	11
12	1	2	6	6	2	5
13	1	1	6	12	9	15
14	1	1	6	17	13	11
15	1	3	6	17	14	17
16	1	1	6	18	10	14
17	1	1	6	13	11	4
18	1	3	6	16	10	16
19	1	3	6	10	2	11
20	1	2	6		19	7
21	2	3	6	18	16	8
22	2	3	6	16	13	7
23	2	3	6	16	12	12
24	2	1	6	20	16	10
25	2	1	6	15	13	12
26	2	3	6	14	9	9
27	2	2	6	12	10	6
28	2	2	6	14	17	12
29	2	1	6	13	8	6
30	2	2	6	20	9	15
31	2	1	6	18	17	7
32	2	1	6	19	11	17
33	2	3	6	18	15	12
34	2	3	6	7	16	
35	2	1	6	10	7	8
36	2	3	6	14	5	11
37	2	2	6	17		9
38	2	2	6			16
39	2	2	6			9
40	2	3	6		17	10
1	1	1	7	32	8	29
2	1	1	7	34	23	31
3	1	3	7	21	20	22
4	1	3	7	31	22	36
5	1	1	7	19	18	51
6	1	3	7	33	30	20
7	1	2	7	35	27	31

8	1	2	7	35	30	42
9	1	2	7	26	24	33
10	1	3	7	24	10	26
11	1	3	7	19	30	28
12	1	2	7	24	17	30
13	1	1	7	37	24	34
14	1	1	7	49	29	20
15	1	3	7	46	27	41
16	1	1	7	43	6	38
17	1	1	7	33	22	4
18	1	3	7	38	24	44
19	1	3	7	29	24	37
20	1	2	7		43	50
21	2	3	7	48	35	31
22	2	3	7	33	33	24
23	2	3	7	22	27	40
24	2	1	7	52	49	36
25	2	1	7	33	39	28
26	2	3	7	33	41	18
27	2	2	7	30	36	56
28	2	2	7	31	45	29
29	2	1	7	33	27	18
30	2	2	7	53	35	49
31	2	1	7	38	51	19
32	2	1	7	52	27	
33	2	3	7	27	52	
34	2	3	7	27	33	
35	2	1	7	26	23	16
36	2	3	7	51	23	30
37	2	2	7			37
38	2	2	7			
39	2	2	7			20
40	2	3	7			29

Values are expressed in arbitrary units (a.u.)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

Training Activity Identification: 1 = Shooting Activity 1; 2 = Shooting Activity

3 = Possession-Based Activity 1; 4 = Possession-Based Activity 2

5 = 5 v 5 + GK Activity 1; 6 = 5 v 5 + GK Activity 2

7 = 11 v 11 Scrimmage Activity

CL = Cardio Load

Appendix M2  
 Cardio Load Descriptives

Descriptive Statistics						
	LevelID	PositionID	TrainingActivityID	Mean	Std. Deviation	N
Session1CardioLoad	1.00	1.00	1.00	10.3750	1.50594	8
			2.00	8.7143	2.13809	7
			3.00	18.5714	4.35343	7
			4.00	18.2857	4.11154	7
			5.00	15.5714	3.25869	7
			6.00	12.8571	3.80476	7
			7.00	35.2857	9.42893	7
			Total	16.9600	9.34369	50
	2.00	2.00	1.00	6.7500	2.62996	4
			2.00	6.6000	1.14018	5
			3.00	13.2500	7.13559	4
			4.00	15.5000	2.88675	4
			5.00	17.0000	2.44949	4
			6.00	11.7500	4.34933	4
			7.00	30.0000	5.83095	4
			Total	14.1379	8.35688	29
	3.00	3.00	1.00	9.3750	2.32609	8
			2.00	8.2500	2.65922	8
			3.00	19.5000	3.62531	8
			4.00	18.7500	4.33425	8
			5.00	13.1250	2.53194	8
			6.00	12.2500	3.37004	8
			7.00	30.1250	9.01487	8
			Total	15.9107	8.27763	56
	Total	Total	1.00	9.2500	2.40340	20
			2.00	8.0000	2.24781	20
			3.00	17.8421	5.10189	19
			4.00	17.8947	3.99854	19
			5.00	14.8421	3.09593	19
6.00			12.3684	3.54668	19	
7.00			32.0000	8.57645	19	
Total			15.9185	8.70242	135	

2.00	1.00	1.00	9.6667	3.98330	6
		2.00	9.3333	3.07679	6
		3.00	19.8333	5.98052	6
		4.00	19.8000	5.67450	5
		5.00	17.3333	2.42212	6
		6.00	15.8333	3.86868	6
		7.00	36.4000	9.71082	5
		Total	17.8250	9.52968	40
2.00	1.00	1.00	7.3333	.57735	3
		2.00	6.6667	3.21455	3
		3.00	22.0000	5.19615	3
		4.00	20.0000	5.19615	3
		5.00	17.3333	2.51661	3
		6.00	15.3333	4.16333	3
		7.00	38.0000	13.00000	3
		Total	18.0952	11.23345	21
3.00	1.00	1.00	10.3333	4.41210	6
		2.00	9.1667	5.03653	6
		3.00	23.6667	5.46504	6
		4.00	19.0000	4.35890	5
		5.00	17.4000	1.51658	5
		6.00	16.0000	1.78885	6
		7.00	37.4000	11.97080	5
		Total	18.5641	10.21040	39
Total	1.00	1.00	9.4667	3.73911	15
		2.00	8.7333	3.88158	15
		3.00	21.8000	5.51880	15
		4.00	19.5385	4.66575	13
		5.00	17.3571	1.98483	14
		6.00	15.8000	3.00476	15
		7.00	37.1538	10.38305	13
		Total	18.1700	10.06951	100
Total	1.00	1.00	10.0714	2.73058	14
		2.00	9.0000	2.51661	13
		3.00	19.1538	4.98073	13
		4.00	18.9167	4.64089	12
		5.00	16.3846	2.93083	13
		6.00	14.2308	3.98233	13

			7.00	35.7500	9.11667	12
			Total	17.3444	9.38342	90
	2.00		1.00	7.0000	1.91485	7
			2.00	6.6250	1.92261	8
			3.00	17.0000	7.50555	7
			4.00	17.4286	4.35343	7
			5.00	17.1429	2.26779	7
			6.00	13.2857	4.34796	7
			7.00	33.4286	9.57178	7
			Total	15.8000	9.76249	50
	3.00		1.00	9.7857	3.26234	14
			2.00	8.6429	3.71291	14
			3.00	21.2857	4.81070	14
			4.00	18.8462	4.16025	13
			5.00	14.7692	3.03188	13
			6.00	13.8571	3.32490	14
			7.00	32.9231	10.42802	13
			Total	17.0000	9.16283	95
	Total		1.00	9.3429	2.99944	35
			2.00	8.3143	3.02705	35
			3.00	19.5882	5.57656	34
			4.00	18.5625	4.28755	32
			5.00	15.9091	2.93006	33
			6.00	13.8824	3.69901	34
			7.00	34.0938	9.54230	32
			Total	16.8766	9.35470	235
Session2Cardioloa	1.00	1.00	1.00	4.3750	2.38672	8
			2.00	6.1429	2.11570	7
			3.00	14.1429	2.54484	7
			4.00	18.2857	4.11154	7
			5.00	11.5714	3.45722	7
			6.00	10.5714	1.39728	7
			7.00	18.5714	8.56071	7
			Total	11.8000	6.48389	50
	2.00		1.00	3.7500	.95743	4
			2.00	6.6000	3.64692	5
			3.00	12.2500	2.62996	4
			4.00	15.5000	2.88675	4

		5.00	8.5000	4.79583	4
		6.00	9.7500	5.56028	4
		7.00	24.5000	5.56776	4
		Total	11.3793	7.33589	29
	3.00	1.00	6.0000	2.97610	8
		2.00	6.2500	2.25198	8
		3.00	14.1250	4.79397	8
		4.00	18.7500	4.33425	8
		5.00	12.2500	5.49675	8
		6.00	10.1250	4.15546	8
		7.00	23.3750	6.47936	8
		Total	12.9821	7.35957	56
	Total	1.00	4.9000	2.53190	20
		2.00	6.3000	2.47301	20
		3.00	13.7368	3.58767	19
		4.00	17.8947	3.99854	19
		5.00	11.2105	4.66165	19
		6.00	10.2105	3.55245	19
		7.00	21.8421	7.25919	19
		Total	12.2000	7.02214	135
2.00	1.00	1.00	8.0000	2.44949	6
		2.00	5.8333	1.72240	6
		3.00	15.3333	5.88784	6
		4.00	13.8000	4.86826	5
		5.00	10.3333	3.66970	6
		6.00	12.0000	4.09878	6
		7.00	37.8000	12.61745	5
		Total	14.1750	10.93545	40
	2.00	1.00	6.3333	5.50757	3
		2.00	5.0000	4.35890	3
		3.00	6.3333	8.50490	3
		4.00	5.0000	8.66025	3
		5.00	16.0000	5.19615	3
		6.00	12.0000	4.35890	3
		7.00	38.6667	5.50757	3
		Total	12.7619	12.65269	21
	3.00	1.00	7.8333	2.13698	6
		2.00	6.1667	2.85774	6

		3.00	13.8333	3.86868	6
		4.00	14.2000	3.89872	5
		5.00	14.8000	3.03315	5
		6.00	11.6667	4.08248	6
		7.00	31.8000	7.01427	5
		Total	13.8718	8.47963	39
	Total	1.00	7.6000	2.92282	15
		2.00	5.8000	2.62406	15
		3.00	12.9333	6.34110	15
		4.00	11.9231	6.40913	13
		5.00	13.1429	4.32981	14
		6.00	11.8667	3.83344	15
		7.00	35.6923	9.21398	13
		Total	13.7600	10.36030	100
Total	1.00	1.00	5.9286	2.97332	14
		2.00	6.0000	1.87083	13
		3.00	14.6923	4.25019	13
		4.00	16.4167	4.81396	12
		5.00	11.0000	3.46410	13
		6.00	11.2308	2.91987	13
		7.00	26.5833	13.99648	12
		Total	12.8556	8.77248	90
	2.00	1.00	4.8571	3.53217	7
		2.00	6.0000	3.70328	8
		3.00	9.7143	6.12955	7
		4.00	11.0000	7.78888	7
		5.00	11.7143	6.04743	7
		6.00	10.7143	4.82059	7
		7.00	30.5714	9.10782	7
		Total	11.9600	9.82699	50
	3.00	1.00	6.7857	2.72251	14
		2.00	6.2143	2.42356	14
		3.00	14.0000	4.26073	14
		4.00	17.0000	4.61880	13
		5.00	13.2308	4.72853	13
		6.00	10.7857	4.04168	14
		7.00	26.6154	7.68699	13
		Total	13.3474	7.80721	95

		Total	1.00	6.0571	2.98962	35
			2.00	6.0857	2.51316	35
			3.00	13.3824	4.92375	34
			4.00	15.4688	5.83640	32
			5.00	12.0303	4.55854	33
			6.00	10.9412	3.71680	34
			7.00	27.4688	10.54632	32
		Total		12.8638	8.61663	235
Session3Cardioloa	1.00	1.00	1.00	7.3750	3.24863	8
			2.00	7.1429	1.67616	7
			3.00	17.7143	4.23140	7
			4.00	15.5714	4.27618	7
			5.00	12.5714	5.47288	7
			6.00	12.7143	4.82059	7
			7.00	29.5714	14.70666	7
		Total		14.5200	9.50669	50
		2.00	1.00	5.7500	1.70783	4
			2.00	5.8000	2.16795	5
			3.00	12.7500	2.62996	4
			4.00	13.2500	3.30404	4
			5.00	13.0000	3.74166	4
			6.00	11.5000	4.65475	4
			7.00	34.0000	5.47723	4
		Total		13.4483	9.47774	29
		3.00	1.00	6.5000	2.07020	8
			2.00	5.3750	2.06588	8
			3.00	13.3750	4.37321	8
			4.00	14.1250	3.64251	8
			5.00	12.3750	4.13824	8
			6.00	11.1250	3.87068	8
			7.00	31.7500	8.95624	8
		Total		13.5179	9.25987	56
		Total	1.00	6.7000	2.51522	20
			2.00	6.1000	2.02355	20
			3.00	14.8421	4.43801	19
			4.00	14.4737	3.73227	19
			5.00	12.5789	4.36292	19
			6.00	11.7895	4.21082	19

		7.00	31.4211	10.54259	19
		Total	13.8741	9.34131	135
2.00	1.00	1.00	8.1667	2.63944	6
		2.00	7.1667	2.63944	6
		3.00	19.1667	5.77639	6
		4.00	21.6000	4.87852	5
		5.00	10.1667	3.86868	6
		6.00	10.0000	4.04969	6
		7.00	23.4000	8.41427	5
		Total	13.8250	7.72902	40
	2.00	1.00	10.3333	4.72582	3
		2.00	9.3333	3.78594	3
		3.00	22.3333	4.72582	3
		4.00	20.6667	5.13160	3
		5.00	11.3333	5.03322	3
		6.00	11.0000	4.58258	3
		7.00	44.6667	14.01190	3
		Total	18.5238	13.31022	21
	3.00	1.00	8.3333	1.86190	6
		2.00	7.0000	1.26491	6
		3.00	18.8333	4.79236	6
		4.00	18.0000	4.00000	5
		5.00	9.8000	2.58844	5
		6.00	9.8333	2.13698	6
		7.00	28.6000	8.23408	5
		Total	14.0000	8.09483	39
	Total	1.00	8.6667	2.76887	15
		2.00	7.5333	2.44560	15
		3.00	19.6667	5.02375	15
		4.00	20.0000	4.52769	13
		5.00	10.2857	3.47361	14
		6.00	10.1333	3.27036	15
		7.00	30.3077	12.31114	13
		Total	14.8800	9.38329	100
Total	1.00	1.00	7.7143	2.92018	14
		2.00	7.1538	2.07550	13
		3.00	18.3846	4.83974	13
		4.00	18.0833	5.31650	12

	5.00	11.4615	4.77171	13
	6.00	11.4615	4.52061	13
	7.00	27.0000	12.40235	12
	Total	14.2111	8.72101	90
2.00	1.00	7.7143	3.86067	7
	2.00	7.1250	3.18198	8
	3.00	16.8571	6.09449	7
	4.00	16.4286	5.47288	7
	5.00	12.2857	4.02965	7
	6.00	11.2857	4.23140	7
	7.00	38.5714	10.62791	7
	Total	15.5800	11.40371	50
3.00	1.00	7.2857	2.12779	14
	2.00	6.0714	1.89997	14
	3.00	15.7143	5.19509	14
	4.00	15.6154	4.11377	13
	5.00	11.3846	3.73136	13
	6.00	10.5714	3.20371	14
	7.00	30.5385	8.48150	13
	Total	13.7158	8.75878	95
Total	1.00	7.5429	2.76898	35
	2.00	6.7143	2.29541	35
	3.00	16.9706	5.23094	34
	4.00	16.7188	4.86087	32
	5.00	11.6061	4.11506	33
	6.00	11.0588	3.86077	34
	7.00	30.9688	11.11374	32
	Total	14.3021	9.35244	235

Appendix M3  
Cardio Load Independent t-test

**Group Statistics**

	LevelID	N	Mean	Std. Deviation	Std. Error Mean
AverageCardioLoad	Advanced	20	100.7000	17.11123	3.82619
	Competitive	20	103.1000	19.73897	4.41377

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
AverageCardioLoad	Equal variances assumed	.149	.702	-.411	38	.342	.683	-2.40000	5.84132	-14.22514	9.42514
	Equal variances not assumed			-.411	37.250	.342	.684	-2.40000	5.84132	-14.23296	9.43296

## Cardio Load Repeated Measures ANOVA

### Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	1764.115	2	882.057	41.557	<.001	.177	83.113	1.000
	Greenhouse-Geisser	1764.115	1.833	962.242	41.557	<.001	.177	76.187	1.000
	Huynh-Feldt	1764.115	2.000	882.057	41.557	<.001	.177	83.113	1.000
	Lower-bound	1764.115	1.000	1764.115	41.557	<.001	.177	41.557	1.000
Time * LevelID	Sphericity Assumed	28.964	2	14.482	.682	.506	.004	1.365	.165
	Greenhouse-Geisser	28.964	1.833	15.798	.682	.494	.004	1.251	.159
	Huynh-Feldt	28.964	2.000	14.482	.682	.506	.004	1.365	.165
	Lower-bound	28.964	1.000	28.964	.682	.410	.004	.682	.130
Time * PositionID	Sphericity Assumed	289.315	4	72.329	3.408	.009	.034	13.631	.851
	Greenhouse-Geisser	289.315	3.667	78.904	3.408	.012	.034	12.495	.826
	Huynh-Feldt	289.315	4.000	72.329	3.408	.009	.034	13.631	.851
	Lower-bound	289.315	2.000	144.657	3.408	.035	.034	6.815	.636
Time * TrainingActivityID	Sphericity Assumed	468.043	12	39.004	1.838	.041	.054	22.051	.894
	Greenhouse-Geisser	468.043	11.000	42.549	1.838	.047	.054	20.214	.871
	Huynh-Feldt	468.043	12.000	39.004	1.838	.041	.054	22.051	.894
	Lower-bound	468.043	6.000	78.007	1.838	.094	.054	11.026	.678
Time * LevelID * PositionID	Sphericity Assumed	210.985	4	52.746	2.485	.043	.025	9.940	.707
	Greenhouse-Geisser	210.985	3.667	57.541	2.485	.048	.025	9.112	.678
	Huynh-Feldt	210.985	4.000	52.746	2.485	.043	.025	9.940	.707
	Lower-bound	210.985	2.000	105.493	2.485	.086	.025	4.970	.495
Time * LevelID * TrainingActivityID	Sphericity Assumed	1706.238	12	142.186	6.699	<.001	.172	80.386	1.000
	Greenhouse-Geisser	1706.238	11.000	155.112	6.699	<.001	.172	73.688	1.000
	Huynh-Feldt	1706.238	12.000	142.186	6.699	<.001	.172	80.386	1.000
	Lower-bound	1706.238	6.000	284.373	6.699	<.001	.172	40.193	.999
Time * PositionID * TrainingActivityID	Sphericity Assumed	606.990	24	25.291	1.192	.245	.069	28.597	.891
	Greenhouse-Geisser	606.990	22.000	27.590	1.192	.252	.069	26.214	.868
	Huynh-Feldt	606.990	24.000	25.291	1.192	.245	.069	28.597	.891
	Lower-bound	606.990	12.000	50.582	1.192	.291	.069	14.299	.668
Time * LevelID * PositionID * TrainingActivityID	Sphericity Assumed	561.571	24	23.399	1.102	.338	.064	26.457	.858
	Greenhouse-Geisser	561.571	22.000	25.526	1.102	.341	.064	24.253	.832
	Huynh-Feldt	561.571	24.000	23.399	1.102	.338	.064	26.457	.858
	Lower-bound	561.571	12.000	46.798	1.102	.360	.064	13.229	.625
Error(Time)	Sphericity Assumed	8193.018	386	21.225					
	Greenhouse-Geisser	8193.018	353.834	23.155					
	Huynh-Feldt	8193.018	386.000	21.225					
	Lower-bound	8193.018	193.000	42.451					

a. Computed using alpha = .05

### Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Intercept	142047.155	1	142047.155	4489.351	<.001	.959	4489.351	1.000
LevelID	668.227	1	668.227	21.119	<.001	.099	21.119	.996
PositionID	10.010	2	5.005	.158	.854	.002	.316	.074
TrainingActivityID	37211.084	6	6201.847	196.007	<.001	.859	1176.043	1.000
LevelID * PositionID	99.409	2	49.704	1.571	.211	.016	3.142	.330
LevelID * TrainingActivityID	618.761	6	103.127	3.259	.004	.092	19.556	.926
PositionID * TrainingActivityID	604.114	12	50.343	1.591	.097	.090	19.093	.821
LevelID * PositionID * TrainingActivityID	154.923	12	12.910	.408	.959	.025	4.896	.228
Error	6106.696	193	31.641					

a. Computed using alpha = .05

Appendix N  
Passes Completed Raw Data

PLAYER ID	LEVEL ID	POSITION ID	Session 2 TP	Session 3 TP	Avg TP
1	1	1	48	50	49
2	1	1	28	40	34
3	1	3	40	50	45
4	1	3	44	44	44
5	1	1	28	36	32
6	1	3	33	42	37.5
7	1	2	56	39	47.5
8	1	2	50	59	54.5
9	1	2	59	63	61
10	1	3	42	46	44
11	1	3	39	46	42.5
12	1	2	62	54	58
13	1	1	57	32	44.5
14	1	2	50	44	47
15	1	3	32	42	37
16	1	1	37	32	34.5
17	1	1	41	50	45.5
18	1	3	41	41	41
19	1	3	32	46	39
20	1	2	38	79	58.5
21	2	3	41	40	40.5
22	2	3	47	34	40.5
23	2	3	45	38	41.5
24	2	3	51	51	51
25	2	2	35	50	42.5
26	2	2	49	78	63.5
27	2	2	45	50	47.5
28	2	1	38	38	38
29	2	1	41	35	38
30	2	1	41	49	45
31	2	3	36	58	47
32	2	1	39	49	44
33	2	1	42	38	40
34	2	1	40	38	39
35	2	2	47	67	57
36	2	2	50	37	43.5
37	2	2	48	43	45.5
38	2	3	74	66	70

39	2	3	41	45	43
40	2	2	49	39	44

Values are expressed in total number of completed passes (#)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

TP = Total Passes

Appendix N2  
Passes Completed Descriptives

Descriptive Statistics					
	LevelID	PositionID	Mean	Std. Deviation	N
Session2TotalPasses	Advanced	Forward	39.8333	11.40906	6
		Midfielder	52.5000	8.57321	6
		Defender	37.8750	4.82368	8
		Total	42.8500	10.24066	20
	Competitive	Forward	40.1667	1.47196	6
		Midfielder	46.1429	5.17779	7
		Defender	47.8571	12.49571	7
		Total	44.9500	8.31913	20
	Total	Forward	40.0000	7.75769	12
		Midfielder	49.0769	7.41015	13
		Defender	42.5333	10.25299	15
		Total	43.9000	9.27030	40
Session3TotalPasses	Advanced	Forward	40.0000	8.29458	6
		Midfielder	56.3333	14.30618	6
		Defender	44.6250	2.97309	8
		Total	46.7500	10.97785	20
	Competitive	Forward	41.1667	6.17792	6
		Midfielder	52.0000	15.18771	7
		Defender	47.4286	11.54494	7
		Total	47.1500	12.04061	20
	Total	Forward	40.5833	6.99946	12
		Midfielder	54.0000	14.34108	13
		Defender	45.9333	7.97735	15
		Total	46.9500	11.37462	40

## Appendix N3

## Passes Completed Independent t-test

**Group Statistics**

	LevelID	N	Mean	Std. Deviation	Std. Error Mean
AvgTP	Advanced	20	44.8000	8.28505	1.85259
	Competitive	20	46.0500	8.46650	1.89317

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
AvgTP	Equal variances assumed	.031	.860	-.472	38	.320	.640	-1.25000	2.64881	-6.61223	4.11223
	Equal variances not assumed			-.472	37.982	.320	.640	-1.25000	2.64881	-6.61231	4.11231

## Passes Completed 3-Factor ANOVA

### Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	162.018	1	162.018	1.919	.175	.053	1.919	.270
	Greenhouse-Geisser	162.018	1.000	162.018	1.919	.175	.053	1.919	.270
	Huynh-Feldt	162.018	1.000	162.018	1.919	.175	.053	1.919	.270
	Lower-bound	162.018	1.000	162.018	1.919	.175	.053	1.919	.270
Time * LevelID	Sphericity Assumed	10.253	1	10.253	.121	.730	.004	.121	.063
	Greenhouse-Geisser	10.253	1.000	10.253	.121	.730	.004	.121	.063
	Huynh-Feldt	10.253	1.000	10.253	.121	.730	.004	.121	.063
	Lower-bound	10.253	1.000	10.253	.121	.730	.004	.121	.063
Time * PositionID	Sphericity Assumed	57.140	2	28.570	.338	.715	.020	.677	.100
	Greenhouse-Geisser	57.140	2.000	28.570	.338	.715	.020	.677	.100
	Huynh-Feldt	57.140	2.000	28.570	.338	.715	.020	.677	.100
	Lower-bound	57.140	2.000	28.570	.338	.715	.020	.677	.100
Time * LevelID * PositionID	Sphericity Assumed	88.020	2	44.010	.521	.598	.030	1.043	.129
	Greenhouse-Geisser	88.020	2.000	44.010	.521	.598	.030	1.043	.129
	Huynh-Feldt	88.020	2.000	44.010	.521	.598	.030	1.043	.129
	Lower-bound	88.020	2.000	44.010	.521	.598	.030	1.043	.129
Error(Time)	Sphericity Assumed	2869.869	34	84.408					
	Greenhouse-Geisser	2869.869	34.000	84.408					
	Huynh-Feldt	2869.869	34.000	84.408					
	Lower-bound	2869.869	34.000	84.408					

a. Computed using alpha = .05

### Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Intercept	163628.709	1	163628.709	1725.804	<.001	.981	1725.804	1.000
LevelID	7.096	1	7.096	.075	.786	.002	.075	.058
PositionID	1691.584	2	845.792	8.921	<.001	.344	17.841	.960
LevelID * PositionID	477.432	2	238.716	2.518	.096	.129	5.036	.470
Error	3223.643	34	94.813					

a. Computed using alpha = .05

Appendix O  
Dribbles Completed Raw Data

PLAYER ID	LEVEL ID	POSITION ID	Session 2 D	Session 3 D	Average D
1	1	1	3	4	3.5
2	1	1	3	7	5
3	1	3	3	1	2
4	1	3	0	9	4.5
5	1	1	2	3	2.5
6	1	3	5	1	3
7	1	2	7	5	6
8	1	2	8	17	12.5
9	1	2	3	5	4
10	1	3	2	3	2.5
11	1	3	1	3	2
12	1	2	2	1	1.5
13	1	1	0	0	0
14	1	2	1	0	0.5
15	1	3	0	3	1.5
16	1	1	0	3	1.5
17	1	1	2	8	5
18	1	3	0	3	1.5
19	1	3	0	1	0.5
20	1	2	4	9	6.5
21	2	3	3	0	1.5
22	2	3	1	1	1
23	2	3	0	1	0.5
24	2	3	0	1	0.5
25	2	2	0	0	0
26	2	2	0	2	1
27	2	2	3	2	2.5
28	2	1	0	1	0.5
29	2	1	0	0	0
30	2	1	0	1	0.5
31	2	3	1	0	0.5
32	2	1	1	0	0.5
33	2	1	4	2	3
34	2	1	4	1	2.5
35	2	2	2	1	1.5
36	2	2	4	0	2

37	2	2	0	0	0
38	2	3	1	0	0.5
39	2	3	0	1	0.5
40	2	2	4	3	3.5

Values are expressed in total number of completed Dribbles (#)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

D = Dribbles

Appendix O2  
Dribbles Completed Descriptives

<b>Descriptive Statistics</b>					
	LevelID	PositionID	Mean	Std. Deviation	N
Session2Dribbles	Advanced	Forward	1.6667	1.36626	6
		Midfielder	4.1667	2.78687	6
		Defender	1.3750	1.84681	8
		Total	2.3000	2.31926	20
	Competitive	Forward	1.5000	1.97484	6
		Midfielder	1.8571	1.86445	7
		Defender	.8571	1.06904	7
		Total	1.4000	1.63514	20
	Total	Forward	1.5833	1.62135	12
		Midfielder	2.9231	2.53185	13
		Defender	1.1333	1.50555	15
		Total	1.8500	2.03243	40
Session3Dribbles	Advanced	Forward	4.1667	2.92689	6
		Midfielder	6.1667	6.21021	6
		Defender	3.0000	2.61861	8
		Total	4.3000	4.09235	20
	Competitive	Forward	.8333	.75277	6
		Midfielder	1.1429	1.21499	7
		Defender	.5714	.53452	7
		Total	.8500	.87509	20
	Total	Forward	2.5000	2.67989	12
		Midfielder	3.4615	4.85825	13
		Defender	1.8667	2.26358	15
		Total	2.5750	3.40352	40

## Appendix O3

## Dribbles Completed Independent t-test

## Group Statistics

	LevelID	N	Mean	Std. Deviation	Std. Error Mean
AverageDribbles	Advanced	20	3.3000	2.84882	.63702
	Competitive	20	1.1250	1.04975	.23473

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
AverageDribbles	Equal variances assumed	7.228	.011	3.204	38	.001	.003	2.17500	.67889	.80066	3.54934
	Equal variances not assumed			3.204	24.066	.002	.004	2.17500	.67889	.77405	3.57595

## Dribbles Completed 3-Factor ANOVA

## Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	10.913	1	10.913	2.773	.105	.075	2.773	.366
	Greenhouse-Geisser	10.913	1.000	10.913	2.773	.105	.075	2.773	.366
	Huynh-Feldt	10.913	1.000	10.913	2.773	.105	.075	2.773	.366
	Lower-bound	10.913	1.000	10.913	2.773	.105	.075	2.773	.366
Time * LevelID	Sphericity Assumed	33.331	1	33.331	8.471	.006	.199	8.471	.807
	Greenhouse-Geisser	33.331	1.000	33.331	8.471	.006	.199	8.471	.807
	Huynh-Feldt	33.331	1.000	33.331	8.471	.006	.199	8.471	.807
	Lower-bound	33.331	1.000	33.331	8.471	.006	.199	8.471	.807
Time * PositionID	Sphericity Assumed	.285	2	.142	.036	.964	.002	.072	.055
	Greenhouse-Geisser	.285	2.000	.142	.036	.964	.002	.072	.055
	Huynh-Feldt	.285	2.000	.142	.036	.964	.002	.072	.055
	Lower-bound	.285	2.000	.142	.036	.964	.002	.072	.055
Time * LevelID * PositionID	Sphericity Assumed	1.377	2	.688	.175	.840	.010	.350	.075
	Greenhouse-Geisser	1.377	2.000	.688	.175	.840	.010	.350	.075
	Huynh-Feldt	1.377	2.000	.688	.175	.840	.010	.350	.075
	Lower-bound	1.377	2.000	.688	.175	.840	.010	.350	.075
Error(Time)	Sphericity Assumed	133.783	34	3.935					
	Greenhouse-Geisser	133.783	34.000	3.935					
	Huynh-Feldt	133.783	34.000	3.935					
	Lower-bound	133.783	34.000	3.935					

a. Computed using alpha = .05

## Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Intercept	409.286	1	409.286	49.251	<.001	.592	49.251	1.000
LevelID	104.249	1	104.249	12.545	.001	.270	12.545	.931
PositionID	50.438	2	25.219	3.035	.061	.151	6.069	.549
LevelID * PositionID	18.967	2	9.484	1.141	.331	.063	2.282	.234
Error	282.545	34	8.310					

a. Computed using alpha = .05

## Appendix P

## Goals Scored Raw Data

Player ID	Level ID	Position ID	GS Session 2	GS Session 3	Total GS
1	1	1	5	1	6
2	1	1	5	3	8
3	1	3	6	0	6
4	1	3	4	0	4
5	1	1	2	1	3
6	1	3	6	5	11
7	1	2	6	6	12
8	1	2	2	5	7
9	1	2	2	3	5
10	1	3	2	3	5
11	1	3	2	3	5
12	1	2	0	8	8
13	1	1	4	5	9
14	1	2	1	1	2
15	1	3	0	2	2
16	1	1	6	4	10
17	1	1	4	3	7
18	1	3	1	5	6
19	1	3	1	2	3
20	1	2	4	7	11
21	2	3	5	2	7
22	2	3	3	2	5
23	2	3	2	4	6
24	2	3	0	1	1
25	2	2	1	0	1
26	2	2	3	1	4
27	2	2	1	2	3
28	2	1	0	3	3
29	2	1	1	7	8
30	2	1	0	3	3
31	2	3	1	3	4
32	2	1	1	3	4
33	2	1	2	4	6
34	2	1	4	2	6
35	2	2	3	3	6
36	2	2	2	1	3
37	2	2	2	3	5
38	2	3	3	1	4

39	2	3	1	3	4
40	2	2	2	3	5

Values are expressed in total number of goals scored (#)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

GS = Goals Scored

Appendix P2  
Goals Scored Descriptives

Descriptive Statistics					
	LevelID	PositionID	Mean	Std. Deviation	N
Session2GoalsScored	Advanced	Forward	4.3333	1.36626	6
		Midfielder	2.5000	2.16795	6
		Defender	2.7500	2.31455	8
		Total	3.1500	2.08440	20
	Competitive	Forward	1.3333	1.50555	6
		Midfielder	2.0000	.81650	7
		Defender	2.1429	1.67616	7
		Total	1.8500	1.34849	20
	Total	Forward	2.8333	2.08167	12
		Midfielder	2.2308	1.53590	13
		Defender	2.4667	1.99523	15
		Total	2.5000	1.85362	40
Session3GoalsScored	Advanced	Forward	2.8333	1.60208	6
		Midfielder	5.0000	2.60768	6
		Defender	2.5000	1.92725	8
		Total	3.3500	2.25424	20
	Competitive	Forward	3.6667	1.75119	6
		Midfielder	1.8571	1.21499	7
		Defender	2.2857	1.11270	7
		Total	2.5500	1.50350	20
	Total	Forward	3.2500	1.65831	12
		Midfielder	3.3077	2.49615	13
		Defender	2.4000	1.54919	15
		Total	2.9500	1.93417	40

## Appendix P3

## Goals Scored Completed Independent t-test

## Group Statistics

	LevelID	N	Mean	Std. Deviation	Std. Error Mean
TotalGS	Advanced	20	6.5000	3.01749	.67473
	Competitive	20	4.4000	1.81804	.40653

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
TotalGS	Equal variances assumed	5.219	.028	2.666	38	.006	.011	2.10000	.78773	.50531	3.69469
	Equal variances not assumed			2.666	31.188	.006	.012	2.10000	.78773	.49380	3.70620

## Goals Scored Completed3-Factor ANOVA

## Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	5.219	1	5.219	1.744	.195	.049	1.744	.250
	Greenhouse-Geisser	5.219	1.000	5.219	1.744	.195	.049	1.744	.250
	Huynh-Feldt	5.219	1.000	5.219	1.744	.195	.049	1.744	.250
	Lower-bound	5.219	1.000	5.219	1.744	.195	.049	1.744	.250
Time * LevelID	Sphericity Assumed	1.376	1	1.376	.460	.502	.013	.460	.101
	Greenhouse-Geisser	1.376	1.000	1.376	.460	.502	.013	.460	.101
	Huynh-Feldt	1.376	1.000	1.376	.460	.502	.013	.460	.101
	Lower-bound	1.376	1.000	1.376	.460	.502	.013	.460	.101
Time * PositionID	Sphericity Assumed	5.302	2	2.651	.886	.422	.050	1.771	.190
	Greenhouse-Geisser	5.302	2.000	2.651	.886	.422	.050	1.771	.190
	Huynh-Feldt	5.302	2.000	2.651	.886	.422	.050	1.771	.190
	Lower-bound	5.302	2.000	2.651	.886	.422	.050	1.771	.190
Time * LevelID * PositionID	Sphericity Assumed	32.629	2	16.314	5.450	.009	.243	10.900	.814
	Greenhouse-Geisser	32.629	2.000	16.314	5.450	.009	.243	10.900	.814
	Huynh-Feldt	32.629	2.000	16.314	5.450	.009	.243	10.900	.814
	Lower-bound	32.629	2.000	16.314	5.450	.009	.243	10.900	.814
Error(Time)	Sphericity Assumed	101.774	34	2.993					
	Greenhouse-Geisser	101.774	34.000	2.993					
	Huynh-Feldt	101.774	34.000	2.993					
	Lower-bound	101.774	34.000	2.993					

a. Computed using alpha = .05

## Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Intercept	605.238	1	605.238	195.605	<.001	.852	195.605	1.000
LevelID	24.140	1	24.140	7.802	.009	.187	7.802	.774
PositionID	5.503	2	2.752	.889	.420	.050	1.779	.190
LevelID * PositionID	6.895	2	3.447	1.114	.340	.062	2.228	.229
Error	105.202	34	3.094					

a. Computed using alpha = .05

## Appendix Q

## Receptions Completed Raw Data

PLAYER ID	LEVEL ID	POSITION ID	Session 2 R	Session 3 R	Avg R
1	1	1	34	41	37.5
2	1	1	27	30	28.5
3	1	3	42	43	42.5
4	1	3	33	37	35
5	1	1	27	36	31.5
6	1	3	28	28	28
7	1	2	60	36	48
8	1	2	48	54	51
9	1	2	54	55	54.5
10	1	3	32	37	34.5
11	1	3	40	29	34.5
12	1	2	59	50	54.5
13	1	1	55	36	45.5
14	1	2	33	34	33.5
15	1	3	38	39	38.5
16	1	1	33	28	30.5
17	1	1	46	45	45.5
18	1	3	27	21	24
19	1	3	18	36	27
20	1	2	31	62	46.5
21	2	3	40	43	41.5
22	2	3	40	26	33
23	2	3	36	37	36.5
24	2	3	34	35	34.5
25	2	2	37	47	42
26	2	2	48	71	59.5
27	2	2	43	48	45.5
28	2	1	42	38	40
29	2	1	38	42	40
30	2	1	33	48	40.5
31	2	3	26	46	36
32	2	1	40	44	42
33	2	1	44	34	39
34	2	1	41	36	38.5
35	2	2	49	59	54
36	2	2	50	34	42
37	2	2	40	35	37.5
38	2	3	62	55	58.5

39	2	3	36	35	35.5
40	2	2	55	40	47.5

Values are expressed in total number of receptions (#)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

R = Receptions

Appendix Q2  
Receptions Completed Descriptives

<b>Descriptive Statistics</b>					
	LevelID	PositionID	Mean	Std. Deviation	N
Session2Control	Advanced	Forward	37.0000	11.22497	6
		Midfielder	47.5000	12.75539	6
		Defender	32.2500	7.90569	8
		Total	38.2500	11.90256	20
	Competitive	Forward	39.6667	3.82971	6
		Midfielder	46.0000	6.27163	7
		Defender	39.1429	11.12697	7
		Total	41.7000	8.11821	20
	Total	Forward	38.3333	8.11657	12
		Midfielder	46.6923	9.38425	13
		Defender	35.4667	9.84789	15
		Total	39.9750	10.20680	40
	Session3Control	Advanced	Forward	36.0000	6.41872
Midfielder			48.5000	11.16692	6
Defender			33.7500	7.14643	8
Total			38.8500	10.26632	20
Competitive		Forward	40.3333	5.27889	6
		Midfielder	47.7143	13.41286	7
		Defender	39.5714	9.34268	7
		Total	42.6500	10.31236	20
Total		Forward	38.1667	6.04278	12
		Midfielder	48.0769	11.91960	13
		Defender	36.4667	8.48416	15
		Total	40.7500	10.33726	40

## Appendix Q3

## Receptions Completed Independent t-test

**Group Statistics**

	LevelID	N	Mean	Std. Deviation	Std. Error Mean
AvgControl	Advanced	20	38.5500	9.38209	2.09790
	Competitive	20	42.1750	7.47676	1.67185

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
AvgControl	Equal variances assumed	2.798	.103	-1.351	38	.092	.185	-3.62500	2.68259	-9.05562	1.80562
	Equal variances not assumed			-1.351	36.197	.092	.185	-3.62500	2.68259	-9.06451	1.81451

## Receptions Completed 3-Factor ANOVA

### Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	10.196	1	10.196	.140	.711	.004	.140	.065
	Greenhouse-Geisser	10.196	1.000	10.196	.140	.711	.004	.140	.065
	Huynh-Feldt	10.196	1.000	10.196	.140	.711	.004	.140	.065
	Lower-bound	10.196	1.000	10.196	.140	.711	.004	.140	.065
Time * LevelID	Sphericity Assumed	.941	1	.941	.013	.910	.000	.013	.051
	Greenhouse-Geisser	.941	1.000	.941	.013	.910	.000	.013	.051
	Huynh-Feldt	.941	1.000	.941	.013	.910	.000	.013	.051
	Lower-bound	.941	1.000	.941	.013	.910	.000	.013	.051
Time * PositionID	Sphericity Assumed	7.766	2	3.883	.053	.948	.003	.106	.057
	Greenhouse-Geisser	7.766	2.000	3.883	.053	.948	.003	.106	.057
	Huynh-Feldt	7.766	2.000	3.883	.053	.948	.003	.106	.057
	Lower-bound	7.766	2.000	3.883	.053	.948	.003	.106	.057
Time * LevelID * PositionID	Sphericity Assumed	6.585	2	3.292	.045	.956	.003	.090	.056
	Greenhouse-Geisser	6.585	2.000	3.292	.045	.956	.003	.090	.056
	Huynh-Feldt	6.585	2.000	3.292	.045	.956	.003	.090	.056
	Lower-bound	6.585	2.000	3.292	.045	.956	.003	.090	.056
Error(Time)	Sphericity Assumed	2483.238	34	73.036					
	Greenhouse-Geisser	2483.238	34.000	73.036					
	Huynh-Feldt	2483.238	34.000	73.036					
	Lower-bound	2483.238	34.000	73.036					

a. Computed using alpha = .05

### Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Intercept	130439.709	1	130439.709	1312.337	<.001	.975	1312.337	1.000
LevelID	166.768	1	166.768	1.678	.204	.047	1.678	.242
PositionID	1919.800	2	959.900	9.657	<.001	.362	19.315	.972
LevelID * PositionID	196.469	2	98.235	.988	.383	.055	1.977	.208
Error	3379.429	34	99.395					

a. Computed using alpha = .05

Appendix R  
Tackles Completed Raw Data

PLAYER ID	LEVEL ID	POSITION ID	Session 2 T	Session 3 T	Total T	Average T
1	1	1	3	3	6	3.00
2	1	1	2	5	7	3.50
3	1	3	5	1	6	3.00
4	1	3	1	3	4	2.00
5	1	1	6	3	9	4.50
6	1	3	4	2	6	3.00
7	1	2	5	6	11	5.50
8	1	2	2	3	5	2.50
9	1	2	3	2	5	2.50
10	1	3	4	5	9	4.50
11	1	3	3	2	5	2.50
12	1	2	1	1	2	1.00
13	1	1	0	5	5	2.50
14	1	2	1	2	3	1.50
15	1	3	1	3	4	2.00
16	1	1	6	1	7	3.50
17	1	1	1	4	5	2.50
18	1	3	0	1	1	0.50
19	1	3	1	0	1	0.50
20	1	2	6	3	9	4.50
21	2	3	0	1	1	0.50
22	2	3	2	2	4	2.00
23	2	3	3	1	4	2.00
24	2	3	8	2	10	5.00
25	2	2	2	2	4	2.00
26	2	2	5	2	7	3.50
27	2	2	0	2	2	1.00
28	2	1	0	1	1	0.50
29	2	1	1	0	1	0.50
30	2	1	3	2	5	2.50
31	2	3	1	0	1	0.50
32	2	1	0	0	0	0.00
33	2	1	2	1	3	1.50
34	2	1	1	0	1	0.50
35	2	2	3	1	4	2.00
36	2	2	1	8	9	4.50

37	2	2	2	3	5	2.50
38	2	3	2	0	2	1.00
39	2	3	2	1	3	1.50
40	2	2	1	5	6	3.00

Values are expressed in total number of tackles (#)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

T = Tackles

Appendix R2  
Tackles Completed Descriptives

<b>Descriptive Statistics</b>					
	LevelID	PositionID	Mean	Std. Deviation	N
Session2Tackles	Advanced	Forward	3.0000	2.52982	6
		Midfielder	3.0000	2.09762	6
		Defender	2.3750	1.84681	8
		Total	2.7500	2.04875	20
	Competitive	Forward	1.1667	1.16905	6
		Midfielder	2.0000	1.63299	7
		Defender	2.5714	2.57275	7
		Total	1.9500	1.90498	20
	Total	Forward	2.0833	2.10878	12
		Midfielder	2.4615	1.85362	13
		Defender	2.4667	2.13363	15
		Total	2.3500	1.99422	40
Session3Tackles	Advanced	Forward	3.5000	1.51658	6
		Midfielder	2.8333	1.72240	6
		Defender	2.1250	1.55265	8
		Total	2.7500	1.61815	20
	Competitive	Forward	.6667	.81650	6
		Midfielder	3.2857	2.42997	7
		Defender	1.0000	.81650	7
		Total	1.7000	1.92217	20
	Total	Forward	2.0833	1.88092	12
		Midfielder	3.0769	2.06000	13
		Defender	1.6000	1.35225	15
		Total	2.2250	1.83258	40

## Appendix R3

## Tackles Completed Independent t-test

## Group Statistics

	LevelID	N	Mean	Std. Deviation	Std. Error Mean
TotalTackles	Advanced	20	5.5000	2.68524	.60044
	Competitive	20	3.6500	2.75824	.61676
AvgTackles	Advanced	20	2.7500	1.34262	.30022
	Competitive	20	1.8250	1.37912	.30838

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
TotalTackles	Equal variances assumed	.036	.850	2.149	38	.019	.038	1.85000	.86077	.10747	3.59253
	Equal variances not assumed			2.149	37.973	.019	.038	1.85000	.86077	.10743	3.59257
AvgTackles	Equal variances assumed	.036	.850	2.149	38	.019	.038	.92500	.43038	.05373	1.79627
	Equal variances not assumed			2.149	37.973	.019	.038	.92500	.43038	.05371	1.79629

## Tackles Completed 3-Factor ANOVA

## Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	.271	1	.271	.082	.776	.002	.082	.059
	Greenhouse-Geisser	.271	1.000	.271	.082	.776	.002	.082	.059
	Huynh-Feldt	.271	1.000	.271	.082	.776	.002	.082	.059
	Lower-bound	.271	1.000	.271	.082	.776	.002	.082	.059
Time * LevelID	Sphericity Assumed	.415	1	.415	.126	.725	.004	.126	.064
	Greenhouse-Geisser	.415	1.000	.415	.126	.725	.004	.126	.064
	Huynh-Feldt	.415	1.000	.415	.126	.725	.004	.126	.064
	Lower-bound	.415	1.000	.415	.126	.725	.004	.126	.064
Time * PositionID	Sphericity Assumed	7.707	2	3.853	1.167	.323	.064	2.335	.239
	Greenhouse-Geisser	7.707	2.000	3.853	1.167	.323	.064	2.335	.239
	Huynh-Feldt	7.707	2.000	3.853	1.167	.323	.064	2.335	.239
	Lower-bound	7.707	2.000	3.853	1.167	.323	.064	2.335	.239
Time * LevelID * PositionID	Sphericity Assumed	7.640	2	3.820	1.157	.326	.064	2.314	.237
	Greenhouse-Geisser	7.640	2.000	3.820	1.157	.326	.064	2.314	.237
	Huynh-Feldt	7.640	2.000	3.820	1.157	.326	.064	2.314	.237
	Lower-bound	7.640	2.000	3.820	1.157	.326	.064	2.314	.237
Error(Time)	Sphericity Assumed	112.238	34	3.301					
	Greenhouse-Geisser	112.238	34.000	3.301					
	Huynh-Feldt	112.238	34.000	3.301					
	Lower-bound	112.238	34.000	3.301					

a. Computed using alpha = .05

## Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Intercept	415.915	1	415.915	123.877	<.001	.785	123.877	1.000
LevelID	20.717	1	20.717	6.170	.018	.154	6.170	.675
PositionID	9.434	2	4.717	1.405	.259	.076	2.810	.281
LevelID * PositionID	16.193	2	8.096	2.411	.105	.124	4.823	.453
Error	114.155	34	3.357					

a. Computed using alpha = .05

Appendix S  
Blocks Completed Raw Data

PLAYER ID	LEVEL ID	POSITION ID	Session 2 B	Session 3 B	Total B	Avg B
1	1	1	1	4	5	2.5
2	1	1	3	2	5	2.5
3	1	3	1	4	5	2.5
4	1	3	4	0	4	2
5	1	1	3	2	5	2.5
6	1	3	0	1	1	0.5
7	1	2	0	2	2	1
8	1	2	1	2	3	1.5
9	1	2	2	1	3	1.5
10	1	3	5	4	9	4.5
11	1	3	2	7	9	4.5
12	1	2	1	1	2	1
13	1	1	3	1	4	2
14	1	2	0	3	3	1.5
15	1	3	2	2	4	2
16	1	1	0	1	1	0.5
17	1	1	6	0	6	3
18	1	3	2	3	5	2.5
19	1	3	2	0	2	1
20	1	2	1	0	1	0.5
21	2	3	2	1	3	1.5
22	2	3	2	1	3	1.5
23	2	3	4	3	7	3.5
24	2	3	5	3	8	4
25	2	2	1	1	2	1
26	2	2	3	5	8	4
27	2	2	2	0	2	1
28	2	1	1	1	2	1
29	2	1	2	0	2	1
30	2	1	2	1	3	1.5
31	2	3	2	1	3	1.5
32	2	1	0	0	0	0
33	2	1	0	0	0	0
34	2	1	0	3	3	1.5
35	2	2	2	1	3	1.5
36	2	2	1	3	4	2
37	2	2	2	2	4	2
38	2	3	5	2	7	3.5
39	2	3	1	0	1	0.5

40	2	2	0	0	0	0
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Values are expressed in total number of blocks (#)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

B = Blocks

Appendix S2  
Blocks Completed Descriptives

<b>Descriptive Statistics</b>					
	LevelID	PositionID	Mean	Std. Deviation	N
Session2Blocks	Advanced	Forward	2.6667	2.06559	6
		Midfielder	.8333	.75277	6
		Defender	2.2500	1.58114	8
		Total	1.9500	1.66938	20
	Competitive	Forward	.8333	.98319	6
		Midfielder	1.5714	.97590	7
		Defender	3.0000	1.63299	7
		Total	1.8500	1.49649	20
	Total	Forward	1.7500	1.81534	12
		Midfielder	1.2308	.92681	13
		Defender	2.6000	1.59463	15
		Total	1.9000	1.56566	40
Session3Blocks	Advanced	Forward	1.6667	1.36626	6
		Midfielder	1.5000	1.04881	6
		Defender	2.6250	2.38672	8
		Total	2.0000	1.77705	20
	Competitive	Forward	.8333	1.16905	6
		Midfielder	1.7143	1.79947	7
		Defender	1.5714	1.13389	7
		Total	1.4000	1.39170	20
	Total	Forward	1.2500	1.28806	12
		Midfielder	1.6154	1.44559	13
		Defender	2.1333	1.92230	15
		Total	1.7000	1.60448	40

## Appendix S3

## Blocks Completed Independent t-test

## Group Statistics

	LevelID	N	Mean	Std. Deviation	Std. Error Mean
AvgBlocks	Advanced	20	1.9750	1.15251	.25771
	Competitive	20	1.6250	1.24473	.27833
TotalBlocks	Advanced	20	3.9500	2.30503	.51542
	Competitive	20	3.2500	2.48945	.55666

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
AvgBlocks	Equal variances assumed	.039	.845	.923	38	.181	.362	.35000	.37932	-.41789	1.11789
	Equal variances not assumed			.923	37.777	.181	.362	.35000	.37932	-.41804	1.11804
TotalBlocks	Equal variances assumed	.039	.845	.923	38	.181	.362	.70000	.75863	-.83578	2.23578
	Equal variances not assumed			.923	37.777	.181	.362	.70000	.75863	-.83607	2.23607

## Blocks Completed 3-Factor ANOVA

## Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	.850	1	.850	.396	.533	.012	.396	.094
	Greenhouse-Geisser	.850	1.000	.850	.396	.533	.012	.396	.094
	Huynh-Feldt	.850	1.000	.850	.396	.533	.012	.396	.094
	Lower-bound	.850	1.000	.850	.396	.533	.012	.396	.094
Time * LevelID	Sphericity Assumed	.967	1	.967	.451	.506	.013	.451	.100
	Greenhouse-Geisser	.967	1.000	.967	.451	.506	.013	.451	.100
	Huynh-Feldt	.967	1.000	.967	.451	.506	.013	.451	.100
	Lower-bound	.967	1.000	.967	.451	.506	.013	.451	.100
Time * PositionID	Sphericity Assumed	3.695	2	1.848	.862	.431	.048	1.724	.186
	Greenhouse-Geisser	3.695	2.000	1.848	.862	.431	.048	1.724	.186
	Huynh-Feldt	3.695	2.000	1.848	.862	.431	.048	1.724	.186
	Lower-bound	3.695	2.000	1.848	.862	.431	.048	1.724	.186
Time * LevelID * PositionID	Sphericity Assumed	6.538	2	3.269	1.525	.232	.082	3.050	.302
	Greenhouse-Geisser	6.538	2.000	3.269	1.525	.232	.082	3.050	.302
	Huynh-Feldt	6.538	2.000	3.269	1.525	.232	.082	3.050	.302
	Lower-bound	6.538	2.000	3.269	1.525	.232	.082	3.050	.302
Error(Time)	Sphericity Assumed	72.890	34	2.144					
	Greenhouse-Geisser	72.890	34.000	2.144					
	Huynh-Feldt	72.890	34.000	2.144					
	Lower-bound	72.890	34.000	2.144					

a. Computed using alpha = .05

## Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Intercept	243.630	1	243.630	98.602	<.001	.744	98.602	1.000
LevelID	2.235	1	2.235	.905	.348	.026	.905	.152
PositionID	15.612	2	7.806	3.159	.055	.157	6.319	.567
LevelID * PositionID	10.463	2	5.232	2.117	.136	.111	4.235	.404
Error	84.009	34	2.471					

a. Computed using alpha = .05

## Appendix T

## Interceptions Completed Raw Data

PLAYER ID	LEVEL ID	POSITION ID	Session 2 I	Session 3 I	Total I	Avg I
1	1	1	4	4	8	4
2	1	1	8	6	14	7
3	1	3	3	5	8	4
4	1	3	6	1	7	3.5
5	1	1	3	2	5	2.5
6	1	3	5	3	8	4
7	1	2	0	4	4	2
8	1	2	1	2	3	1.5
9	1	2	3	2	5	2.5
10	1	3	4	4	8	4
11	1	3	1	9	10	5
12	1	2	2	1	3	1.5
13	1	1	2	1	3	1.5
14	1	2	3	5	8	4
15	1	3	1	5	6	3
16	1	1	3	7	10	5
17	1	1	5	3	8	4
18	1	3	6	7	13	6.5
19	1	3	2	5	7	3.5
20	1	2	5	4	9	4.5
21	2	3	2	3	5	2.5
22	2	3	8	5	13	6.5
23	2	3	3	4	7	3.5
24	2	3	9	7	16	8
25	2	2	3	2	5	2.5
26	2	2	5	5	10	5
27	2	2	6	4	10	5
28	2	1	2	3	5	2.5
29	2	1	2	2	4	2
30	2	1	1	2	3	1.5
31	2	3	5	0	5	2.5
32	2	1	2	1	3	1.5
33	2	1	6	5	11	5.5
34	2	1	2	3	5	2.5
35	2	2	2	1	3	1.5
36	2	2	3	2	5	2.5
37	2	2	3	5	8	4
38	2	3	2	5	7	3.5
39	2	3	3	6	9	4.5

40	2	2	3	3	6	3
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Values are expressed in total number of interceptions (#)

Level of Competition Identification: 1 = Advanced-level; 2 = Competitive-level

Position Identification: 1 = Forward; 2 = Midfielder, 3 = Defender

I = Interceptions

Appendix T2  
Interceptions Completed Descriptives

<b>Descriptive Statistics</b>					
	LevelID	PositionID	Mean	Std. Deviation	N
Session2Interceptions	Advanced	Forward	4.1667	2.13698	6
		Midfielder	2.3333	1.75119	6
		Defender	3.5000	2.07020	8
		Total	3.3500	2.03328	20
	Competitive	Forward	2.5000	1.76068	6
		Midfielder	3.5714	1.39728	7
		Defender	4.5714	2.87849	7
		Total	3.6000	2.18608	20
	Total	Forward	3.3333	2.05971	12
		Midfielder	3.0000	1.63299	13
		Defender	4.0000	2.44949	15
		Total	3.4750	2.08766	40
Session3Interceptions	Advanced	Forward	3.8333	2.31661	6
		Midfielder	3.0000	1.54919	6
		Defender	4.8750	2.41646	8
		Total	4.0000	2.20048	20
	Competitive	Forward	2.6667	1.36626	6
		Midfielder	3.1429	1.57359	7
		Defender	4.2857	2.28869	7
		Total	3.4000	1.84676	20
	Total	Forward	3.2500	1.91288	12
		Midfielder	3.0769	1.49786	13
		Defender	4.6000	2.29285	15
		Total	3.7000	2.02801	40

## Appendix T3

## Interceptions Completed Independent t-test

## Group Statistics

	LevelID	N	Mean	Std. Deviation	Std. Error Mean
AvgInterceptions	Advanced	20	3.6750	1.52415	.34081
	Competitive	20	3.5000	1.76963	.39570
TotalInterceptions	Advanced	20	7.3500	3.04830	.68162
	Competitive	20	7.0000	3.53925	.79140

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
AvgInterceptions	Equal variances assumed	.594	.446	.335	38	.370	.739	.17500	.52224	-.88221	1.23221
	Equal variances not assumed			.335	37.183	.370	.739	.17500	.52224	-.88297	1.23297
TotalInterceptions	Equal variances assumed	.594	.446	.335	38	.370	.739	.35000	1.04447	-1.76442	2.46442
	Equal variances not assumed			.335	37.183	.370	.739	.35000	1.04447	-1.76595	2.46595

## Interceptions Completed 3-Factor ANOVA

## Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Time	Sphericity Assumed	.740	1	.740	.222	.640	.006	.222	.074
	Greenhouse-Geisser	.740	1.000	.740	.222	.640	.006	.222	.074
	Huynh-Feldt	.740	1.000	.740	.222	.640	.006	.222	.074
	Lower-bound	.740	1.000	.740	.222	.640	.006	.222	.074
Time * LevelID	Sphericity Assumed	2.794	1	2.794	.839	.366	.024	.839	.145
	Greenhouse-Geisser	2.794	1.000	2.794	.839	.366	.024	.839	.145
	Huynh-Feldt	2.794	1.000	2.794	.839	.366	.024	.839	.145
	Lower-bound	2.794	1.000	2.794	.839	.366	.024	.839	.145
Time * PositionID	Sphericity Assumed	1.405	2	.702	.211	.811	.012	.422	.080
	Greenhouse-Geisser	1.405	2.000	.702	.211	.811	.012	.422	.080
	Huynh-Feldt	1.405	2.000	.702	.211	.811	.012	.422	.080
	Lower-bound	1.405	2.000	.702	.211	.811	.012	.422	.080
Time * LevelID * PositionID	Sphericity Assumed	4.055	2	2.028	.609	.550	.035	1.217	.143
	Greenhouse-Geisser	4.055	2.000	2.028	.609	.550	.035	1.217	.143
	Huynh-Feldt	4.055	2.000	2.028	.609	.550	.035	1.217	.143
	Lower-bound	4.055	2.000	2.028	.609	.550	.035	1.217	.143
Error(Time)	Sphericity Assumed	113.259	34	3.331					
	Greenhouse-Geisser	113.259	34.000	3.331					
	Huynh-Feldt	113.259	34.000	3.331					
	Lower-bound	113.259	34.000	3.331					

a. Computed using alpha = .05

## Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power <sup>a</sup>
Intercept	989.168	1	989.168	201.190	<.001	.855	201.190	1.000
LevelID	.517	1	.517	.105	.748	.003	.105	.061
PositionID	26.167	2	13.083	2.661	.084	.135	5.322	.493
LevelID * PositionID	15.305	2	7.652	1.556	.226	.084	3.113	.307
Error	167.164	34	4.917					

a. Computed using alpha = .05

