An Exploration of the Developmental Sport and Training Histories of Canadian Sport Officials

by

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An oral defense of this thesis took place on June 28th, 2019 in front of the following examining committee:

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The above committee determined that the thesis is acceptable in form and content and that a satisfactory knowledge of the field covered by the thesis was demonstrated by the candidate during an oral examination. A signed copy of the Certificate of Approval is available from the School of Graduate and Postdoctoral Studies.

ABSTRACT

Sport officials occupy essential roles in sport and are necessary for sport to function properly. However, compared to athletes and coaches there has been scant research conducted on the development of sport officials. Therefore, the purpose of this thesis was to explore the developmental pathways and milestones that might relate to success as an official. A sample of 223 Canadian sport officials completed The Developmental History of Officials Questionnaire, which collected information on sport and officiating participation histories, as well as training histories related to officiating. Results suggest that respondents' highest level of athletic performance was predictive of a similarly high level as an official ($H(3, n = 217) = 13.37$, $p < .01$, $\eta^2 = 0.06$), thus past athletic participation might be beneficial for future officials' development. Additionally, starting at a younger age as an official was also predictive of reaching a higher level as an official ($F(3, 212) = 9.09$, $p < .001$, $\eta^2 = 0.90$). Competitive officiating was the most relevant activity for skill development, with national/international level referees consistently officiating more hours throughout their career, while practice activities were not as prevalent. Future studies should attempt to increase the sample size, widen the variety of sports represented, and gather more respondents from lower- and middle-tier officiating backgrounds.

Keywords: referee; competitive officiating; Canadian; expertise development; sport participation

AUTHOR'S DECLARATION

I hereby declare that this thesis consists of original work of which I have authored. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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The research work in this thesis that was performed in compliance with the regulations of UOIT's Research Ethics Board/Animal Care Committee under REB Certificate number 15032.

Jason Mergler

STATEMENT OF CONTRIBUTIONS

Part of the work described in Chapter 3 was presented as:

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I performed the majority of the data collection, analysis, and presented each of the conference presentations above.

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LIST OF ABBREVIATIONS AND SYMBOLS

DHOQ	Developmental History of Officials Questionnaire
DMSP	Developmental Model of Sport Participation
DPF	Deliberate Practice Framework
LTAD	Long Term Athlete Development
LTOD	Long Term Official Development

Chapter 1.

Introduction

Along with players and coaches, sport officials have a primary role in sport (Livingston & Forbes, 2017; Purdy & Snyder, 1985), and organized sport could not function without them. Sport officials are the facilitators of sports matches, and offer many positive contributions to sport, such as an ability to educate players and coaches on the laws of the game (Trudel, Côté, & Syvestre, 1996). Along with maintaining the smooth progression of a game, a competent official can offer secondary benefits, such as educating players and coaches, creating a positive environment for development (Trudel et al., 1996), and protecting the safety of athletes (Hancock, Rix-Lièvre, & Côté, 2015). Therefore, as essential members within the sport system (Forbes & Livingston, 2013), sport officials deserve to be treated as respected participants.

Research on sport officials has historically examined various factors affecting this population's performance during competition, whether they be psychological (Philippe, Vallerand, Andrianarisoa, & Brunel, 2009; Purdy & Snyder, 1985; Taylor, Daniel, Leith, & Burke, 1990), physiological (Krustrup et al., 2009), related to decision-making (Jones, Paull, & Erskine, 2002; Nevill, Balmer, & Williams, 2002), or sociological/based on personality (Mascarenhas, Collins, & Mortimer, 2005; Purdy & Snyder, 1985). The attrition and retention of sports officials has also been well researched (Forbes & Livingston, 2013; Livingston & Forbes, 2016; Warner, Tingle, & Kellett, 2013). However, there remains a dearth of research on the aspects of officiating related to the *development* of sport officials. For instance, there have only been a few studies taking

into account the effects of past practice behaviours and sport participation histories on the development of sport officials (Catteeuw, Helsen, Gilis, & Wagemans, 2009; Mack, Schulenkorf, Adair, & Bennie, 2018; MacMahon, Helsen, Starkes, & Weston, 2007; Ollis, Macpherson, & Collins, 2006). With the current lack of information about officials' development, more research is needed to expand officiating literature past historically studied factors.

Therefore, the purpose of this study was to explore the developmental histories of sport officials and explore aspects of their developmental history, milestones, and trajectories that relate to success in reaching different levels of the sport and adherence to the role over time. Specifically, the main research questions that this project aimed to explore the following:

- *Are there any differences in demographics, athletic playing histories, officiating milestones, representative history and practice history among sport officials?*
- *Do developmental trajectories and histories affect officials' overall development/achievement?*

The ultimate objective of this research was to explore officials' developmental histories, with the aim of acquiring a greater understanding of factors that differentiate sport officials of different skill levels. Ultimately, we hope that this research provides useful information to national and provincial sporting organizations about the factors that

influence sport officials' histories. More broadly we hope that continued research on sport officials helps inform officiating development programs, and reinforces the fact that officials are valued and integral members of the sporting community.

The subsequent section includes a review of the literature that details past research on sport officials. Few studies have actually applied sport expertise development concepts to sport officials, although those that could be found were included. Due to the limited amount of research on the development of sport officials, studies conducted on athletes, but that could pertain and transfer over to sport officiating, were also included. Additionally, the penultimate chapter contains a manuscript-style study, with information regarding the methods used for this thesis research such as the procedure, statistical analysis, and recruitment, as well as the study results and discussion. The final chapter provides a summary of the thesis contents, limitations and future research directions.

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Chapter 2.

Literature Review

Introduction

Hancock, Rix-Lièvre and Côté (2015) note that the sport official is vital and "complicated, yet necessary," and that understanding the research on officials is valuable to maintaining "the integrity of sport performance and athletes' development" (Hancock et al., 2015, p. 96). Indeed, organized sport could arguably not function without sport officials, as they occupy primary roles alongside both players and coaches (Purdy & Snyder, 1985). For instance, there are currently over 9,000 soccer officials in Ontario ("Who We Are," 2019) who arbitrate across various levels of sport, from recreational to international competition.

Research on sport officials has predominantly focused on factors that influence officials' performance. Mascarenhas, Collins, and Mortimer (2005) describe officiating performance based on four integral pillars. The Cornerstones Performance Model of Refereeing's four stanchions include i) knowledge and application of the law (i.e., rules), ii) contextual judgment, iii) personality and game management skills, and iv) fitness, positioning and mechanics (Mascarenhas et al., 2005). The model's creation was necessary as there was an overall lack of published research on refereeing performance. This was evidenced by the existing literature's generic advice on how to improve refereeing performance as well as the fact that most studies used referees as a vehicle to study psychological phenomena (Mascarenhas et al., 2005). Furthermore, the development of the model was founded upon four different sets of literature, including

assessor reports, elite level rugby training literature, elite referee performance profiles, and published research from sport science journals (Mascarenhas et al., 2005). The model was then validated by three representative refereeing groups, such as referee trainers, and both high potential and elite referees. All three independent groups came to the conclusion that the model replicated refereeing performance and was "a valuable aid to referee development" (Mascarenhas et al., 2005, p. 372). However, while the link to the development of officials is present, the model is arguably more attuned to officials' performance as opposed to their development. Indeed, there has been a lack of research on the development of sport officials (Aragão e Pina, Passos, Araújo, & Maynard, 2018).

As such, due to the fact that we do not know much about officiating development and that they play an integral role in the sporting environment, more research is needed to understand the development of sport officials. The following sections review pertinent research on sport officiating. While models of officiating performance currently exist, including the Cornerstones Performance Model of Refereeing (Mascarenhas et al., 2005), and MacMahon et al.'s taxonomy of sport officiating roles (2014), neither are developmental models, nor do they explicitly address environmental factors that influence officials' development or performance. As such, an ecological model, Newell's theoretical model of constraints (1986), will be utilized to contextualize officiating and provide structure to the literature review. Officials from different sports do have different performance demands, but environmental factors (e.g., crowd proximity and the cultural

norms of a sport) also differ between sports. As such, Newell's multidimensional theory (1986) will aid in understanding the interplay between the unique inter- and intra-sport factors affecting sport officials' development, and will be a useful way of organizing the existing literature to better understand current gaps and future directions.

Theory of Constraints

According to Newell (1986), performance results from the interaction between the organism, the environment and the task at hand. As this review focuses on sport officials, and thus human performance, the term "individual" will be used in place of "organism" (Haywood & Getchell, 2014). Figure 1 illustrates the various components which make up Newell's seminal theory. Individual constraints can either be structural or functional (Haywood & Getchell, 2014). Structural constraints can include aspects of the individual such as age, weight, height, sex, and fitness level as defined by their aerobic capacity. Functional constraints involve behavioural features of an individual more akin to motivation, resilience, stress coping mechanisms, decision-making ability, and personality. Environmental constraints are external to the individual, but also might refer to broader social constructs related to the world around us (Haywood & Getchell, 2014; Newell, 1986; Wattie, Schorer, & Baker, 2015), such as the physical (e.g., temperature, humidity) and psychosocial (e.g., normalized verbal abuse) environment, organizational policies, and the influence of family, friends, and colleagues. Finally, task constraints are also external to the individual and include the goals and rules of a task, the equipment and

playing field (e.g., basketball court, soccer pitch), as well as the physical (strength, speed, agility) and psychological demands (resilience, ability to perform under pressure) of a sport (Haywood & Getchell, 2014).

The following sections use Newell's model of constraints to illustrate the complexity and diversity inherent to sport officiating in order to summarize the sport science literature on officiating, and to emphasize the need for research on the development of sport officials.

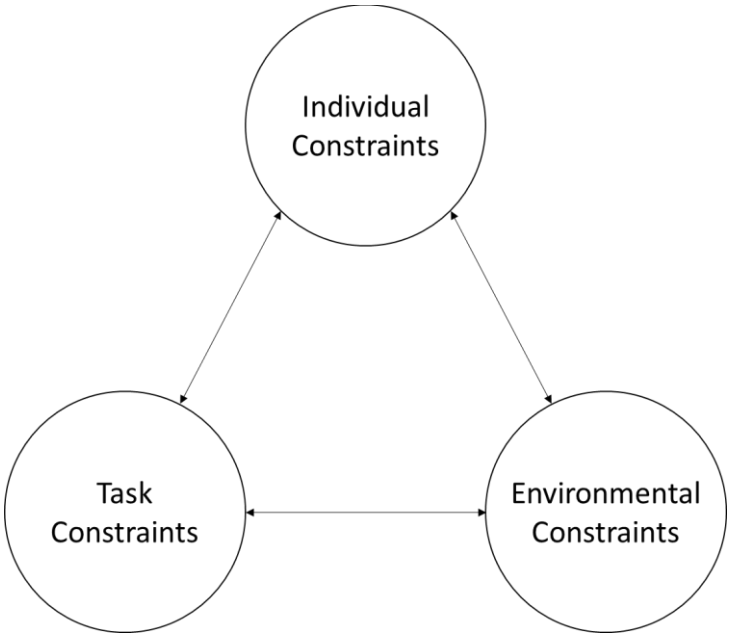

Figure 2.1. Newell's model of constraints (Newell, 1986)

Task Constraints

Although an official might have some control over the game, they are limited by the rules they enforce. While they have discretion in judgment, they do not have limitless power; they are constrained by rules as well as infrastructure. For instance, technology, such as instant replay, might be an equipment-related task constraint in that it could affect an official's decision or their development as a video assistant referee (VAR) in soccer.

A study conducted by Snyder and Purdy focused on the maintenance of social control within matches. Specifically, Snyder and Purdy (1987) proposed that rule enforcement is elastic, meaning that officials subjectively "expand and contract the boundaries of permissible violations based on the ebb and flow of the game" (p. 401) and in accordance with the spirit of the rules, creating fluid game contexts. Moreover, officials were found to personally construct their own meanings of the rules, implying a uniquely subjective definition of what constitutes social order within a game context (Snyder & Purdy, 1987). However, despite varying perceptions, officials widely believed that consistency, balance, and competence were necessary for social control to be properly maintained (Snyder & Purdy, 1987).

Livingston and Forbes (2003) conducted a content analysis of international rule books and found that while soccer and basketball officials are more empowered than hockey officials based on the language used in these rule manuals, officials should be

aware that their role is significant in not only controlling the pace of the game, but also being ready to enforce these rules when necessary. Thus, all officials have a foundational commonality in that they must enforce the rules of the game, regardless of which sport it might be. However, the extent to which officials have control over the game depends upon the sport, their seniority rank, current developmental level and various task constraints (e.g., rule set, equipment, and contextual match information). MacMahon et al. (2014) suggested that sport officials can be subdivided into three categories: interactors, monitors, and reactors. Interactors, which attend to a heightened number of cues and are typically more physically involved in the action of the game, include basketball and soccer referees. However, soccer referees have higher physical demands than basketball officials, and within the sport of soccer, head referees have notably higher physical demands than linesmen (Castillo, Camara, Castagna, & Yanci, 2017). Monitors typically have moderate to low physical demands, but still have a large number of cues to keep track of whilst officiating. An example of a monitor would be a gymnastics or diving judge. Finally, reactors deal with the fewest number of cues and are the least interactively engaged with athletes (e.g., tennis line judge).

In summary, task constraints are sport- and role-specific, resulting in different demands on sport officials depending on their sport and role within that sport. However, it is not clear if specific task constraints within a sport require different amounts training and accumulated experience, or if an official's development might be guided by the tasks

they are required to perform. For example, soccer referees must be fit to successfully execute their role, while a tennis line judge must have the endurance to fixate for long periods of time. Additionally, an official's developmental trajectory might alter the individual-task interaction itself, such as when elite level basketball referees perform their jobs more efficiently than novices. However, Newell's interaction of constraints is incomplete without discussion of the environmental constraints which might also uniquely influence officials in a sport-specific manner.

Environmental Constraints

A number of different environmental constraints have been researched with respect to the performance of officials. Typically, environmental constraints are influences that will not affect the nature of the task (Haywood & Getchell, 2014). However, Newell (1986, p. 350) stated that "[e]nvironmental constraints and task constraints are not mutually exclusive as their definition depends on the nature of the task." However, compared to task constraints, environmental constraints are more dynamic and less stable. For example, switching from a large stadium to a small soccer field does not change the nature of the task, which is to enforce the rules, but it could interact with the task constraints to influence performance. Environmental constraints can include a range of factors, including climatic, socio-cultural, and political influences.

An official's ability to make decisions can be affected by environmental constraints. For instance, bias in decision-making has been associated with multiple environmental factors, including crowd noise (Nevill et al., 2002), the colour of an athlete's outfit (MacMahon et al., 2014), the order of competition (e.g., better athletes perform last in gymnastics; MacMahon et al., 2014), and home team advantage (MacMahon et al., 2014). In particular, Nevill et al. (2002) asked 40 qualified soccer officials to judge the legality of a number of challenges in both a silent condition and while under pressure from simulated crowd noise. Results revealed that, across the entire sample, there was no unanimity for any of the incidents, possibly indicating that officiating errors and diverse perceptions are inevitable. Moreover, officials attempting to make decisions in the noise condition were more uncertain, calling an average of 2.3 lesser fouls for the home team (Nevill et al., 2002), a potentially game-changing statistic. Home crowds can affect officials' decisions by offering salient, albeit biased cues when faced with a contentious decision (Nevill et al., 2002), such as a situation where a penalty shot is deemed necessary, whereby a soccer referee might be inclined to make a decision in favour of the home team. Additionally, officials might use heuristics, or a practical, imperfect set of general rules meant to simplify complex tasks (Simon & Chase, 1973), to solve controversial incidents by using unreliable information from the crowd "as if" it was of equal importance to perceived visual information from the match itself (Nevill et

al., 2002). Simply, officials might take the crowd's reactions as a trustworthy source of diagnostic information which could result in errors.

While attrition rates have been touched upon briefly in the introduction, there are multiple noteworthy environmental factors that affect attrition in the officiating ranks. These include issues such as career and familial demands, physical and verbal abuse initiated by players, coaches, and fans, as well as loss of interest, and personal health (Betts, Livingston, & Forbes, 2007; Forbes & Livingston, 2013; Livingston & Forbes, 2007). These studies also cited conflicts with local sporting organizations as a prevalent reason for terminating participation, including a lack of opportunity for advancement partly due to "politics," or unfair promotion policies, and low rates of remuneration. However, despite a consensus that a flawed political structure (i.e., who you knew) restricted advancement, a high degree of congruence was seen between officials with prominent self-efficacy ratings and those with lofty aspirations (Purdy & Snyder, 1985) suggesting that officials who rated themselves favourably might be more motivated to succeed.

Furthermore, Warner et al. (2013) observed that the primary demotivators which caused basketball officials to retire included negative interactions, inadequate training and mentoring, a lackluster community, poor administrator support, and cumbersome sport policies. However, the primary motivators which influenced basketball officials to

first begin officiating included staying involved with the game, feeling challenged, remuneration, and becoming part of the officiating community. The officials studied made the decision to discontinue when their positive experiences were outweighed by the negative experiences (Warner et al., 2013). In order to improve these organizational features, Forbes and Livingston (2013) have advocated for more awareness and to problematize the issue of attrition, and recommended better training modules, performance feedback, and continual objective evaluations; Titlebaum et al. (2009) seconded these thoughts. Additionally, Cuskelly and Hoye (2013) suggested that reduced turnover lowers recruitment and training costs, and augments the depth of officiating pools (i.e., more experienced officials), thereby facilitating more officiating practice, and thus further developing and refining referees' skills. However, reduced turnover creates a dilemma. More officials might lead to greater competition to officiate high-level games, leading to fewer opportunities to improve, and potentially equivalent attrition rates. Thus, the number of opportunities available must be proportional to the number of employed officials.

Nevertheless, higher organizational support seemingly correlates with higher retention and enhanced developmental outcomes for officials. However, this correlation might be affected by an official's developmental level and career trajectory. For instance, in the author's opinion, a novice official might experience different benefits from greater organizational support, such as more consistent or substantial remuneration, while an

experienced official might feel as if they have an influential voice within the organization's political structure. These variations in seniority also affect an official's ability to practice both individually and in groups as those with a higher rank might have greater or first access to game schedules and could choose to officiate the most competitive games. As such, depending upon an official's current location in their career trajectory, and because each individual official and the overall officiating ranks are highly diverse (i.e., a plethora of sports and roles), the advantages and disadvantages experienced after a change in organizational support might be consirably diverse.

Individual Constraints

Officials occupy a difficult position within the sport system requiring mental toughness and stress regulation, conflict resolution, keen decision-making, and specifically for basketball and soccer officials, a high level of fitness (Castillo et al., 2017; Leicht, 2008; MacMahon & Mildenhall, 2012; Voight, 2009). Thus, it should come as no surprise that studies have historically focused their efforts on the plethora of individualized factors affecting sport officials' performance in the field. Particularly, some of these individual constraints include psychological and perceptual-cognitive factors, in addition to physiological components and accumulated experience throughout one's development.

Psychological and Perceptual-Cognitive Factors

Psychological factors, including stress, coping mechanisms, burnout, social profile, and personality have all been observed at various competitive levels of soccer and basketball officials (Philippe et al., 2009; Purdy & Snyder, 1985; Rainey, 1999; Snyder & Purdy, 1987; Taylor et al., 1990). For instance, over 500 Ontario competitive-level soccer officials were administered a questionnaire and queried on factors causing stress, burnout, and turnover in an attempt to create a causal link between perceived stress and intent to terminate officiating through a mediating burnout effect (Taylor et al., 1990). Taylor et al. (1990) observed that fear of failure (i.e., making a poor call) was the greatest predictor of burnout, followed by interpersonal conflicts, or an inability to assert control, and role-culture conflicts, i.e. the discrepancy between perceived and expected appreciation.

Younger officials were also most likely to report burnout (Taylor et al., 1990), with speculation that, along with fear of failure, those with low self-esteem and inexperience might be more prone to feelings of burnout. Similarly, high school basketball officials reported that interpersonal conflicts was the greatest predictor of burnout, with burnout again taking on a mediating role toward intention to terminate (Rainey, 1999); however, absolute burnout and termination scores were overall very low. Importantly, Taylor et al. (1990) suggested that burnout might be a slow burn, affecting officials after having accumulated several chronically stressful years in the field, while Rainey (1999) proposed that a small minority of officials might be experiencing high

degrees of stress, burnout, and intention to resign. Both studies offered practical and preventative solutions, such as stress and time management, assertiveness and confidence training, and mental wellness techniques comprising of visualization, deep breathing, and self-talk.

Purdy and Snyder (1985; 1987) conducted research on over 600 high school basketball officials from the state of Ohio with the intention of manufacturing a social profile of this population, including reasons for entering the profession and continuing participation. In the former study, over a third of officials began their career due to an existing relationship with an official, while the vast majority reported to have continued because of a deep interest in basketball and finding enjoyment in the challenges that came with officiating (Purdy & Snyder, 1985). Conversely, over half of officials claimed that their unpopular role as enforcer (i.e., blamed for losses, never completely correct) was a major downside (Purdy & Snyder, 1985). Importantly, around half the population had taken a course on officiating, suggesting that many were interested in improving their performance.

A study by Philippe et al. (2009) examined motivational effects and their consequences on officiating performance, and discovered that the type of passion for one's sport varied based on competition level. Using the dualistic model of passion (Vallerand et al., 2003), Philippe et al. (2009) found that Harmonious Passion (HP),

associated with positive emotion during a game, provided a small protective effect and greater flexibility on officials' cognitive and emotional consequences after an error (i.e., less stress). Conversely, Obsessive Passion (OP), related to rigid persistence and a controlling nature, had a small detrimental effect on officials' affective processes. Furthermore, league level (i.e., elite, competitive, nonprofessional) was positively correlated with the strength and type of officials' passion, with elite referees recording higher HP (Philippe et al., 2009), suggesting that either more passion is required to officiate at the top level, or self-selection naturally separates those with more motivation. OP was also shown to lead to poorer decision-making than HP, with the former causing rumination, imbalanced decisions, and potential repair behaviours (i.e., make-up calls) while HP facilitated concentration, allowing for a more neutral stance subsequent to an error (Philippe et al., 2009).

In reference to perceptual-cognitive skills, Helsen and Bultynck (2004) proposed that in order to appropriately develop these skills, sport officials must train within a dynamic, sport-specific context using anticipatory training tasks or simulated game situations. Jones et al. (2002) suggested that officials utilize heuristics and schemata, or mental structures of previously acquired knowledge, to help quicken the decision-making process. This might, however, skew decisions unevenly in favour of one team if officials interpret the opposing team as aggressive, having either been told this information verbally or witnessed the behaviour themselves. Jones et al. (2002) demonstrated this

phenomenon in their study of sub-elite soccer officials' verdicts on challenges, as the group having been informed of one team's aggressive nature awarded more yellow and red cards, but fewer overall fouls (i.e., fewer decisions, harsher results). Thus, expectancies and prior knowledge are a double-edged sword, creating an anticipatory bias which facilitates faster activation when specific conditions are met, but which might also lead to incorrect decisions if said expectancies are not realized as an official becomes trapped in anticipation (Jones et al., 2002).

Physical Factors

Physiologically speaking, officials require optimum fitness levels to keep up with the pace of a game, both in soccer and basketball. As such, Krustrup et al. (2009) not only demonstrated that elite soccer referees and assistant referees need strong fitness levels based on significant amounts of high-intensity running (HIR) throughout international games, but that both groups have heterogeneous fitness requirements to match unique activity profiles. With referees performing more HIR and backwards running, and achieving higher heart rates compared to assistant referees' larger volume of lateral running, study results emphasized distinct physical skills for each group (Krustrup et al., 2009). Castillo et al. (2017) partially confirmed these findings with their examination of elite field and assistant referees' training programs between soccer seasons, learning that both groups saw uniquely diminished acceleration capacities after the nine week off-season period and denoting the importance of continual individualized physical training.

Thus, it was concluded that both groups might benefit from lower-limb power training, with assistant referees specifically meant to focus on endurance training (Castillo et al., 2017). Helsen and Bultynck (2004) suggested that different roles in soccer required separate training programs (i.e., head versus assistant soccer referees), but that programs should be task-specific, with a priority on high-intensity aerobic exercise to match the high work rate during a real game. These results suggest that in order to properly develop (in soccer/invasion sports), physical training should be specific to an official's sport and task requirements.

With respect to basketball, Leicht (2008) documented a small sample of elite officials' heart rates during an international tournament and observed that these referees experienced significant physiological demands, i.e. inside high (i.e., 70—89% HRmax) intensity category for the bulk (~59%) of each quarter. Krustrup et al. (2009) proposed that officials with the highest fitness capacity might be the most efficient at evaluating the actions in an international setting and are better prepared than the domestic referees. This might suggest that fitter officials reach higher levels of officiating. Furthermore, officials' current training programs and fitness assessments were found to be arbitrary and did not account for important fitness components such as anaerobic capacity, speed, and agility (Leicht, 2008). This further points to a need for more specialized training according to one's sport and role within that sport.

Accumulated Experience

Accumulated experience can be considered an individual functional constraint as experience becomes embodied as an individual's performance capacity. From the inherent length of each constraint section, it can be deduced that the primary focus of past research on sport officials has been on individual differences. And although factors such as resilience and passion (individual constraints) and organizational support (environmental constraints) are indicators of factors that could influence developmental activities, there still remains a lack of literature regarding the explicit characteristics, milestones and histories regarding accumulated experience that influence sport officials' performance and development.

Athletic Experience

However, prior athletic participation might be important for the development of sport officials, and possible initial recruitment, as many officials were former athletes or are currently still active in their sport (Titlebaum et al., 2009). Specifically, four out of every five officials (i.e., 78.8%) in a widespread sample of Canadian amateur referees (Livingston & Forbes, 2016) and 91% of rugby officials (Cuskelly & Hoye, 2013) began their sporting career as athletes. However, we remain uncertain of the remaining fifth's origins before entering the field, as they became active in officiating with no prior athletic connection, potentially because of their child's involvement in sport (Livingston & Forbes, 2016). It is also not clear if the characteristics of athlete participation in sport

(e.g., level of competition achieved as an athlete and start age), or possible transfer of skills between athletic and officiating domains (Mack et al., 2018; Ollis et al., 2006), correlate with officiating developmental outcomes. For instance, Ollis and his fellow researchers (2006) found that their participants reported a transfer of skill based on their origins as athletes, and that this was integral to officiating skill development. Similarly, Mack and colleagues (2018) also found that playing experience was a critical component to their participants' original interest in officiating and subsequent development as capable referees.

As such, because many officials have athletic backgrounds (Warner et al., 2013), the scope of this literature review was broadened to include research on the expertise of athletes. When discerning appropriate developmental models for expertise development, two influential pathways towards improved athletic performance stand out which could be applied to sport officials. These two particularly important theories include Ericsson, Krampe, and Tesch-Römer's (1993) deliberate practice framework (DPF) and Côté, Baker, and Abernethy's (2007) developmental model of sport participation (DMSP).

Ericsson et al. (1993) derived the DPF from Simon and Chase (1973) who reviewed multiple studies on improving performance in chess. Their review determined that practice, specifically thousands of hours practice, were necessary to attain high levels of performance, and that while initially, chess moves were made consciously, with

sufficient amounts of practice, these movements become automatic (Simon & Chase, 1973). For instance, a master's level chess player would require years of practice in order to build their memory skills and familiarity for the game (Simon & Chase, 1973). Deliberate practice can be defined as any activity that requires effort (cognitive or physical), does not lead to any immediate rewards (i.e., slow developmental process), and is specifically meant to improve performance (Ericsson et al., 1993). Moreover, Ericsson et al. (1993, p. 368) noted that deliberate practice is "not inherently enjoyable." This is an important point of contention as expertise research on sport officials has suggested that the most relevant tasks for improvement also rank as some of the highest in enjoyment (MacMahon et al., 2007; Ollis et al., 2006).

The constraints affecting deliberate practice include an individual's motivation, effort and resources (Ericsson et al., 1993). As stated earlier, athletes are motivated not for enjoyment, but to explicitly increase performance levels. However, motivation is an important constraint because, according to Ericsson et al. (1993), the acquisition of expertise demands extended amounts of time (e.g., 10+ years). With such elongated pathways to expertise, effort can only be sustained for a limited period of time. Thus, athletes must be able to sustain their effort and maintain attention during the entirety of a deliberate practice session, but must also allow ample time for rest and recuperation (Ericsson et al., 1993). Finally, resources are needed to successfully engage in deliberate practice. Essentials might include financial resources, as well as parents or guardians who

often provide the necessary funds to access training facilities and learning materials (Baker & Young, 2014; Ericsson et al., 1993). The aforementioned definition and constraints together form the foundation of the DPF which has been extremely influential for the progression of expertise research. For instance, in Baker and Young's 20 year review since the inception of the DPF, 17 sport-related deliberate practice studies were compiled, of which 16 "revealed that experts spend more time overall in training" (2014, p. 142).

However, competition, credited by Ericsson et al. (1993) as having little value to performance gains, has been repeatedly found to be the "most valuable training activity" (Baker & Young, 2014, p. 147) based on its intrinsically unique demands, which include providing distinctive time constraints, important self-regulatory capabilities, and extremely effortful, nearly inimitable scenarios (Baker & Young, 2014). These findings fall in line with past research on sport officials which also dictate that competition is both highly relevant to performance and highly enjoyable (Catteeuw et al., 2009; MacMahon et al., 2007; Ollis et al., 2006).

While there are only a few studies (Catteeuw et al., 2009; Mack et al., 2018; MacMahon et al., 2007; Ollis et al., 2006) specifically examining the development of officials in relation to the DPF, there is other research on athletes that can also be associated back to officials which supports the important role of accumulated deliberate

play on development. Almost antithetical to deliberate practice, deliberate play (Côté et al., 2007) can be defined as a variety of activities conducted early in development (i.e., childhood) that are informal in nature, immediately gratifying, maximize inherent enjoyment, and are regulated by accommodating, age-adapted rules in an easily-created environment (Côté, Lidor, & Hackfort, 2009). Pellegrini and Smith (1998), as cited in Côté et al. (2007), reported that early physical play such as rough-and-tumble activities provide children with an extensive collection of motor skills, including greater movement control and economy, endurance, strength, as well as better emotional regulation and cognitive functioning. According to Côté et al. (2009, p. 10), "[a]dult expert performance in sport is difficult to predict from sport performance in childhood." Thus, as expertise prediction is unreliable, the principle of providing as many opportunities and resources as possible to developing children might aid in lowering sport program dropout rates and help retain a considerable number of motivated adolescents from which to select the best athletes (Côté et al., 2009).

Both deliberate practice and deliberate play take on critical roles in Côté et al.'s (2007) DMSP, where the former has been associated with early specialization and the latter characterizes the early sampling pathway. According to Côté et al. (2007), early specializing begins around the age of six, with children focusing on a single sport and completing high numbers of deliberate practice hours; potential outcomes might include elite performance, but also reduced bodily health (e.g., injuries) and enjoyment. On the

other hand, early sampling includes two pathways (elite and recreational), both beginning with the sampling years around age 6 and include an involvement with multiple different sports and high amounts of deliberate play (Côté et al., 2007). The recreational and elite pathways split near age 12, whereby the former continues with a more mature version of the sampling years, and the latter continues specializing and investing in their sport(s) of choice (Côté et al., 2007). These specializing years are characterized by the successive lowering of deliberate play and steady increase of deliberate practice (Côté et al., 2007). Importantly, early sampling might be connected to a longer sporting career and long-term sport involvement (Côté et al., 2009), and potentially to a longer officiating career.

Time-on-task is an important measure of comparison between both forms of deliberate activities. Time-on-task for deliberate practice might vary between 25-54% of total practice time, with the majority of time spent waiting for the following drill or allowing for the coach to set up equipment. Although, the advantages of a coach being present might include immediate feedback and instruction, monitoring of success, and drills that emphasize concentration and intensity (Baker & Young, 2014; Côté et al., 2007). Conversely, deliberate play is characterized by greater time-on-task, much less downtime, an informal context (e.g., backyard soccer, pick-up basketball), and allows for more innovation, flexibility, creativity, and freedom to experiment with a variety of movements and strategies (Côté et al., 2007).

Côté et al. (2009) also proposed that intrinsic motivation, necessary for the acquisition of expertise (Baker & Horton, 2004), can be built through deliberate play and sampling, which might support the development of greater self-direction, self-efficacy, motivation and willingness to participate in sport, which are some of the vital traits previously discussed in reference to high officiating performance. Furthermore, adolescents around the age of 16 who have developed the appropriate foundational motor, cognitive, and social skills have all the required tools to invest into highly specialized training (Côté et al., 2009). In support of this postulate, a study by Soberlak and Côté (2003) investigated the development of a small sample of professional hockey players and found that while an average of over 10,000 hours were devoted to sport between the ages of 6 to 20, the majority of deliberate play hours (around 3,500) were invested prior to age 15 and the majority of deliberate practice hours were experienced after age 15. This is of import as some officials were found to begin their careers as young as 15 (Livingston & Forbes, 2016), which might suggest that if they were part of the near 80% involved with sport prior to starting along the officiating pathway, then it is possible that they engaged in significant amounts of deliberate play. However, it is not clear if participating in multiple sports (i.e., sampling) or deliberate play are important for the development of sport officials, or even if they are relevant for all levels of officiating. Though this is not clear, what is more certain is that every future expert athlete must

eventually adopt a training program centred around some form of deliberate practice, which suggests that the same might also be true of officials.

Officiating-Specific Practice

One of the major studies on officiating development was MacMahon et al.'s (2007) examination of elite soccer referees. The authors conducted two studies with the first determining that referees were better than players, matched for playing experience, in a video-based decision-making task, providing evidence that role-specific skills exist within a sport (MacMahon et al., 2007). The second study focused on the training activities related to officiating development, including both on- and off- field activities, therapeutic activities, and leisurely, everyday tasks. Utilizing the DPF, elite soccer officials were asked to retrospectively rate these activities based on their concentration, effort, enjoyment, and relevance to development at three points in time (MacMahon et al., 2007). These high level referees were found to specialize early as an official (e.g., stopped playing sport) and engage in higher volumes and diverse types of training as they developed, and as they gained experience, certain activities became more relevant over others as training evolved to meet current competitive levels (MacMahon et al., 2007). Again, refereeing league matches was considered the most significant and relevant activity for skill acquisition, which does not fit the DPF. However, MacMahon et al. (2007, p. 67) proposed that "referees engage in structured rather than deliberate practice," whereby structured practice involves monitoring and gradual feeback in lieu of the

careful monitoring and *immediate* feedback indicative of the DPF. Feedback might also originate from "discovery learning" (MacMahon et al., 2007, p. 67), or learning while refereeing competitive matches, which could be a critical mechanism relevant to promoting skill development in officials.

Catteeuw, Helsen, Gilis, and Wagemans performed a similar study comparing role specificity between soccer referees (2009). The major difference between the work of MacMahon et al. (2007) and Catteeuw et al. (2009) was the comparison of head referees to assistant referees in a test of role specificity, as well as an investigation into the training histories of both groups. Findings included a clear indication that role specificity was present as head referees performed better on an assessment of foul plays while assistant referees were better at making an offside call (Catteeuw et al., 2009). Moreover, while both head and assistant referees performed over 5,000 hours of deliberate practice over the course of a career spanning nearly 20 years (Catteeuw et al., 2009), this was still a relatively small number of hours compared to athletes (Baker & Young, 2014). Finally, competitive match officiating was found to be the most relevant activity for skill development as referees' skill level was positively correlated with match experience (Catteeuw et al., 2009). However, Catteeuw and his colleagues (2009) found that decision-making training was limited, and while physical abilities were undoubtedly necessary, more off-field training meant to develop decision-making skills was encouraged.

Importantly, both studies reported small samples of elite referees which might not be representative of the larger population of sport officials. Thus, a more representative cross-sectional sample of officials is needed to understand the broader developmental pathways, from the grassroots to elite level.

Another important study that examined the development of officials in relation to deliberate practice is Ollis et al.'s (2006) investigation of rugby officials. Over the span of 18 months, the research team utilized a holistic approach to better understand the resources constraining expertise development. A qualitative method identified four recurring themes, including personal development, where deliberate experience and skill transfer were integral to skill development, and referees were thriving under adversity due to a non-linear development (Ollis et al., 2006). A lack of deliberate practice meant that the only place to significantly improve one's officiating skills was through competition, i.e. deliberate experience (Ollis et al., 2006). Furthermore, non-normative influences, or unexpected obstacles such as luck, might create adverse effects on officiating performance, although poor performances were found to be the turning point of certain individuals' careers (Ollis et al., 2006).

Ollis et al. (2006) also found that social factors might accelerate development as healthier relationships lead to improved communication and decision-making. Additionally, rugby officials were seen to work best in teams (i.e., peer-monitoring)

while sharing knowledge and experiences. However, certain organizational decisions, including financial, political, or structural decrees could directly impinge or constrain technical and individual support, which could negatively affect access to training resources (Ollis et al., 2006).

Mack, Schulenkorf, Adair, and Bennie (2018) conducted a qualitative study on elite level Australian officials, and found that the most beneficial form of training occurred while officiating high-level games. Ideally, however, the authors suggested that a combination of training including deliberate practice and experiential learning (i.e., reffing competitive matches) would provide the most optimal benefits to officials (Mack et al., 2018). Mack and colleagues (2018) also discovered that referee mentors were beneficial to the retainment and continued development of officials, especially in the early years of one's officiating career. Likewise, feedback from peers and senior officials aided in increasing overall enjoyment, leading to prolonged officiating participation.

While the studies conducted by MacMahon et al. (2007), Catteeuw et al. (2009), Ollis et al. (2006), and Mack et al. (2018) shed some light on the development of sport officials, there is still much that remains to be understood. For instance, it is uncertain how an official develops over the course of their career, or how that pathway changes depending on their developmental peak. Furthermore, researchers have mostly studied elite officials, while there has not been much research involving grassroots or

moderate/sub-elite officials (Aragão e Pina et al., 2018). Although MacMahon et al. (2007) found that certain activities became more relevant over time as officials developed, not much is known about the volumn of sport specific physical practice, physical and mental preparation, and training camps within specific age groups, or even when officials typically reach important developmental milestones. Finally, it is unclear as to how many sports officials typically adjudicate, or what sort of developmental timelines are typical of an (invasion) sport official.

Purpose

Literature on sport officials has historically examined various factors affecting officials' performance in the field, whether that be psychological, physiological, decision-making, or based on personality. However, there remains a dearth of research on the aspects of officiating related to development. As such, the current research project aims to explore elements of sport officials' training and developmental history. Specifically, this research will attempt to utilize developmental trends in order to generate officiating profiles which incorporate information from many different areas of interest, including demographic information, athletic playing careers, officiating milestones, representative history and practice history.

Therefore, the purpose of this study will be to explore the developmental histories of sport officials and explore aspects of their developmental history, milestones and

trajectories that relate to success in reaching different levels of the sport and adherence to the role over time.

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Chapter 3.

An Exploration of the Developmental Sport and Training Histories of Canadian Sport Officials

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Sport officials, generally regarded as the arbiters of sport, are vital to providing a structured environment for all participants (Livingston & Forbes, 2016). Because sport officials occupy primary sport roles alongside players and coaches (Purdy & Snyder, 1985), they are integral components of the sporting environment. Sport officials are important because of their ability to mediate conflict within a match. Along with maintaining the smooth progression of a game, a competent official can offer secondary benefits such as educating players and coaches and creating a positive environment for development (Trudel et al., 1996), and promoting safe play through the protection of athletes (Hancock et al., 2015). To exemplify their importance, Ontario Soccer requires a large number of officials to mediate games across the province. With around 450,000 total members, most of whom are players, Ontario Soccer employs over 9,000 referees ("Who We Are," 2019) across all levels to enforce the rules of the game. And although referees are far fewer than athletes, officials constitute a significant group of individuals who are integral to the success of the sport.

Officials face numerous game-related performance demands, such as having to cope with many stressors (Voight, 2009), make rapid and accurate decisions (Jones et al., 2002; MacMahon & Mildenhall, 2012), and often having to be physically fit (Krustrup et al., 2009; Leicht, 2008) to perform properly (see Mascarenhas et al., 2005). Additionally, officials must remain motivated (Philippe et al., 2009; Warner et al., 2013) and employ practical solutions, such as stress management and mental wellness techniques (Rainey,

1999; Taylor et al., 1990), to avoid burnout and continue officiating through adversity. Indeed, considerable research has focused on understanding and identifying the factors that influence official's performance (see Mascarenhas et al., 2005). However, there is currently little knowledge about the *development* of officials (Aragão e Pina et al., 2018), especially compared to the current database of literature on athletic development.

Notably, the majority of sport officials began their sporting career as athletes. For instance, four out of every five respondents (i.e., 78.8%) in a multi-sport survey of amateur Canadian officials specified that they either started or were still active in sport as an athlete (Livingston & Forbes, 2016). Furthermore, 91% of rugby officials were found to have also begun their sporting journey as athletes (Cuskelly & Hoye, 2013). However, there exists uncertainty as to how the final fifth of sport officials became involved in sport, or to their origins before becoming an official. This could potentially be due to a sport organization's need for volunteers or if a child's involvement in sport required or allowed their parents' to become more engaged (Livingston & Forbes, 2016). This is an important finding as officials' origins as athletes might increase their similarities to full-time athletes. As such, with a lack of literature on the development of officials and with the majority of officials coming from an athletic background, articles concerning athlete development might also overlap with the development of officials, which could dictate future findings.

Ollis et al. (2006) qualitatively investigated rugby officials using a holistic approach to gain a greater understanding of the resources constraining their development. Deliberate experience, i.e. experience gained through competition, and skill transfer were found to be integral to skill development, while developmental trends were found to be non-linear (Ollis et al., 2006); no two officials followed the same path. Furthermore, because these officials did not participate in much deliberate practice (Ericsson et al., 1993), i.e. effortful, non-enjoyable training meant to improve performance, the only way to significantly improve one's officiating skills was through competition, or through past experience as an athlete via the transfer of skills (Ollis et al., 2006). Moreover, non-normative (i.e., unconventional) influences, such as luck or an unexpected accident, might create adverse effects on officiating performance, although certain officials were able to overcome and thrive from their hardship (Ollis et al., 2006). Ollis et al. (2006) also found that teamwork and peer-monitoring allowed knowledge and officiating experiences to be shared freely and accelerate development. However, certain organizational decisions, including constraining financial, political, or structural policies, might directly impinge refereeing behavior (Ollis et al., 2006).

A second important article concerning the development of official involves MacMahon, Helsen, Starkes, and Weston's (2007) two studies of elite soccer referees. The first determined that officials were superior to players in a video-based task of assessing foul calls, providing evidence that role-specific skills do exist within sport

(MacMahon et al., 2007). The second study investigated the on- and off- field training activities related to officiating development, including physical and psychological training, and everyday tasks (MacMahon et al., 2007). As the officials developed, higher volumes and more diverse types of training were required, and certain activities became more relevant as training necessarily evolved to meet current competitive levels (MacMahon et al., 2007). Importantly, officiating league matches were found to be the most significant and relevant activity for skill acquisition (MacMahon et al., 2007). As such, "discovery learning" (MacMahon et al., 2007, p. 67), or learning while officiating competitive matches, might be an essential mechanism pertinent to skill development in officials. Additionally, officials might also make use of observational learning (i.e., learning by watching other officials) in order to improve their performance, skills, and ability to strategize (Ste-Marie & Hancock, 2015).

A third study was similarly conducted by Catteeuw, Helsen, Gilis, and Wagemans (2009) comparing head soccer referees to assistant referees on tests of role specificity (i.e., foul calls and offside calls, respectively). Additionally, a deliberate practice questionnaire was also given to participants asking to rate the same on- and off-field activities on their relevancy to officiating development. Head referees were found to be better at calling fouls whereas assistant referees performed better at calling offsides, suggesting that different officiating roles might acquire different skills in order to properly perform in their specific role (Catteeuw et al., 2009). Furthermore, although

both head and assistant referees accumulated over 5,000 hours of deliberate practice experience during their nearly 20-year careers (Catteeuw et al., 2009), this was considerably less than the deliberate practice hours performed by some athletes in a shorter time span (Baker & Young, 2014). The most important finding, however, was that competitive match officiating was the most revelant activity for skill development and was posititively correlated with skill level (Catteeuw et al., 2009).

Despite the significant findings garnered from these three studies, there currently remains much more to be uncovered. For example, most researchers have focused on elite-level officials, while grassroot and sub-elite officials continue to be an understudied population (Aragão e Pina et al., 2018). It is important for younger officials to have a clear understanding of how to progress from the bottom to the top of the developmental arc (Aragão e Pina et al., 2018), including the steps that can be taken to advance to a higher level. As such, the idea that competition is the most relevant training activity (MacMahon et al., 2007) should be studied further, along with the relevance and significance of sport specific physical practice, physical and mental preparation, and training camps. Finally, key developmental milestones should be charted as well as the average number of sports both officiated and participated in as an athlete in order to create a summary profile of a typical sport official. Therefore, the purpose of this study was to describe the developmental histories of sport officials and explore aspects of their

developmental history, milestones and trajectories that relate to success in reaching different levels of the sport and adherence to the role over time.

Based on previous literature, we hypothesize that most sport officials will have originated as athletes and developed their officiating skills through competitions and training camps as well as through the transfer of skills from their athletic career to their officiating career. Furthermore, we suggest that the majority of officials will have little to no officiating practice experience, whether that be sport specific physical practice or mental and physical preparatory activities.

Methods

Procedure

The Developmental History of Athletes Questionnaire (Hopwood, 2013), which was modified to create the Developmental History of Officials Questionnaire (DHOQ), is both a reliable and valid instrument for collecting detailed information on retrospective sport participation and training, with the majority of sections receiving a percent agreement value and intraclass correlation coefficient of good (65-79%) or very good (80-100%).

Prospective participants were asked to complete the Developmental History of Officials Questionnaire (DHOQ; see Appendix B), using SurveyMonkey™, a secure online survey software. The DHOQ was modified and shortened (see Hopwood, 2013 for

original questionnaire) to take approximately 35 – 40 minutes to complete. The only inclusion criteria were that respondents were over the age of consent (18+) and were currently, or had once been active sport officials. This study was approved by the UOIT Research Ethics Board REB (#15032) on November 2nd, 2018. See Appendix A for Letter of Informed Consent.

Participants

Ontario Soccer was the primary target of this questionnaire. These two sporting organizations employ approximately 9,000 officials. However, because this questionnaire was shared more broadly via social media than this sporting organizations, participants had a variety of athletic and officiating backgrounds. A total sample size of 263 adult participants (18 years of age and older) was collected, largely from Ontario Soccer.

Twelve participants were excluded from the sample after having answered no questions. Fifteen respondents were removed because they did not include any data about their officiating career. One respondent was removed because their age could not be determined. And finally, one more individual was removed because they indicated that they were not an official. The final sample size that was analyzed was made up of 223 participants.

Measures

The DHOQ survey captures the specific details relating to sport officials' previous and current athletic endeavours in addition to their overall career trajectories. Sections include questions asking officials to disclose a variety of information ranging from demographic data and both athletic and officiating practice histories, to their experiences of first becoming officials. The following is a breakdown of the four main sections that were used to group the variables that were analyzed.

Demographics

The demographics section included variables such as gender (male, female and other), the average age of participants, the country that most participants originated from, and participants' educational level.

Athletic Career

The athletic career section included variables such as the percentage of respondents that participated as an athlete, the overall number of sports respondents participated in throughout their athletic career, the sports most frequently played, and the average number of sports played. Additional variables included the average age respondents started and stopped participating in each sport, the average number of years played as an athlete (i.e., the difference between start and stop ages), the percentage of respondents who began playing sport before starting as an official, and the average

number of sports played before respondents began their officiating career. The latter two variables were calculated by comparing respondents' start age as an athlete in each sport they participated in to their start age as an official in their main officiating sport. The highest level of athletic participation variable was recoded to combine the lowest two levels (i.e., unsupervised play and club level) and combine the top two levels (i.e., national and international levels), while leaving the regional, provincial, and collegiate levels unchanged.

Officiating Career Milestones

The officiating career milestones section included variables such as the most frequently officiated sports, the average number of sports officiated, the percentage of respondents who played their main officiating sport as an athlete, and the percentage of respondents who described their main athletic sport as the same as their main officiating sport. Additional variables included the average starting and stopping age as an official (i.e., those officials who have retired from officiating), as well as the average number of years officiated (i.e., the difference between start and stop ages). The proportion of respondents that were still officiating was found by comparing the number of respondents who had stopped officiating to the total sample size. The highest level of officiating achieved variable was recoded to combine the lowest two levels (i.e., recreational and house league/club level) and combine the top two levels (i.e., national and international

levels), while leaving the district and provincial levels unchanged. The highest level of officiating was used in the athletic career section, this section, and the following section.

Officiating Practice and Competitive History

The officiating practice and competitive history section included variables such as the percentage of respondents that participated in each type of practice, i.e. officiating-specific practice, physical preparation, mental preparation, and training camps. The percentage of respondents who engaged in competitive officiating was also included. Officiating-specific practice, physical preparation, and mental preparation each had four conditions (i.e., by yourself with and without a coach, or with others with and without a coach) and were each measured in hours per year. A coach in this case refers to either a referee coach or a peer mentor. These hours per year were calculated by multiplying the number of hours of practice per week by four and then multiplying the product by the number of months respondents engaged in that form of practice each year. Competitive officiating was also measured in hours per year. The variables used to define training camps included the total number of camps attended and the total length of camps (in days). Finally, each practice type and condition, training camp, and competitive officiating variable was calculated for each of six consecutive age ranges between 11 to 40 years (i.e., 11 to 15, 16 to 20, 21 to 25, 26 to 30, 31 to 35, and 36 to 40).

Statistical Analysis

All data was organized and analyzed using both SPSS and Excel, and will be presented using the following sub-heading: demographics, athletic career, officiating milestones, and officiating practice and competitive history. Unless otherwise indicated, the criteria for statistical significance was $p < .05$. Effect sizes were also calculated for each statistical output. The magnitude of effect sizes were interpreted using Miles and Shevlin's (2001) rule of thumb for the eta squared and partial eta squared effect sizes, while Cohen's (1988) rule of thumb was used for the phi coefficient effect size. For both eta and partial eta squared, the ranges of values included 0.01 for a small effect, 0.06 for a medium effect, and 0.14 for a large effect. For the phi coefficient, the range of effect sizes included 0.1 for a small effect, 0.3 for a medium effect, and 0.5 for a large effect.

Demographics

Descriptive statistics (frequencies, means, and variance) were performed to describe the demographic characteristics (i.e., age, gender and education) of the sample.

Athletic Career

Descriptive statistics (frequencies and mean) were calculated to describe the number of sports officials participated in as athletes, as well as the average start age, stop age and duration of participation as an athlete.

A number of inferential tests were carried out to compare the athletic histories of officials. A one-way ANOVA was conducted to compare the difference between the total number of sports played based on the highest level of officiating achieved. Three separate one-way ANOVAs were also run to determine if there was a difference between the starting and stopping ages, as well as the number of years played compared to the highest level of officiating achieved.

Additional frequency analyses were conducted to determine the percentage of respondents who began playing sport before becoming an official, in addition to the average number of sports played before beginning their officiating career. A chi-square test was run to compare whether respondents began playing sport before becoming an official to the highest level of officiating reached to understand whether there was a difference in proportion of prior athletes between officiating levels. Moreover, a one-way ANOVA was performed to compare the total number of sports played before respondents began their officiating career across the highest level of officiating achieved. This test was used to determine whether certain levels of officiating played more sports than others before beginning their officiating career.

Finally, an independent samples Kruskal-Wallis test was run to compare the highest level of athletic participation alongside the highest level of officiating achieved. This test was meant to determine whether higher athletic levels were more likely to reach

higher levels of officiating. Specifically, this type of test was chosen because we were comparing two ordinal variables with more than two groups each. An effect size (eta squared) for this test was calculated according to Rosenthal and DiMatteo (2001). The magnitude of the effect size followed the same range as previously stated.

Officiating Career Milestones

Similarly to the Athletic Career section, descriptive statistics (frequencies and mean) were calculated to describe the sports respondents officiated (i.e., the type and average number) as well as the overlap between main athletic sport and main officiating sport.

Descriptive analyses were performed to find the average starting and stopping ages, in addition to the average number of years officiated. Two separate one-way ANOVAs were run to compare respondent's starting ages in officiating and total number of years officiated across the highest level of officiating achieved. These tests were performed to determine whether certain levels of officiating began their officiating careers at different times and whether higher levels of officiating had officiated for longer than lower levels.

Officiating Practice & Competitive History

Descriptive analyses were conducted to determine the proportion of respondents that participated in each type of practice (i.e., officiating-specific practice, physical

preparation, and mental preparation), as well as in training camps and competitive officiating. Furthermore, each type of practice had four conditions (i.e., with or without a coach, and with others or by yourself); proportions were calculated for each condition.

Separate repeated measures ANOVAs were performed for each type of practice and their respective conditions (i.e., 12 tests), for the total length (in days) and total number of training camps, and competitive officiating. As such, 15 tests were completed in total. These inferential analyses were run to compare the variables mentioned prior to the highest level of officiating achieved across six consecutive age ranges (i.e., 11 to 15, 16 to 20, 21 to 25, 26 to 30, 31 to 35, and 36 to 40). All age range main effects and interaction effects used the Greenhouse-Geisser correction. These tests were performed to determine whether the number of practice hours, the length of training camps, the number of training camps attended, and the number of hours of competitive officiating changed depending on the level of officiating achieved across a relevant developmental age range (i.e., 11 to 40).

Results

Demographics

The sample included 183 male and 39 female participants. Respondents ranged from 18 to 78 years of age, with an average age of 41.71 years (SD = 15.37). The country from which most participants originated was Canada (89%), with a few individuals (3%)

hailing from other Commonwealth countries (i.e., United Kingdom, Australia, New Zealand) and the rest spread out throughout the world. The average education level of participants was relatively high, with 90% of respondents having completed at least some form of post-secondary college or undergraduate university schooling. Furthermore, 17% of respondents had completed postgraduate degrees.

Athletic Career

Out of the entire sample, 62% of respondents were currently participating as athletes, while 38% were retired or had never played sport. For number of sports, 98% of participants engaged in at least one sport as an athlete, while 27% of respondents were involved in at least 5 sports, displaying a substantial involvement in a variety of sports (see Figure 3.1).

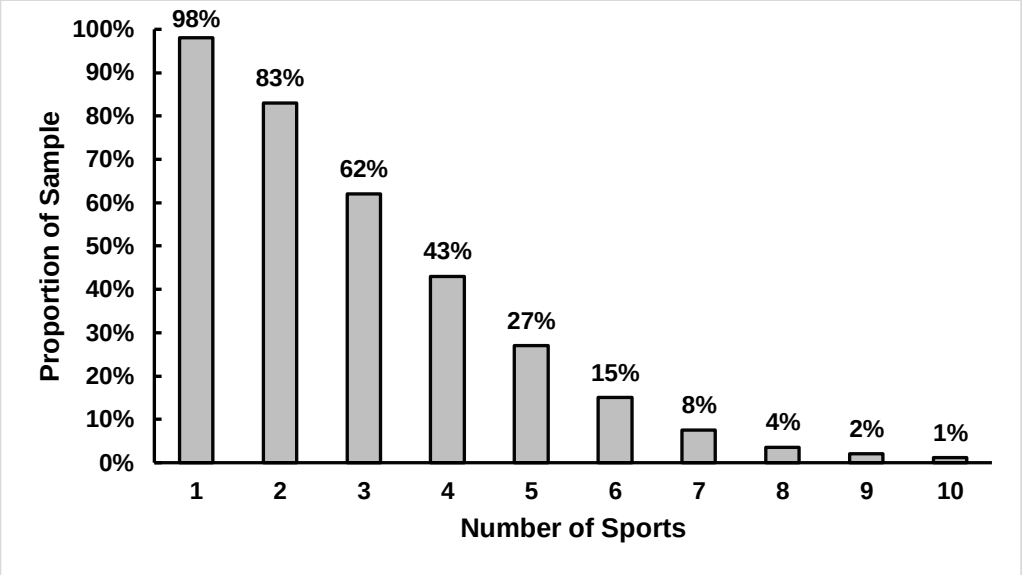

Figure 3.1. Number of sports participated in as an athlete

Approximately 61% of respondents participated in soccer as their main athletic sport, while 11% played ice hockey, and over 5% engaged in either rugby or football. The average number of sports played was 3.44 (SD = 2.05), although the most frequent (i.e., mode) number of sports played was two. No significant differences were found between the mean number of sports played based on the highest level of officiating achieved (i.e., recreational, district, provincial, and national/international levels), $F(3, 214) = 0.78$, $p = .51$, $\eta^2 = 0.44$.

The average start age of participants in sport as athletes was 12.30 years (SD = 7.14), while the average stop age was 24.39 years (SD = 9.64) based on a smaller number

of respondents. The average number of years played was 19.14 (SD = 11.86). Based on three one-way ANOVAs comparing the highest level of officiating to the average age started, average age stopped, as well as the average number of years played as an athlete, none were statistically significant ($F(3, 209) = 1.02$, $p = .38$, $\eta^2 = 0.50$, $F(3, 152) = 1.05$, $p = .37$, $\eta^2 = 0.51$, $F(3, 209) = 1.31$, $p = .27$, $\eta^2 = 0.57$, respectively). See Figure 3.2 for the average starting and stopping ages for each level of officiating.

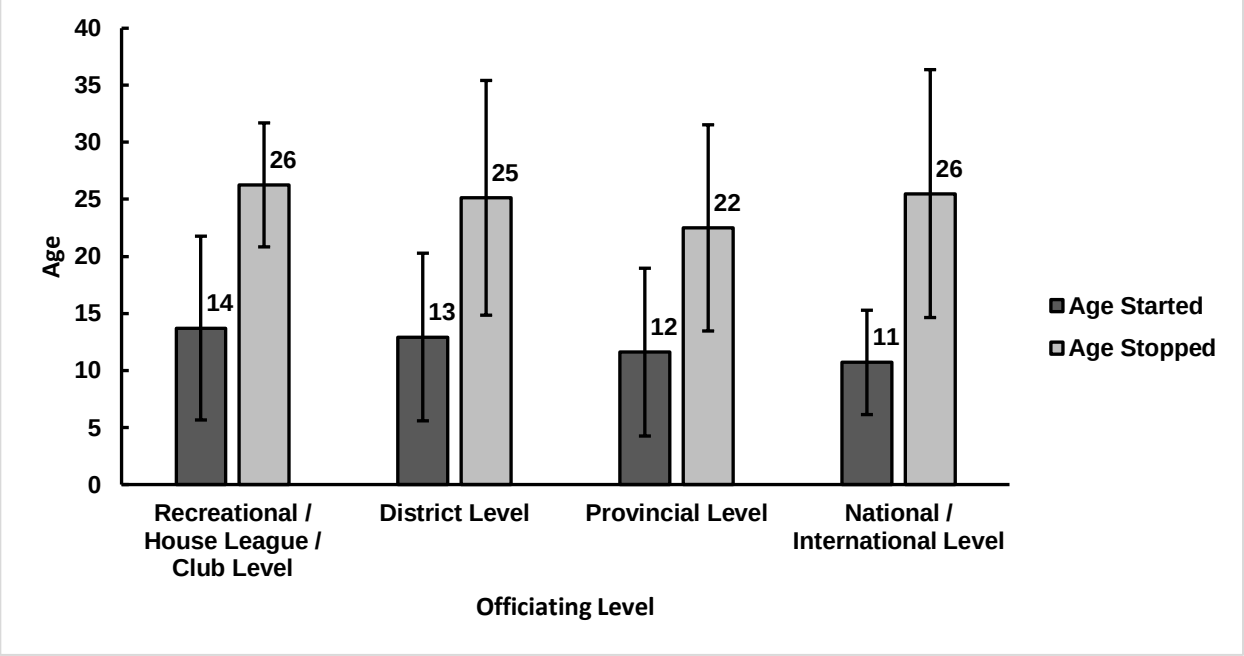

Figure 3.2. Average age started and stopped as an athlete by the highest level of officiating achieved

Over 97% of respondents began playing sport *before* beginning their officiating career in their main officiating sport. The average number of sports played before starting as an official was 2.78 (SD = 2.01). A chi-square test comparing whether respondents began playing as athletes or not before becoming an official based on the highest level of officiating achieved was not statistically significant, $\chi^2(3) = 1.94$, $p = .59$, $\varphi_c = 0.09$. Moreover, a one-way ANOVA comparing the total number of sports played before beginning as an official to the highest level of officiating achieved was also not statistically significant, $F(3, 214) = 1.00$, $p = .39$, $\eta^2 = 0.50$. An independent samples Kruskal-Wallis test revealed that the difference between the highest level of athletic participation and highest level of officiating reached was statistically significant, $H(3, n = 217) = 13.37$, $p < .01$, $\eta^2 = 0.06$. Specifically, a post-hoc test showed that for participants who reached the national/international level of officiating, their level of athletic performance was significantly higher than the athletic level reached by recreational, district, and provincial level officials (see Figure 3.3).

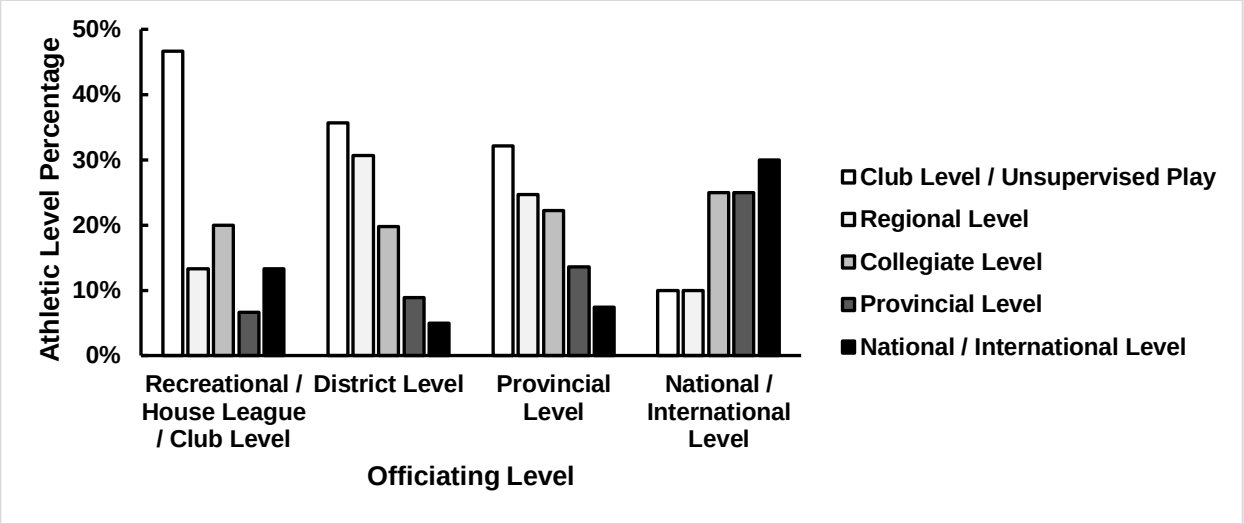

Figure 3.3. Percentage of respondents that reached each athletic level for each officiating level

Officiating Career Milestones

Comparatively, based on the entire sample, 100% of respondents officiated in at least one sport, while only 29% of participants were involved in at least two sports as an official. Furthermore, only 7% of respondents reported having officiated three or more sports, showcasing a less diverse sport involvement than during their athletic career (see Figure 3.4).

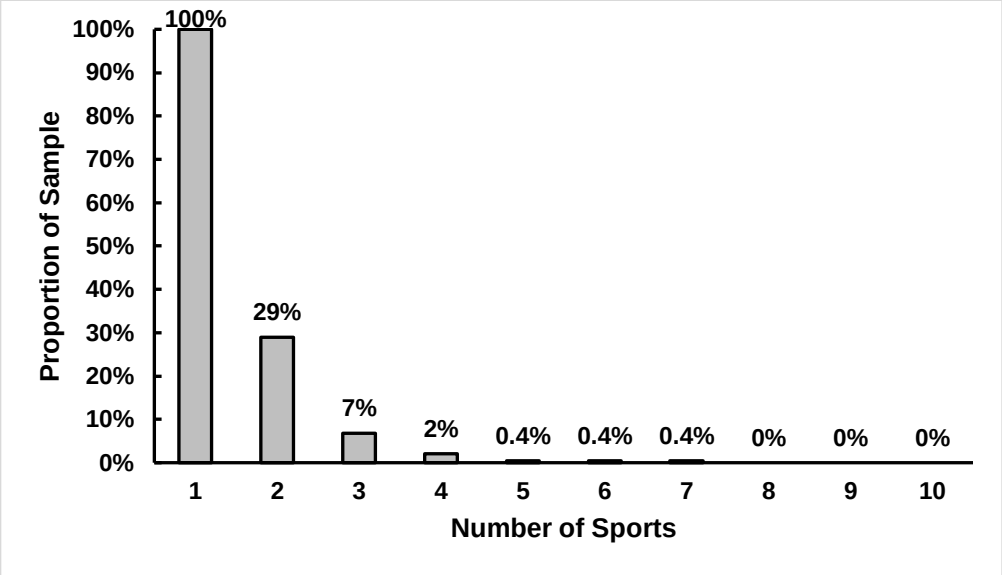

Figure 3.4. Number of sports participated in as an official

Furthermore, over 90% of respondents refereed soccer as their main officiating sport, while the rest officiated a variety of other sports (e.g., ice hockey, rugby, or ringette; see Table 3.1). The average number of sports officiated was 1.40 (SD = 0.76).

Main Officiating Sport	Percentage of Sample
Baseball	0.4%
Basketball	0.4%
Cycling	0.4%
Football	0.4%
Gymnastics	1%
Ice Hockey	2%
Ringette	2%
Rugby	3%
Soccer	90%
Soccer/Ice Hockey	0.4%

Table 3.1. Summary of main officiating sports

Comparing respondents' officiating career to their athletic background, 86% of the sample participated in their main officiating sport as an athlete. However, the proportion of the sample that described their main athletic sport as the same as their main officiating sport was 63%. Respondents' "main sport" simply indicates the sport that they were the most passionate about and dedicated the most time and effort towards. Additionally, because soccer was the most frequently played and officiated sport, it is worth noting that 68% of soccer officials also played soccer as their main athletic sport.

The proportion of individuals that were currently still officiating was 78%. The average starting age as an official was 25.69 (SD = 12.53), while the average stopping age was 32.18 (SD = 14.10), and the average number of years officiated was 14.23 (SD =

10.73). Because only 22% of respondents had stopped officiating, the average stop age only reflected a smaller sample (n = 49). Furthermore, two one-way ANOVAs comparing the average starting age and the average number of years officiated to the highest level of officiating achieved were both statistically significant ($F(3, 212) = 9.09$, $p < .001$, $\eta^2 = 0.90$, $F(3, 212) = 4.14$, $p < .01$, $\eta^2 = 0.81$, respectively). Both one-way ANOVAs had very large effect sizes (Miles & Shevlin, 2001). A post-hoc test showed that the average starting age of provincial officials was 10 years younger than recreational and district officials, and that the starting age of national/international level officials was also 10 years younger than recreational level officials. Additionally, a second post-hoc test revealed that both provincial and national/international officials had, on average, refereed for 8 years and 10 years longer than recreational level officials, respectively.

Officiating Practice & Competitive History

Officiating-Specific Practice

Based on the entire sample, the proportion of respondents that engaged in any officiating-specific practice ranged from 7% to 28%. This range depended on whether officials were practicing with a coach present or not, as well as whether they were practicing alone or with others. See Table 3.2 for the average number of hours spent in officiating-specific practice across the various age ranges as well as lifetime practice hours. A repeated measures ANOVA comparing the total accumulated officiating-specific practice hours per year to the highest level of officiating achieved across multiple

consecutive age ranges between 11 to 40 years (i.e., 11 to 15, 16 to 20, 21 to 25, 26 to 30, 31 to 35, and 36 to 40) was not statistically significant for any condition of officiating-specific practice.

Physical and Mental Preparation

Based on the entire sample, the proportion of respondents that engaged in physical preparation ranged from 4% to 25%. This range depended on whether officials were performing physical preparatory exercises with a coach present or not, as well as whether they were practicing alone or with others. See Table 3.2 for the average number of hours spent in physical preparation across the various age ranges as well as lifetime practice hours. A repeated measures ANOVA comparing the total accumulated physical preparation hours per year to the highest level of officiating achieved across multiple consecutive age ranges between 11 to 40 years (i.e., 11 to 15, 16 to 20, 21 to 25, 26 to 30, 31 to 35, and 36 to 40) was statistically significant for the conditions of practicing 1-on-1 with a coach, as well as without a coach, both by oneself and with other officials.

For officials practicing 1-on-1 with a coach and officials practicing with others officials, but no coach, there were main effects for age range ($F(1, 132) = 4.43$, $p < .05$, $\eta_p^2 = 0.03$, $F(1.04, 138.09) = 3.98$, $p < .05$, $\eta_p^2 = 0.03$, respectively) and for the highest level of officiating achieved ($F(3, 132) = 3.10$, $p < .05$, $\eta_p^2 = 0.07$, $F(3, 133) = 3.24$, $p < .05$, $\eta_p^2 = 0.07$, respectively). There were also interaction effects between the various age

ranges and the highest officiating level for both types of practice ($F(3, 132) = 3.10$, $p < .05$, $\eta_p^2 = 0.07$, $F(3.11, 138.09) = 3.17$, $p < .05$, $\eta_p^2 = 0.07$, respectively). A post-hoc test revealed that national/international level officials had more accumulated hours of physical preparatory exercises than district and provincial level officials both 1-on-1 with a coach and with other officials and no coach. National/international officials practicing solely with a coach accumulated nearly 10 more hours per year during the 36 to 40 age range, while similarly high level officials who practiced with their peers, but with no coach present, performed around 30+ more hours per year of physical preparation predominantly in the 11 to 15, 16 to 20, and the 21 to 25 age ranges.

For officials practicing by themselves with no coach present, there was only a main effect for the highest level of officiating achieved ($F(3, 133) = 2.97$, $p < .05$, $\eta_p^2 = 0.06$). A post-hoc test revealed that national/international level officials had, on average, 36 more accumulated hours per year of physical preparatory exercises than district level officials while they were by themselves with no coach present.

Based on the entire sample, the proportion of respondents that engaged in mental preparation ranged from 5% to 24%. This range depended on whether officials were performing mental preparatory exercises with a coach present or not, as well as whether they were practicing alone or with others. See Table 3.2 for the average number of hours spent in mental preparation across the various age ranges as well as lifetime practice

hours. A repeated measures ANOVA comparing the total accumulated mental preparation hours per year to the highest level of officiating achieved across multiple consecutive age ranges between 11 to 40 years (i.e., 11 to 15, 16 to 20, 21 to 25, 26 to 30, 31 to 35, and 36 to 40) was statistically significant for the conditions of practicing 1-on-1 with a coach, and practicing by oneself with no coach present.

For officials practicing exclusively with a coach, there were main effects for age range and for the highest level of officiating achieved, as well as an interaction effect between the various age ranges and the highest level of officiating achieved ($F(1.00, 133.64) = 3.95$, $p < .05$, $\eta_p^2 = 0.03$, $F(3, 133) = 3.41$, $p < .05$, $\eta_p^2 = 0.07$, $F(3.01, 133.64) = 3.24$, $p < .05$, $\eta_p^2 = 0.07$, respectively). A post-hoc test showed that national/international level officials had 25 more accumulated hours per year of mental preparatory exercises exclusively with a coach than district and provincial level officials, particularly in the 11 to 15, 16 to 20, and 21 to 25 age ranges. For officials practicing by themselves with no coach present, there was a main effect for the highest level of officiating achieved ($F(3, 133) = 2.91$, $p < .05$, $\eta_p^2 = 0.06$). A post-hoc test showed that national/international level officials performed on average 16 more accumulated hours per year of mental preparatory exercises than district level officials while they were by themselves with no coach present.

Training Camps

Based on the entire sample, the proportion of respondents that participated in training camps was 22%. See Table 3.2 for the average number of days spent in training camps and the average number of training camps attended for each age range as well as over the course of respondents' careers (i.e., lifetime). A repeated measures ANOVA comparing the total length of training camps to the highest level of officiating achieved across multiple consecutive age ranges between 11 to 40 years (i.e., 11 to 15, 16 to 20, 21 to 25, 26 to 30, 31 to 35, and 36 to 40) was statistically significant. Furthermore, a second repeated measures ANOVA comparing the total number of training camps to the highest level of officiating achieved across the same consecutive age ranges was also statistically significant.

For the total length of training camps, there was a main effect for the highest level of officiating achieved ($F(3, 133) = 3.35$, $p < .05$, $\eta_p^2 = 0.07$). A post-hoc test showed that national/international level officials attended, on average, 1 more day of training camp per age range than district level officials. For the total number of training camps, there were main effects for age range and for the highest level of officiating achieved, as well as an interaction effect between the various age ranges and the highest officiating level ($F(2.08, 276.69) = 3.19$, $p < .05$, $\eta_p^2 = 0.02$, $F(3, 133) = 5.53$, $p < .01$, $\eta_p^2 = 0.11$, $F(6.24, 276.69) = 3.30$, $p < .01$, $\eta_p^2 = 0.07$, respectively). A post-hoc test revealed that

national/international level officials participated in 2+ more training camps than recreational, district and provincial level officials, particularly in the 16 to 20 age range.

Competitive Officiating

Finally, 79% of the sample responded as to whether they were officiating competitively (i.e., number of games and hours per week spent officiating). A repeated measures ANOVA comparing the total accumulated competitive officiating hours per year to the highest level of officiating achieved across multiple consecutive age ranges between 11 to 40 years (i.e., 11 to 15, 16 to 20, 21 to 25, 26 to 30, 31 to 35, and 36 to 40) was found to be statistically significant. There was only a main effect for the highest level of officiating achieved ($F(3, 137) = 6.41$, $p < .01$, $\eta_p^2 = 0.12$). Specifically, competitive match hours officiated at the national/international level were significantly higher than the hours officiated at both the recreational and district levels. See Figure 3.5 for the average number of competitive officiating hours performed across the various age ranges for each level of officiating.

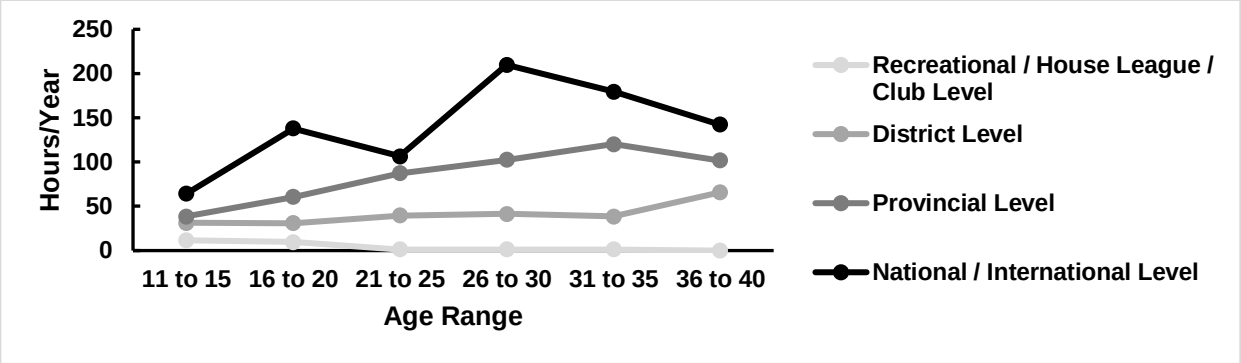

Figure 3.5. Competitive officiating (mean hours/year) by the highest level of officiating across multiple age ranges (11 to 40)

Practice Type and Condition		Age Range						
		11 to 15	*16 to 20*	*21 to 25*	*26 to 30*	*31 to 35*	*36 to 40*	*Lifetime*
Officiating-Specific Practice*	*Coach, with Others*	1.22 (±6.88)	6.3 (±21.82)	4.06 (±18.95)	9.01 (±63.91)	4.13 (±22.88)	3.06 (±15.92)	5.86 (±21.75)
	Coach, only You	1.99 (±26.82)	3.32 (±30.06)	0.36 (±2.74)	0.53 (±3.99)	0.28 (±3.23)	3.26 (±33.97)	2 (±13.9)
	No Coach, with Others	1.35 (±8.66)	6.57 (±40.64)	2.77 (±15.93)	2.37 (±12.26)	2.5 (±14.4)	3.72 (±21.03)	4.37 (±20.77)
	No Coach, only You	6.12 (±45.79)	27.8 (±143.74)	15.4 (±94.68)	8.74 (±43.4)	4.18 (±25.68)	5.87 (±38.77)	15.3 (±66.53)
Physical Preparation*	*Coach, with Others*	1.17 (±7.78)	3.09 (±14.54)	4.9 (±30.11)	6.14 (±63.93)	1.39 (±9.17)	0.94 (±4.17)	4.14 (±21.52)
	Coach, only You	1.02 (±12.27)	2.42 (±23.17)	0.73 (±7.61)	0.74 (±7.66)	0 (±0)	1.09 (±10.99)	1.41 (±9.37)
	No Coach, with Others	2.83 (±28.01)	3.78 (±29.32)	5.03 (±38.24)	4.23 (±37.39)	0.33 (±2.57)	0.57 (±3.66)	3.65 (±20.66)
	No Coach, only You	4.65 (±33.58)	22.67 (±111.5)	32.74 (±162.12)	29.24 (±169.38)	10.18 (±43.61)	29.11 (±147.49)	24.75 (±94.09)
Mental Preparation*	*Coach, with Others*	1.92 (±15.82)	3.95 (±22.58)	3.74 (±17.17)	3.45 (±17.24)	3.64 (±18.18)	2.89 (±17.4)	4.33 (±20.7)
	Coach, only You	1.51 (±22.5)	2.83 (±26.22)	2.89 (±28.48)	0.32 (±2.77)	0.05 (±0.64)	0.2 (±1.54)	1.72 (±14.64)
	No Coach, with Others	0.36 (±3.11)	2.37 (±13.11)	3.92 (±23.8)	2.51 (±14.45)	2.41 (±15)	1.08 (±10.87)	2.58 (±13.18)
	No Coach, only You	2.65 (±20.67)	17.6 (±133.9)	12.28 (±57.73)	6.8 (±31.35)	5.28 (±25.72)	7.01 (±44.11)	12.91 (±70.24)
Training Camps**	*Total Length (in Days)*	0.2 (±1.03)	0.61 (±2.75)	0.56 (±2.7)	0.45 (±1.93)	0.59 (±3.36)	0.16 (±0.78)	0.54 (±1.79)
	Total Number	0.14 (±0.78)	0.6 (±2.44)	0.37 (±1.64)	0.25 (±1.03)	0.31 (±1.73)	0.13 (±0.56)	0.41 (±1.36)

Table 3.1. Practice type and condition from 11 to 40, including mean lifetime hours spent in practice (calculated in mean hours/year; ** total length and number of training camps calculated in mean days/age range or mean number/age range, respectively)*

Discussion

The purpose of this study was to explore the various developmental milestones, and practice activities that might influence the development of sport officials. Specifically, we explored the past athletic histories of sport officials, as well as their histories of officiating-specific practice and their volume of officiating actual competitions.

With respect to the sample characteristics, a number of factors were consistent with previous research on officials, as well as athletes. Consistent with what has been seen in past research samples of sport officials (e.g., Livingston & Forbes, 2016), the majority of the study sample was male (i.e., 82%). Furthermore, the minimum age of the sample was 18 years. This statistic is also consistent with previous observations that sport officials begin officiating in their teenage years (Livingston & Forbes, 2016), and also a reason why the age ranges began at 11-15. An average age of over 40 years further points to the fact that the standard participant in this sample was a middle-aged male sport official, which is also consistent with previous research (Forbes & Livingston, 2013; Livingston & Forbes, 2016, 2017). Lastly, 90% had completed some form of postsecondary education. These statistics are consistent with general physical activity and sport participation trends as more educated people are more likely to be physically active and participate in sport (Canadian Heritage, 2013). These results suggest, that to some

degree, similar constraints (e.g., socioeconomic) that influence athletes might also influence participation in officiating.

In reference to officials' history of athletic participation, it seems that over half of respondents participated in at least three sports as an athlete at some point during their development. In fact, 62% of officials were *currently* participating as an athlete at some level. While respondents participated in an average of three sports as an athlete, there was a large variation as nearly 100% of respondents played at least one sport while over 25% played at least five. When officials' highest level of achievement was compared, officials at all levels typically played the same number of sports (i.e., 3 to 4) throughout their athletic career. This could mean that a participant's highest level of officiating might not necessarily be determined by the number of sports played as an athlete. However, because 97% of respondents participated in sport before beginning their officiating career, prior participation in sport appears to be an important, and perhaps necessary, component of an official's developmental pathway. For instance, Pizzera and Raab (2012) found that the prior motor experience of sport officials (ice hockey and trampoline judges in particular) was associated with greater officiating performance. Future research will be needed to determine the extent to which prior participation in sport is necessary as opposed to sufficient for development as a sport official.

The fact that respondents participated in multiple sports as athletes also means that the current results might be relevant to models such as the developmental model of sport participation (DMSP). Based on the DMSP (Côté et al., 2007), individuals in the pre-teen age range (i.e., between the ages of 9 to 12) are typically finishing the sampling years of development and entering into either a recreational pathway, or one involving specialization. Sampling can be defined as being involved in numerous sports as opposed to specializing in a single sport, as well as participating mainly in deliberate play, i.e. physical activities that are intrinsically motivating, immediately gratifying, and enjoyable (Côté et al., 2007, 2009). Since officials engaged in an average of three sports during their athletic career, this suggests that many officials might have sampled sports prior to beginning, or while in the midst of their officiating career. This means that many officials might not have specialized in one sport, and instead participated in multiple sports over the course of their athletic career. While we cannot be certain that this is an important developmental trend, it suggests that officials' developmental pathways might involve a history of sampling.

Interestingly, participants' average starting age in sport (i.e., 12 years old) was later than the typical starting ages of elite team sport athletes (Baker, Côté, & Abernethy, 2003; Soberlak & Côté, 2003). This later starting age might have influenced respondents' development as athletes compared to athletes that began practicing and playing at younger ages. Also of interest was that the average starting age as an athlete did not differ

significantly based on respondents highest level of officiating achieved. This could mean that officials at different levels of achievement might not necessarily begin playing sport at meaningfully different ages, which suggests that respondents' starting age as an athlete did not affect their eventually development as an official. It might, however, suggest that the primary factors that influence the development of officiating expertise involve officiating-specific activities and milestones. The level of athletic performance achieved, for instance, might differentiate officials' later success in their officiating career. Participants who reached a national/international level of officiating were more likely to have higher athletic levels of competition than lower-level officials (i.e., district, provincial, and recreational levels). For instance, it seems that if an individual's highest level of athletic performance was the club level, they might have been more likely to referee at a district level than any other level. Conversely, if an individual reached the provincial or national/international stage of athletic performance, they might have been more likely to officiate at the provincial level or higher. Thus, it seems that if an official reaches a certain level of athletic performance, they might be likely to reach a similar level as an official. Future research might benefit from considering if the highest level of athletic performance might be a determining and limiting factor for the ceiling of one's officiating career.

Notably, while 86% of the sample participated in their main officiating sport as an athlete, only 63% actually reported that their main officiating sport was the same as their

main athletic sport. This might allude to the fact that many referees do not necessarily need to have a linear sport background (i.e., officiating the same sport that they participated in as an athlete) or need experience in their main officiating sport to become an official in that sport.

One interesting trend was that the variation for the starting age, number of years officiated, and even the overall age of the sample was very large, which suggests that many developmental timelines and pathways exist. While some officials might only officiate for a short period of time, others continue officiating for several decades. Similarly, in Ollis et al.'s study of rugby officials (2006, p. 316), each of their study participant's developmental pathways was "distinct" as "no two referees followed the same path". This suggests that the DMSP *per se* might not be useful for describing officials' developmental pathways.

When starting age and mean number of years officiated were compared to the highest level of officiating reached, both comparisons were found to be statistically significant with large effect sizes. Specifically, both provincial and national/international level officials were found to begin officiating in their early 20s, a significantly younger age than recreational level officials (i.e., 10+ years before). Provincial officials were also significantly different compared to district level officials, starting on average 7 years beforehand. Comparatively, MacMahon et al. (2007) and Catteeuw et al. (2009) found

that truly elite referees started officiating in their later teenage years (i.e., around 18). These findings suggest that in order to reach a high level of officiating, future high level referees must begin their officiating career earlier than most other officials. Furthermore, both national/international and provincial level officials were found to have officiated for approximately 8 to 10 years longer than recreational level referees. And because these higher level officials started refereeing on average nearly a decade prior to lower level officials, it is reasonable to assume that they would have accumulated close to 8 to 10 years of additional experience. It is also reasonable to suggest that an earlier start age leads to a greater number of hours and years of competitive officiating experience, which then leads to more opportunities to practice and develop expertise as an official.

While officiating-specific practice, i.e. deliberate practice, should be an important activity for skill development, respondents did not perform many hours of practice across the various age ranges or officiating levels that were tested (i.e., 11 to 15, 16 to 20, 21 to 25, 26 to 30, 31 to 35, and 36 to 40). No matter the condition of practice (i.e., with or without a coach, while with others or by yourself), the majority of respondents (i.e., 72 to 93%, depending on the practice condition) indicated that they were not involved in *any* officiating-specific practice activities (i.e., officiating-specific, physical or mental practice). Effect sizes for each condition were also negligible meaning that none of the practice conditions had much of an effect on total accumulated hours of practice, and therefore only had a trivial effect on the overall development of respondents. This finding

is particularly important because it is antithetical to the DPF, as practice is supposed to be a main activity needed for skill development (Ericsson et al., 1993). This means that officials might not have opportunities to practice and train, and must gain experience by performing some other activity. And while national/international level officials consistently accumulated meaningfully higher amounts of practice (i.e., physical and mental preparation) across the various conditions of practice (i.e., with and without a coach present, while you are by yourself or with others), and attended the largest total number of training camps, it is important to consider the salience of these learning activities which might not exist within the DPF.

With respondents participating in very low amounts of deliberate practice, it is important to understand what kinds of learning activities sport officials typically engage in. For instance, while Côté and Evans' (2017) typology of typical youth activities is meant for young athletes, it could be related to officials by replacing "youth-led" and "adult-led" with "official-led" and "officiating coach-led." With these changes in mind, officials training independently might be considered spontaneous training (Côté & Evans, 2017), while practicing with a refereeing coach might be considered instrumental training. Additionally, whether an activity is extrinsic or intrinsic has bearing on its classification. It can be argued that with few resources available to perform traditional deliberate practice, most practice activities are official-led and conducted out of an inherent desire to improve. As such, most officiating could be regarded as either

spontaneous training or active play, depending on the subjective extrinsic/intrinsic value. Additionally, organized competition might also be an important training activity for officials as it simulates game-like scenarios, does not have to be as structured as deliberate practice, and can aid in improving decision-making skills as well as physical fitness (Côté, Erickson, & Abernethy, 2013). Because these activities are complementary to one another, performing them all in combination would create an integrated and comprehensive learning environment (Côté et al., 2013), allowing officials to develop holistically.

Competitive officiating, which is officiating in earnest, might be the most important training activity for officials. Indeed, both MacMahon and colleagues (2007) and Catteeuw and colleagues (2009) found that competitive officiating was listed by participants the most relevant activity for the skill development. This would be considered inconsistent with Ericsson, Krampe, and Tesch-Römer's DPF (1993) as, for instance, performers are not supposed to make significant developmental improvements from competitions and performances. However, many athletes gain substantial experience from playing their sport, or at least through the performance of activities not related to deliberate practice (Baker et al., 2003; Soberlak & Côté, 2003). Officials might follow similar developmental pathways to these aforementioned athletes and improve their performance by actually officiating competitive matches. Specifically, results concerning competitive officiating were statistically significant between officiating levels, with a

moderate to large effect size confirming that the difference between these levels was meaningful. Notably, national/international officials were found to officiate more hours than both recreational and district officials. Furthermore, the levels of officiating were markedly different, with recreational officials always performing the lowest number of competitive officiating hours, while national/international officials always engaged in the highest number of officiating hours. These might be important trends, as it seems that national/international referees are separating themselves at each age gap from the lower tiers through greater engagement in match officiating. Furthermore, national/international officials were also separating themselves over the span of a career through supplementary attendance at training camps, and a greater number of hours spent performing physical and mental preparation. However, regardless of the type of training, officials might have to learn implicitly (i.e., learning without conscious awareness; see Masters & Poolton, 2012) and transfer their skills from activities not related to deliberate practice *per se* in order to fully develop their officiating skills.

Limitations

While this study provided some interesting and novel findings with respect to the development of sport officials, there were a number of limitations that should be considered. The sample was primarily made up of soccer officials. This limited the generalizability of the findings to other sports, and perhaps to officials in other countries. Respondents' geography (i.e., rural vs. urban) might have also affected officials' access

to resources and training facilities The sample also had a large proportion of higher level officials (i.e., provincial and national/international), which might have negatively affected the representativeness of the results insofar as more grassroots officials were needed to create a truly representative portrayal of developmental trajectories. Similarly, more younger officials are needed to further improve the representativeness of results, as the average age was over 40 years old, and many officials are beginning their careers as young as 15 (Livingston & Forbes, 2016). Furthermore, respondents' developmental trajectories might have inherently been different according to their current age, as an individual in their early 60s would most likely have developed in a distinctly different sporting environment than another individual in their early 20s.

This study also utilized a retrospective design, which can be troublesome as respondents might be inaccurate in their retrospective recall of training hours (MacMahon et al., 2007). Additionally, the survey was lengthy (i.e., 44 pages; see Appendix B), which could have contributed to data entry errors. Thus, we need more prospective and longitudinal designs to determine the exact details of respondents' athletic participation and officiating involvement.

Future Directions

Future studies must attempt to take into account different sports and types of officials. For instance, there are most likely differences between basketball and tennis

officials, as well as differences within each sport, as a tennis line judge would have different responsibilities and requirements than a chair umpire. The questionnaire itself could have multiple versions. One version of the survey could be more thorough, while others are adapted for different audiences. For example, North American referees might have different officiating levels and experiences than European referees. Collecting data from other countries would allow for a broader international understanding of how officials develop.

Additionally, the sample size should be larger and more representative of the various officiating levels with potentially roughly equal numbers of respondents from each level. Gathering younger respondents would also help to improve the representativeness of the sample, as well as provide more information on officials currently in the early developmental stages of their officiating career. Similarly, gathering respondents who might have already retired would provide a useful benchmark compared to individuals who have continued to officiate.

Conclusion

In summary, many of this study's findings were consistent with previous literature. For example, demographically, the current sample were consistent with previous reports about officials (Livingston & Forbes, 2016). Interestingly, while respondents' average starting age as an athlete did not affect their development as an

official, the highest level of athletic performance did influence the highest level achieved as an official. Importantly, there was seemingly no single developmental pathway as officials begin and end their careers at exceedingly variable times throughout their life. Overall, however, deliberate practice of any kind did not seem to be a predominant activity for officials. Instead, consistent with prior studies (MacMahon et al., 2007; Ollis et al., 2006), competitive officiating seemed to be the most important and relevant activity for the development of officials.

Finally, in order to have a thorough understanding of officials' developmental pathways and milestones, future studies should gather officials from varying sport backgrounds, from different levels (i.e., more grassroots and mid-tier officials), and increase the total number of respondents so as to improve the overall representativeness of the results and better inform Long Term Official Development (LTOD) plans.

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Chapter 4.

Thesis Discussion

Newell's model of constraints (1986) suggests that developmental outcomes are the result of the interactions between the individual, the task, and the environment. Based on this model, many factors need to be considered to understand the development and performance of sport officials. Previous research looked at many factors that affect sport officials. For instance, crowd noise (Nevill et al., 2002), the influence of self-esteem on burnout (Taylor et al., 1990), and poor organizational support (Livingston & Forbes, 2016) can all influence the performance of officials. However, while there have been numerous studies conducted on the psychological (Philippe et al., 2009; Purdy & Snyder, 1985; Taylor et al., 1990), physiological (Krustrup et al., 2009), decision-making (Jones et al., 2002; Nevill et al., 2002), sociological/personality-related (Mascarenhas et al., 2005; Purdy & Snyder, 1985), and attrition-related factors affecting sport officials (Forbes & Livingston, 2013; Livingston & Forbes, 2016; Warner et al., 2013), there has been a lack of research performed on the development of officials.

With this in mind, the purpose of this study was to explore the developmental pathways and milestones of sport officials to increase our general understanding about how officials gain experience, train, and advance to higher positions. Current results suggest that accumulated experiences, including deliberate practice (Ericsson et al., 1993), athletic participation, and officiating matches are important individual functional constraints on the development of sport officials. However, we must reiterate the

importance of considering the interactions between different constraints in order to understand how accumulated experience interacts with other salient constraints.

Two important variables which could greatly affect officials' accumulated experience are the variety of sports and officiating roles which exist. For example, a rugby official would not necessarily train in the same fashion as a basketball official or tennis judge, and within each sport there are an array of roles (e.g., head referee versus assistant referee in soccer) that might further influence how one type of official gains experience versus another. Additionally, participating in certain sports as an athlete might offer translatable skills (e.g., fitness level) when starting one's officiating career, as when an athlete switches from competing in long-distance running to refereeing soccer. As such, more research is needed on the variety of other sports and officiating roles. Furthermore, there is also a need for more multivariate and multidisciplinary research to understand the relationship between accumulated experience and the various task, environmental, and other individual constraints such as anthropometrics or role-related behaviours. Lastly, in the context of Newell's model, additional research should be conducted on the interaction between constraints in different populations (i.e., differences between North American and European officials), or even the diversity of officials within Ontario, as there might be inherent cultural differences between populations from various regions. In summary, it is important to understand the holistic interplay between the individual, the task at hand, and their environmental conditions.

While this thesis has attempted to provide a greater understanding of officials' development, there are still many questions remaining. As such, the representativeness of the sample must be interpreted cautiously. Future information gathered will be valuable to many provincial and national sporting organizations, particularly as they formulate Long Term Official Development (LTOD) plans. LTOD is essentially a structured and more standardized plan to recruit, develop, advance, and retain officials over the course of their career (see https://www.ontariosoccer.net/ltod for more information). It is the sport official equivalent of Long Term Athlete Development (LTAD) plans. LTOD has become a prevalent topic of discussion as more research becomes available about how officials are underserved, underrated, and leaving sport at an alarmingly high rate (Forbes & Livingston, 2013; Livingston & Forbes, 2016). However, the creation of LTOD plans will be complicated by the fact that there are seemingly many different developmental pathways.

To support and improve the performance and preservation of officials, from grassroots to the elite level, it is crucial to understand how officials develop. One of the major takeaways from this thesis is that there is no single developmental timeline as officials begin and end their careers at extremely variable times throughout their life. This is consistent with previous research (Ollis et al., 2006). Moreover, another particularly important result in the context of officials' developmental pathways was that the average starting age as an official was different depending on one's highest level of officiating

achieved. Simply put, the earlier one starts refereeing, the better your chances are to reach a high level of officiating. Lastly, competitive officiating seems to be the most important activity for the skill development of officials, which is also consistent with the previous officiating literature (MacMahon et al., 2007; Ollis et al., 2006). Specifically, national/international level officials regularly separated themselves from the lower levels by performing more hours of match officiating, as well as completing more practice hours and attending more training camps.

While these findings are notable, they are not enough to be able to fully inform the LTOD plan. More information is needed about the variety of officiating types, i.e. interactors, monitors, and reactors (MacMahon et al., 2014), as well as the combinations of constraints which affect officials' accumulated experience and how they gather that experience in the first place. Future research will need to determine if the results mentioned prior are generalizable to all sports, types of officials, cultures, and regions. It is likely that the development of sport officials is highly heterogeneous within and between sports. Various sporting organizations might also differ in their ability to support their members as, for instance, some officials feel they are undervalued and not cared for by their parent organization (i.e., Perceived Organizational Support) (Livingston & Forbes, 2016). When designing an LTOD plan for a sport, it is necessary to appreciate the interaction between multiple constraints specific to that sport. However, we are currently unaware of what all those constraints might be or how they might interact with one

another. Based on how the majority of the sample in this thesis could be considered multi-sport athletes, and how participating in sport before becoming an official might be an important developmental trend, there might even be pathways between LTAD and LTOD.

Thus, if we are to have a thorough understanding of officials' developmental pathways, more sports are needed to fill the gaps, and more respondents, both currently officiating and retired, are needed to improve the sample's representativeness and offer differing perspectives on the typical start and end times of one's officiating career. Additionally, more grassroots and mid-tier officials are needed to further improve the representativeness of the results. Furthermore, future studies should inquire about athletic performance hours and their accompanying sports in order to compare respondents' athletic experiences to their officiating experiences. Finally, because different constraints and role specificity across and within sports might influence how officials develop, it will be essential to keep Newell's model in mind when collecting participants for future studies.

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APPENDICES

Appendix A.

A1. Letter of Consent

Informed Consent – Developmental Histories of Canadian Sport Officials

This consent form is only part of the process of informed consent. This should give you a basic idea and understanding of what the study and your participation entails. If you would like more information on anything you see here, or information not included, please do not hesitate to get in contact with Jason Merger, Dr. Nick Wattie, Dr. Lori Livingston, or Dr. Susan Forbes. Please take the time to read this form carefully, and to understand the following information.

Study Name:

The Developmental Histories of Sport Officials

Researchers:

Mr. Jason Mergler, BIT

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Dr. Susan Forbes, PhD

Adjunct Professor and Part-time Instructor; Special Advisor to the Provost on Student Retention

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Purpose of Research:

Research on sport officials has historically examined factors affecting this population's performance in the field, whether they be psychological, physiological, decision-making, or based on personality. However, there remains a dearth of research on the aspects of officiating related to expertise.

Officials are the facilitators of sports matches, and offer many positive contributions to sport, including an ability to educate players and coaches on the laws of the game, in addition to reducing injury through the promotion of safe play and rule enforcement. Along with players and coaches, sport officials have primary sport roles, and organized sport could arguably not function without them. Therefore, as valued members within the sport system, sports officials deserve to be treated as respected colleagues. With well-

documented rates of abuse in invasion and fielding sports, an inability to progress to higher rankings, and an overall absence of recognition and support from sporting organizations, it is no surprise that yearly attrition rates are very high (i.e., about 30% annually). Thus, the purpose of this study will be to describe the previously unknown developmental histories of basketball and soccer officials and explore aspects of their developmental history that relate to success in reaching the highest level of the sport and adherence to the role over time.

Study Information:

In order to understand more about the developmental histories of sport officials, participants will be asked to complete the following questionnaires:

The Developmental History of Officials Questionnaire (DHOQ), preceded by two short surveys concerning participants' resilience and perceived organizational support (POS). All surveys will be completed online through SurveyMonkey, ™.

The DHOQ has been modified to take approximately 35 – 40 minutes to complete, while the Connor-Davidson Resilience Scale and 8-item Survey of Perceived Organizational Support should take approximately 5 – 10 minutes each.

Risks and discomforts:

There are no risks associated with the methods of study or possible outcomes.

Benefits of Research and Benefits to you:

For this study, there can be many direct benefits to the subjects participating. This research will be important in providing previously unknown knowledge about the developmental histories and trajectories of officials, and in educating national and provincial sporting organizations about the value and integral membership of officials in the sporting community. Additionally, this research will create a greater understanding of the factors that influence the recruitment, retention, and advancement of officials which will be essential to ensuring that our sport systems sustainably and efficiently perform to high standards. Moreover, the information gathered will be valuable to many Provincial and National Sporting Organizations and inform Long Term Official Development (LTOD) plans in order to support and improve the performance of grassroots, competitive, and elite level sport systems in Canada and abroad. Finally, we will be able to provide a report card to both Ontario Basketball and Ontario Soccer detailing the major findings of the project which would allow for a greater understanding of where to find prospective officials and how to approach the recruitment process.

Voluntary Participation:

Your participation in the research is completely voluntary and participants may choose to stop participating at any time. The participant should note that if he/she chooses to not participate, this will not affect their relationship, or the nature of their relationship with the researchers or with staff at University of Ontario Institute of Technology, Ontario Basketball or Ontario Soccer either now or in the future.

Withdrawal from the study:

You may stop participating in the study at any time, for any reason, if you so decide. Your decision to stop participating in the study, or refusal to answer particular questions will not affect your relationship with the Principal Investigator, Co-Investigators, the University of Ontario Institute of Technology, Ontario Basketball, or Ontario Soccer. In the case of withdrawal, all participant data will be immediately destroyed and removed. There is no consequence from withdrawing from the study.

Confidentiality:

All data collected and contained in the study will be treated as confidential. The questionnaires will require participants to disclose their name, email address and parent sport organization. In order to ensure the confidentiality of data both during the conduct of the research and in the release of its findings, these identifiers will then be coded,

making it impossible to trace any data back to a specific individual. This process is necessary in order to remove participant data should they wish to withdraw from the study. Consistent with Statistics Canada guidelines for ensuring confidentiality in data, no cell sizes less than 5 will be reported or used in the description and analysis of the data. This practice ensures that it is impossible to trace any data back to a specific individual. Participants consent to have their data used for the purpose of research in the form of a thesis, as well as academic outputs such as: presentations, conferences, and peer reviewed publications. All results of the study will be presented as aggregate data, and no individual will ever be presented. All qualitative and quantitative data will be compiled and stored on secure servers, and password-protected computers and files that only the principle investigator – Mr. Jason Mergler, and co-investigators – Dr. Nick Wattie, Dr. Lori Livingston and Dr. Susan Forbes, will be able to access. No individual data will be presented during the dissemination of the results. Data will be stored for up to 5 years, after which point the data will be destroyed.

Confidentiality will be provided to the fullest extent possible by law.

Participants Concerns and Reporting:

If you have any questions concerning the research study or experience any discomfort related to the study, please contact the researcher Jason Mergler at 416-768-0592 or jason.mergler@uoit.net.

Any questions regarding your rights as a participant, complaints, or adverse events may be addressed to Research Ethics Board through the Research Ethics Coordinator – researchethics@uoit.ca or 905.721.8668 x. 3693.

This study has been approved by the UOIT Research Ethics Board REB (#15032) on November 2nd, 2018.

This research conforms to the standards of the Canadian Tri-Council Research Ethics guidelines.

Legal Rights and Signatures:

I _____, consent to participate in *The Developmental Histories of Sport Officials* research project conducted by Jason Mergler. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

Signature:_____ Date:_____

Participant:

Signature:  **Date:_____**

Principal Investigator: Jason Mergler

Appendix B.

B1. Developmental History of Officials Questionnaire

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The Developmental History of Officials Questionnaire

Informed Consent

We are interested in the development of officials (referees, umpires, linesmen, etc.). If you are not an official, please do not fill out this questionnaire.

This consent form is only part of the process of informed consent. This should give you a basic idea and understanding of what the study and your participation entails. If you would like more information on anything you see here, or information not included, please do not hesitate to get in contact with Jason Mergler, Dr. Nick Wattie, Dr. Lori Livingston, or Dr. Susan Forbes. Please take the time to read this form carefully, and to understand the following information. You are also free to exit at any point; the button is on the top right of the page.

Study Name:

The Developmental Histories of Sport Officials

Researchers:

Mr. Jason Mergler, BIT
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Purpose of Research:

Research on sport officials has historically examined factors affecting this population's performance in the field, whether they be psychological, physiological, decision-making, or attrition-related. However, there remains a lack of research on the aspects of officiating related to their development. Officials are the facilitators of sports matches, and offer many positive contributions to sport, including an ability to educate players and coaches on the laws of the game, in addition to reducing injury through the promotion of safe play and rule enforcement.

Thus, the purpose of this study will be to describe the previously unknown developmental histories of sport officials and explore aspects of their developmental history that predict success in reaching the highest level of the sport and adherence to the role over time.

Study Information:

In order to understand more about the developmental histories of sport officials, participants will be asked to complete the following questionnaires:

The Developmental History of Officials Questionnaire (DHOQ), preceded by two short surveys concerning participants' resilience and perceived organizational support (POS). All surveys will be completed online through SurveyMonkey, TM.

The DHOQ has been modified to take approximately 20-25 minutes to complete, while the Connor-Davidson Resilience Scale and 8-item Survey of Perceived Organizational Support should together take approximately 5 minutes to complete.

Risks and discomforts:

There are no risks associated with the methods of study or possible outcomes.

Benefits of Research and Benefits to You:

There are many direct benefits to participating in this study. This research will be important in providing previously unknown knowledge about the developmental histories and trajectories of officials, and in educating national and provincial sporting organizations about the value and integral membership of officials in the sporting community. Additionally, this research will create a greater understanding of the factors that influence the recruitment, retention, and advancement of officials which will be essential to ensuring that our sport systems sustainably and efficiently perform to high standards. Moreover, the information gathered will be valuable to many Provincial and National Sporting Organizations and inform Long Term Official Development (LTOD) plans in order to support and improve the performance of grassroots, competitive, and elite level sport systems in Canada and abroad. Finally, we will be able to provide a report card to sport organizations detailing the major findings of the project which would allow for a greater understanding of where to find prospective officials and how to approach the recruitment process.

Voluntary Participation:

Your participation in the research is completely voluntary and participants may choose to stop participating at any time. The participant should note that if he/she chooses to not participate, this will not affect their relationship, or the nature of their relationship with the researchers or with staff at University of Ontario Institute of Technology, your sport organization either now or in the future.

Withdrawal from the study:

You may stop participating in the study at any time, for any reason, if you so decide. Your decision to stop participating in the study, or refusal to answer particular questions will not affect your relationship with the Principal Investigator, Co-Investigators, the University of Ontario Institute of Technology, or your sport organization. In the case of withdrawal, all participant data will be immediately destroyed and removed. There is no consequence from withdrawing from the study.

Confidentiality:

All data collected and contained in the study will be treated as confidential. The questionnaires will require participants to disclose their name, email address and parent sport organization. In order to ensure the confidentiality of data both during the conduct of the research and in the release of its findings, these identifiers will then be coded, making it impossible to trace any data back to a specific individual. This process is necessary in order to remove participant data should they wish to withdraw from the study. Consistent with Statistics Canada guidelines for ensuring confidentiality in data, no cell sizes less than 5 will be reported or used in the description and analysis of the data. This practice ensures that it is impossible to trace any data back to a specific individual. Participants consent to have their data used for the purpose of research in the form of a thesis, as well as academic outputs such as: presentations, conferences, and peer reviewed publications. All results of the study will be presented as aggregate data, and no individual will ever be presented. All qualitative and quantitative data will be compiled and stored on secure servers, and password-protected computers and files that only the principle investigator – Mr. Jason Mergler, and co-investigators – Dr. Nick Wattie, Dr. Lori Livingston and Dr. Susan Forbes, will be able to access. No individual data will be presented during the dissemination of the results. Data will be stored for up to 5 years, after which point the data will be destroyed.

Confidentiality will be provided to the fullest extent possible by law.

Participants Concerns and Reporting:

If you have any questions concerning the research study or experience any discomfort related to the study, please contact Dr. Nick Wattie at 905-721-8668, ext. 2248 or nick.wattie@uoit.ca.

Any questions regarding your rights as a participant, complaints, or adverse events may be addressed to Research Ethics Board through the Research Ethics Coordinator – researchethics@uoit.ca or 905-721-8668, ext. 3693.

This study has been approved by the UOIT Research Ethics Board REB 15032 on November 2nd, 2018.

This research conforms to the standards of the Canadian Tri-Council Research Ethics guidelines.

* 1. I consent to participate in The Developmental Histories of Sport Officials research project. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

- ◯ Yes
- ◯ No

2. Please enter your name

3. Today's Date

Date / Time

DD/MM/YYYY

4

Thank you!

Thank you for your time, it is greatly appreciated.

Please click "Next" to continue through the survey.

Thank you for your time

We're sorry to hear that you won't be participating, but nevertheless we greatly appreciate your time.

Please click the "Exit" button on the top right of the page or click "Next" to continue to the end of the survey.

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The Developmental History of Officials Questionnaire

Section 1 of 7: Demographic Information

To begin we would like to ask a few questions about yourself.

4. Gender

- ◯ Male
- ◯ Female
- ◯ Other

5. What is your date of birth?

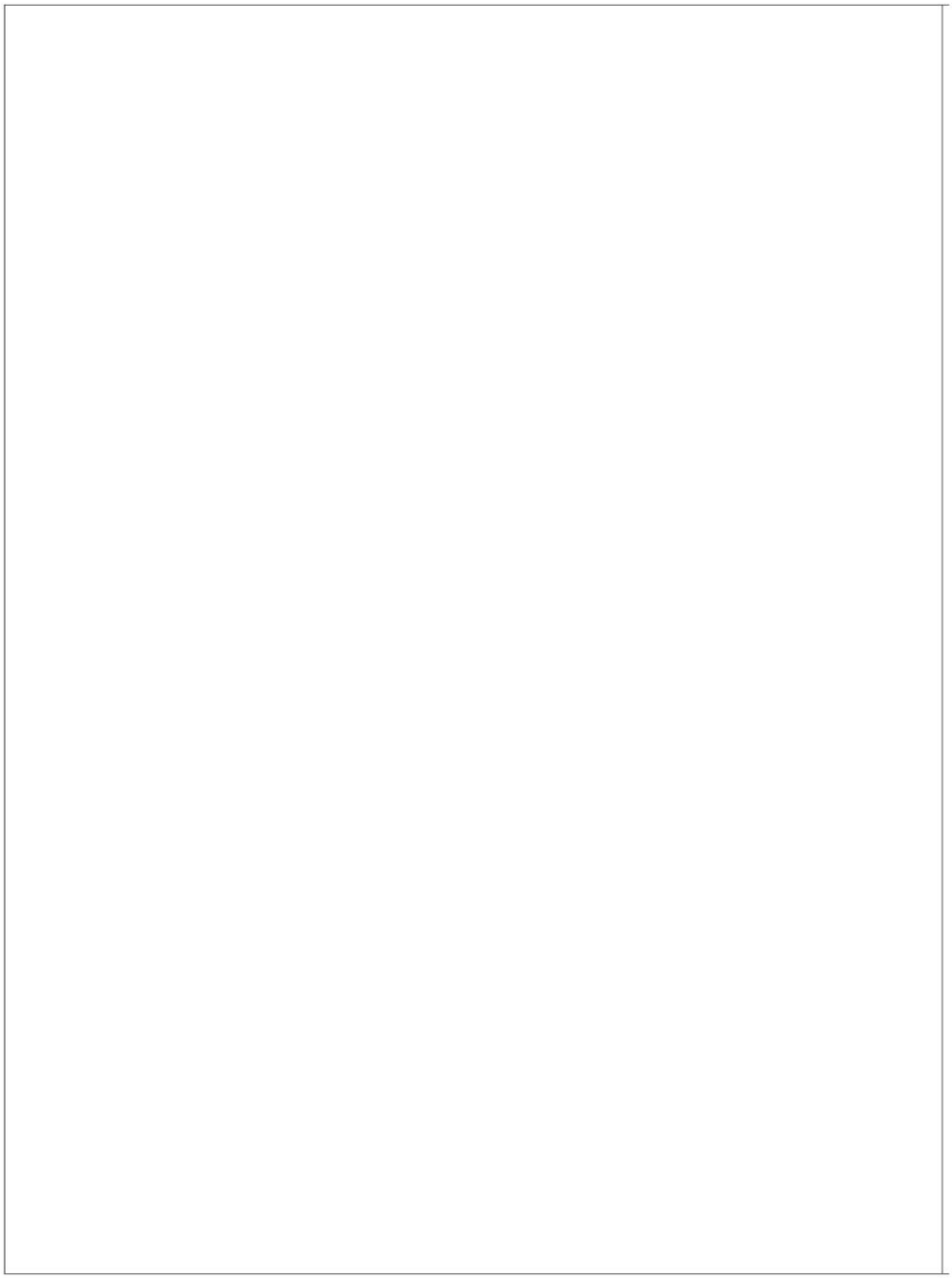
Date / Time

DD/MM/YYYY

6. In which country have you resided for the majority of your life?

7. What is the highest level of education that you have completed?

- ◯ Less than secondary school
- ◯ Some secondary school
- ◯ Completed secondary school
- ◯ Some post-secondary college / undergraduate university
- ◯ Completed a post-secondary college diploma / undergraduate university degree
- ◯ Some postgraduate university
- ◯ Completed a masters degree
- ◯ Completed a law / professional degree
- ◯ Completed a doctoral degree
- ◯ Other – Please specify


8

Section 2 of 7: Your Playing Career in Sport

Next we would like to ask some general questions about your athletic career in your main sport.

8. Are you currently participating in sport as an athlete?

- ◯ Yes
- ◯ No

9. What **sport(s)** do / did you participate in as an athlete?

Please list each sport below.

Example:

Sport 1 - Basketball
Sport 2 - Swimming

Sport 1	
Sport 2	
Sport 3	
Sport 4	
Sport 5	
Sport 6	
Sport 7	
Sport 8	
Sport 9	
Sport 10	

10. For each sport that you have listed in the previous question, please indicate the **age that you started participating** and the **age that you stopped participating** in each sport below.

If you are currently still involved as an athlete in one or more sports that you have indicated above, please choose N/A on the dropdown box when selecting the age that you stopped participating.

Example:

Sport 1 (Basketball) - Started (13); Stopped (27)
Sport 2 (Swimming) - Started (5); Stopped (43)

	Age Started Participating	Age Stopped Participating
Sport 1		
Sport 2		
Sport 3		
Sport 4		
Sport 5		
Sport 6		
Sport 7		
Sport 8		
Sport 9		
Sport 10		

11. Which sport do you consider to be / to have been your main sport of participation as an athlete?

10

12. What was the highest level of performance you achieved while*playing* in your main sport?

- ◯ Unsupervised play (no coach or personnel organizing the game)
- ◯ Club level
- ◯ Regional level
- ◯ Provincial level
- ◯ Collegiate (university or college level)
- ◯ National level
- ◯ International level
- ◯ Olympic or World Games participant
- ◯ Olympic or World Games medal winner

* 13. For your main sport, do you feel that you have reached the peak of your*playing* career?

- ◯ Yes
- ◯ No

14. At what age did you reach the peak of your career?

15. Are you still participating in practice activities for your main sport?

- Yes
- No

16. At what age do you predict that you might reach the peak of your career?

Section 3 of 7: Your Officiating Career

Next we would like to ask some general questions about your officiating career.

17. What **sport(s)** do / did you participate in as an official?

Please list each sport below.

Example:

Sport 1 - Soccer
Sport 2 - Basketball

Sport 1	
Sport 2	
Sport 3	
Sport 4	
Sport 5	
Sport 6	
Sport 7	
Sport 8	
Sport 9	
Sport 10	

18. For each sport that you have listed in the previous question, please indicate the **age that you started officiating** and the **age that you stopped officiating** in each sport below.

If you are currently still involved as an official in one or more sports that you have indicated above, please choose N/A on the dropdown box when selecting the age that you stopped officiating.

Example:

Sport 1 (Soccer) - Started (16); Stopped (N/A)
Sport 2 (Basketball) - Started (21); Stopped (45)

	Age Started Officiating	Age Stopped Officiating
Sport 1		
Sport 2		
Sport 3		
Sport 4		
Sport 5		
Sport 6		
Sport 7		
Sport 8		
Sport 9		
Sport 10		

19. What sport do you presently consider to be your main sport for officiating?

The majority of the remaining questions will relate to the main officiating sport that you have identified above. If you officiate more than one sport, please complete the remaining questions as they relate to the sport you have identified above.

15

20. For your main officiating sport, what is the highest level of competition at which you have officiated?

- ◯ Recreational involvement only
- ◯ Officiating at the house league / club level
- ◯ Officiating at the district level
- ◯ Officiating at the regional level
- ◯ Officiating at the provincial level
- ◯ Officiating at the national level
- ◯ Officiating at the international level
- ◯ Other – Please specify

* 21. For your main officiating sport, do you feel that you have reached the peak of your officiating career?

- ◯ Yes
- ◯ No

22. At what age did you reach the peak of your officiating career?

23. At what age do you predict that you might reach the peak of your officiating career?

24. What is the highest level of competition that you predict you will participate at as an official?

- ◯ Recreational involvement only
- ◯ Officiating at the house league / club level
- ◯ Officiating at the district level
- ◯ Officiating at the regional level
- ◯ Officiating at the provincial level
- ◯ Officiating at the national level
- ◯ Officiating at the international level
- ◯ Other – Please specify

Section 4 of 7: Officiating Milestones

Now we would like to ask about your career progression in your main officiating sport. The following section relates to the ages at which you reached various officiating milestones

25. Thinking specifically about your involvement in your main officiating sport, are the following **officiating milestones** relevant to you / your sport?

If so, please indicate at what **age** you reached the following officiating milestones?

For those levels that are irrelevant, please choose N/A on the dropdown box or leave the box blank.

	Age
First participated in your main officiating sport (in any position)	
First participated in regular supervised practice for your main officiating sport (i.e. practice with a coach / peer-mentor)	
First participated in regular unsupervised practice for your main officiating sport (i.e. practice without a coach / peer-mentor)	
First participated in non-sport specific training (e.g. physical conditioning, weights, pilates etc.)	
First participated in off-season or year-round training for your main officiating sport	
Stopped officiating in all other sports to concentrate on your main officiating sport	
The idea of becoming an elite official first emerged	
Made a conscious decision to become an elite official	
All of your leisure time began being spent on activities relating to your main officiating sport	
Moved house for reasons relating to your main officiating sport	
Established a close and extended relationship with a coach or peer-mentor for your main officiating sport	

26. Thinking specifically about your involvement in various levels of officiating for your main sport, please indicate the **age** at which you reached the following officiating milestones for all of the different levels of officiating below.

For those levels/milestones that are irrelevant, please choose N/A on the dropdown box or leave the box blank.

	Officiating at the **house league / club level**	Officiating at the **district level**	Officiating at the **provincial / regional level**	Officiating at the **national / international level**
First participation at this level of officiating				
First became a regular starting official (i.e. an official who regularly gets asked to officiate games)				

Section 5 of 7: Your Representative History

Within a single year of involvement, officials often participate in their main officiating sport at multiple levels of competition.

For example, a 35 year-old basketball referee may officiate for their local club team, while also officiating for their state / provincial team. In this case, at age 35, the referee officiated at the club level, as well as others at the provincial level.

The following section relates to your participation in the various levels of competition across your officiating career in your main officiating sport.

27. For each age range, please indicate the levels of competition in which you participated in your main officiating sport by checking the appropriate boxes in the chart below.

For those age ranges/levels that are irrelevant, please leave those boxes blank.

	Officiating at the **house league / club level**	Officiating at the **district level**	Officiating at the **provincial / regional level**	Officiating at the **national / international level**
Age 11 to 15	☐	☐	☐	☐
Age 16 to 20	☐	☐	☐	☐
Age 21 to 25	☐	☐	☐	☐
Age 26 to 30	☐	☐	☐	☐
Age 31 to 35	☐	☐	☐	☐
Age 36 to 40	☐	☐	☐	☐
Age 41 to 50	☐	☐	☐	☐
Age 51 to 60	☐	☐	☐	☐
Age 61+	☐	☐	☐	☐

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The Developmental History of Officials Questionnaire

Section 6 of 7: Your Competition History

We would now like to ask about your competition officiating history for your main officiating sport. The following section takes a detailed look into the average length and number of competitions that you have engaged in throughout your officiating career in your main officiating sport to date.

28. For each age range, please indicate the average game length (in hours), how many games per week (on average), and for how many months of the year you engaged in competition officiating for your main officiating sport at your highest level of competition.

For those age ranges that are irrelevant, please choose N/A on the dropdown menu or leave the box blank.

Example:

Age 16 to 20 - 1 hour, 2 games, 8 months
Age 21 to 25 - 2 hours, 1 game, 10 months

	Number of **games per week**	Average **game length** (in **hours**)	**Months** spent officiating in competitions
Age 11 to 15			
Age 16 to 20			
Age 21 to 25			
Age 26 to 30			
Age 31 to 35			
Age 36 to 40			
Age 41 to 50			
Age 51 to 60			
Age 61+			

Section 7 of 7: Your Practice History

We would now like to ask about your practice history for your main officiating sport. The following section takes a detailed look into the amount of practice and the types of practice activities that you have engaged in throughout your officiating career in your main officiating sport to date.

The next set of questions will address your participation in:

1. Officiating specific practice (e.g. officiating scrimmages or mock games; **Note: Do not include practicing or playing as an athlete towards your hours of officiating practice**)

2. Physical preparation (e.g. playing sport as an athlete, strength and conditioning, weights, fitness, pilates, yoga, flexibility)

3. Mental preparation (e.g. working with a psychologist, video analysis / review, reading about your sport, talking about your sport, searching the internet for news and results)

4. Training camps

Officiating Specific Practice

Officiating specific practice:

Officiating specific practice includes those **activities that directly resemble the technical and/or tactical demands associated with your main officiating sport**. These activities require physical effort as well as concentration, and are aimed directly at improving performance (e.g. officiating scrimmages or mock games).

Please note that officiating specific practice **does not include**:

- Competitions.
- Non-sport specific physical preparation activities such as strength and conditioning, weights, fitness, yoga, pilates, or flexibility.
- Informal playful games relating to your main officiating sport that you engage in for fun with friends and family such as pick-up basketball, street hockey, or swimming in the backyard pool.

29. If you have never participated in officiating specific practice activities for your main officiating sport, please place a tick in the box below:

☐ I have never participated in officiating specific practice activities for my main officiating sport

Officiating Specific Practice

There are **four conditions** in which officiating specific practice can take place:

1. A coach, peer-mentor or specialized instructor is present at the training venue providing supervision to you and 1 or more other officials.

2. A coach, peer-mentor or specialized instructor is present at the training venue providing one-on-one supervision to you and only you in an individual practice session.

3. No coach, peer-mentor or specialized instructor is present to provide supervision but you and 1 or more other officials are practicing together.

4. No coach, peer-mentor or specialized instructor is present to provide supervision, no-one else is practicing with you, but you are practicing on your own.

The next question relates to your participation in officiating specific practice under each of the four conditions described above. **Please consider your involvement in each of the four practice conditions separately**.

30. For each age range, please indicate how many hours **(H)** per week (on average), and for how many months **(M)** of the year you engaged in officiating specific practice for your main officiating sport within the four conditions outlined above at your highest level of competition.

For readability purposes, this question has been divided into two. This part is when the coach / peer-mentor IS present.

For those age ranges that are irrelevant, please choose N/A on the dropdown menu or leave the box blank.

Example:

Coach Present, Only You - 6 Hours, 10 Months
Coach Present, You and 1 or more officials - 3 Hours, 12 Months

	A coach / peer-mentor **is** present with **you and 1 or more** other officials **(H)**	A coach / peer-mentor **is** present with **you and 1 or more** other officials **(M)**	A coach / peer-mentor **is** present with **only you** in an individual practice session **(H)**	A coach / peer-mentor **is** present with **only you** in an individual practice session **(M)**
Age 11 to 15				
Age 16 to 20				
Age 21 to 25				
Age 26 to 30				
Age 31 to 35				
Age 36 to 40				
Age 41 to 50				
Age 51 to 60				
Age 61+				

26

31. Continued from above. This part is when the coach / peer-mentor IS NOT present.

For those age ranges that are irrelevant, please choose N/A on the dropdown menu or leave the box blank.

Example:

Coach NOT Present, Only You - 7 Hours, 12 Months
Coach NOT Present, You and 1 of more officials- 1 Hours, 5 Months

	A coach / peer-mentor **is not** present; **you and 1 or more** other officials are practicing together **(H)**	A coach / peer-mentor **is not** present; **you and 1 or more** other officials are practicing together **(M)**	A coach / peer-mentor **is not** present; you are practicing **on your own (H)**	A coach / peer-mentor **is not** present; you are practicing **on your own (M)**
Age 11 to 15				
Age 16 to 20				
Age 21 to 25				
Age 26 to 30				
Age 31 to 35				
Age 36 to 40				
Age 41 to 50				
Age 51 to 60				
Age 61+				

Physical Preparation

Physical preparation:

Physical preparation includes all activities aimed at **improving physiological and muscular capacities** such as strength, power, endurance, and flexibility. Examples of physical preparation activities include, but are not limited to, playing sport as an athlete, strength and conditioning, weights, fitness, pilates, yoga, and flexibility training.

Please refer only to your participation in physical preparation activities **completed outside of officiating specific practice** as separate stand-alone practice sessions.

32. If you have never participated in physical preparation activities for your main officiating sport, please place a tick in the box below:

☐ I have never participated in physical preparation activities for my main officiating sport

Physical Preparation

There are **four conditions** in which physical preparation activities can take place:

1. A coach, peer-mentor or specialized instructor is present at the training venue providing supervision to you and 1 or more other people.

2. A coach, peer-mentor or specialized instructor is present at the training venue providing one-on-one supervision to you and only you in an individual practice session.

3. No coach, peer-mentor or specialized instructor is present to provide supervision but you and 1 or more other people are practicing together.

4. No coach, peer-mentor or specialized instructor is present to provide supervision, no-one else is practicing with you, but you are practicing on your own.

The next question relates to your participation in physical preparation under each of the four conditions described above. **Please consider your involvement in each of the four practice conditions separately**.

33. For each age range, please indicate how many hours **(H)** per week (on average), and for how many months **(M)** of the year you engaged in physical preparation activities for your main officiating sport within the four conditions outlined above at your highest level of competition.

For readability purposes, this question has been divided into two. This part is when the coach / peer-mentor IS present.

For those age ranges that are irrelevant, please choose N/A on the dropdown menu or leave the box blank.

Example:

Coach Present, Only You - 4 Hours, 9 Months
Coach Present, You and 1 or more officials - 5 Hours, 4 Months

	A coach / peer-mentor **is** present with **you and 1 or more** other officials **(H)**	A coach / peer-mentor **is** present with **you and 1 or more** other officials **(M)**	A coach / peer-mentor **is** present with **only you** in an individual practice session **(H)**	A coach / peer-mentor **is** present with **only you** in an individual practice session **(M)**
Age 11 to 15				
Age 16 to 20				
Age 21 to 25				
Age 26 to 30				
Age 31 to 35				
Age 36 to 40				
Age 41 to 50				
Age 51 to 60				
Age 61+				

30

34. Continued from above. This part is when the coach / peer-mentor IS NOT present.

For those age ranges that are irrelevant, please choose N/A on the dropdown menu or leave the box blank.

Example:

Coach NOT Present, Only You - 10 Hours, 12 Months
Coach NOT Present, You and 1 of more officials- 2 Hours, 4 Months

	A coach / peer-mentor **is not** present; **you and 1 or more** other officials are practicing together **(H)**	A coach / peer-mentor **is not** present; **you and 1 or more** other officials are practicing together **(M)**	A coach / peer-mentor **is not** present; you are practicing **on your own (H)**	A coach / peer-mentor **is not** present; you are practicing **on your own (M)**
Age 11 to 15				
Age 16 to 20				
Age 21 to 25				
Age 26 to 30				
Age 31 to 35				
Age 36 to 40				
Age 41 to 50				
Age 51 to 60				
Age 61+				

Mental Preparation

Mental preparation:

Mental preparation includes all activities aimed at **improving your knowledge** of your sport, your officiating team, and/or your opponents. Examples of mental preparation activities include, but are not limited to, working with a psychologist, reviewing rule books, video analysis / review, watching your sport live or on television, reading about your sport, surfing the internet for websites and articles about your sport, or talking about your sport with others.

Please refer only to your participation in mental preparation activities **completed outside of officiating specific practice** as separate stand-alone practice sessions.

35. If you have never participated in mental preparation activities for your main officiating sport, please place a tick in the box below:

☐ I have never participated in mental preparation activities for my main officiating sport

Mental Preparation

There are **four conditions** in which mental preparation activities can take place:

1. A coach, peer-mentor or specialized instructor is present at the training venue providing supervision to you and 1 or more other people.

2. A coach, peer-mentor or specialized instructor is present at the training venue providing one-on-one supervision to you and only you in an individual practice session.

3. No coach, peer-mentor or specialized instructor is present to provide supervision but you and 1 or more other people are practicing together.

4. No coach, peer-mentor or specialized instructor is present to provide supervision, no-one else is practicing with you, but you are practicing on your own.

The next question relates to your participation in mental preparation under each of the four conditions described above. **Please consider your involvement in each of the four practice conditions separately**.

36. For each age range, please indicate how many hours **(H)** per week (on average), and for how many months **(M)** of the year you engaged in mental preparation activities for your main officiating sport within the four conditions outlined above at your highest level of competition.

For readability purposes, this question has been divided into two. This part is when the coach / peer-mentor IS present.

For those age ranges that are irrelevant, please choose N/A on the dropdown menu or leave the box blank.

Example:

Coach Present, Only You - 2 Hours, 5 Months
Coach Present, You and 1 or more officials - 1 Hours, 5 Months

	A coach / peer-mentor **is** present with **you and 1 or more** other officials **(H)**	A coach / peer-mentor **is** present with **you and 1 or more** other officials **(M)**	A coach / peer-mentor **is** present with **only you** in an individual practice session **(H)**	A coach / peer-mentor **is** present with **only you** in an individual practice session **(M)**
Age 11 to 15				
Age 16 to 20				
Age 21 to 25				
Age 26 to 30				
Age 31 to 35				
Age 36 to 40				
Age 41 to 50				
Age 51 to 60				
Age 61+				

34

37. Continued from above. This part is when the coach / peer-mentor IS NOT present.

For those age ranges that are irrelevant, please choose N/A on the dropdown menu or leave the box blank.

Example:

Coach NOT Present, Only You - 3 Hours, 12 Months
Coach NOT Present, You and 1 of more officials- N/A

	A coach / peer-mentor **is not** present; **you and 1 or more** other officials are practicing together **(H)**	A coach / peer-mentor **is not** present; **you and 1 or more** other officials are practicing together **(M)**	A coach / peer-mentor **is not** present; you are practicing **on your own (H)**	A coach / peer-mentor **is not** present; you are practicing **on your own (M)**
Age 11 to 15				
Age 16 to 20				
Age 21 to 25				
Age 26 to 30				
Age 31 to 35				
Age 36 to 40				
Age 41 to 50				
Age 51 to 60				
Age 61+				

Training Camps

The following question relates to your participation in **officiating training camps** for your main officiating sport.

Training camps refer to **intensive periods of training** during which officials come together for an extended time to participate in practice activities that **exceed your regular week to week training and officiating commitments** .

Training camps can last from one day or weekend to several months in duration, and they are often held at a location away from your regular training venue.

Typical activities involved in a training camp include officiating specific practice, supplementary practice activities such as physical conditioning and video review, educational sessions, team building exercises, and mock competitions.

38. If you have never participated in any training camps for your main officiating sport please place a tick in the box below:

☐ I have never participated in training camps for my main officiating sport

Training Camps

39. For each age range, please indicate the **total number of training camps**, and **overall length** (in **days**) you spent in officiating training camps for your main officiating sport.

If you participated in multiple training camps within a single age range, please add the total number of days you spent in training camps together to provide an overall total duration for the range.

For those age ranges that are irrelevant, please choose N/A on the dropdown menu or leave the box blank.

Example:

Age 11 to 15 - 5 Total Camps, 10 Days (Total Length)
Age 16 to 20 - 7 Total Camps, 14 Days (Total Length)

	Total number of training camps per age range	**Total length** of officiating training camps (in **days**)
Age 11 to 15		
Age 16 to 20		
Age 21 to 25		
Age 26 to 30		
Age 31 to 35		
Age 36 to 40		
Age 41 to 50		
Age 51 to 60		
Age 61+		

Almost Done!

We would like to ask you a few more questions to understand more about yourresilience.

Using the scale below, please indicate to what extent each of the following statements describe you on a day-to-day basis.

40. I am able to adapt to change.

Not true at all ◯ Rarely true ◯ Sometimes true ◯ Often true ◯ True nearly all of the time

41. I tend to bounce back after illness or hardship.

Not true at all ◯ Rarely true ◯ Sometimes true ◯ Often true ◯ True nearly all of the time

Almost Done!

We would like to ask you a few more questions to understand more about yourperceived organizational support related to the main officiating organization to which you report and interact with the most, and the people who are part of the organization (i.e., sport administrators, game assignors/schedulers, mentors, etc.).

Using the scale below, please indicate to what extent each of the following statements describe you on a day-to-day basis.

42. The organization values my contribution to its well-being.

- ○ Strongly disagree
- ○ Moderately disagree
- ○ Slightly disagree
- ○ Neither agree nor disagree
- ○ Slightly agree
- ○ Moderately agree
- ○ Strongly agree

43. The organization fails to appreciate any extra effort from me.

- ○ Strongly disagree
- ○ Moderately disagree
- ○ Slightly disagree
- ○ Neither agree nor disagree
- ○ Slightly agree
- ○ Moderately agree
- ○ Strongly agree

44. The organization would ignore any complaint from me.

- Strongly disagree
- Moderately disagree
- Slightly disagree
- Neither agree nor disagree
- Slightly agree
- Moderately agree
- Strongly agree

45. The organization really cares about my well-being.

- Strongly disagree
- Moderately disagree
- Slightly disagree
- Neither agree nor disagree
- Slightly agree
- Moderately agree
- Strongly agree

46. Even if I did the best job possible, the organization would fail to notice.

- Strongly disagree
- Moderately disagree
- Slightly disagree
- Neither agree nor disagree
- Slightly agree
- Moderately agree
- Strongly agree

40

47. The organization cares about my general satisfaction at work.

- ◯ Strongly disagree
- ◯ Moderately disagree
- ◯ Slightly disagree
- ◯ Neither agree nor disagree
- ◯ Slightly agree
- ◯ Moderately agree
- ◯ Strongly agree

48. The organization shows very little concern for me.

- ◯ Strongly disagree
- ◯ Moderately disagree
- ◯ Slightly disagree
- ◯ Neither agree nor disagree
- ◯ Slightly agree
- ◯ Moderately agree
- ◯ Strongly agree

49. The organization takes pride in my accomplishments at work.

- ◯ Strongly disagree
- ◯ Moderately disagree
- ◯ Slightly disagree
- ◯ Neither agree nor disagree
- ◯ Slightly agree
- ◯ Moderately agree
- ◯ Strongly agree

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The Developmental History of Officials Questionnaire

Contact Information

Please note: Your responses will remain completely anonymous.

50. Email Address

51. Sport Organization

52. Are you interested in participating in further research relating to talent development in sport?

- [ ] Yes, please add my name and email address to the register to be informed of future studies
- [ ] No, please do not add my name or email address to the register

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The Developmental History of Officials Questionnaire

Final Comments

You have just completed the final section of the Developmental History of Officials Questionnaire!

53. Did you have any difficulties understanding or answering any of the questions?

- ◯ Yes
- ◯ No

54. If yes, please describe the question(s) and the difficulties you have had:

55. Do you have any final comments that you wish to make about the Developmental History of Officials Questionnaire, your own sport involvement, or any other issues that you feel are important to mention?

Congratulations!

You have now completed the Developmental History of Officials Questionnaire.

Thank you very much for your time, patience, co-operation, and assistance. Your participation in this research project is extremely valuable.

If you have any questions concerning the research study or experienced any discomfort related to the study, please contact the Dr. Nick Wattie at 905-721-8668, ext. 2248 or nick.wattie@uoit.ca.

Any questions regarding your rights as a participant, complaints, or adverse events may be addressed to Research Ethics Board through the Research Ethics Coordinator – researchethics@uoit.ca or 905-721-8668, ext. 3693.

This study has been approved by the UOIT Research Ethics Board REB 15032 on November 2nd, 2018.

This research conforms to the standards of the Canadian Tri-Council Research Ethics guidelines.