



**Research Article**

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## Testing the factor validity of the Referee Self-Efficacy Scale (REFS) in non-invasion sports officials

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### Abstract

Officials occupy an essential role in sport, and one that is beginning to be recognized in the research literature. One growing area of research on officials is officiating efficacy, or refficacy. Previous research includes a conceptualization of the construct and an operational definition that has been supported with respect to factor structure and other psychometric properties. However, the samples that have supported the validity and reliability of the scale have reflected a narrow conceptualization of officiating; samples have been dominated by interactor officials in invasion sports, such as football and basketball. The current study was designed to assess the psychometric properties of the REFS with a sample of monitor and reactor officials. A sample of 174 officials from monitor sports such as wrestling, tennis and figure skating completed the REFS. A Confirmatory Factor Analysis supported Myers *et al* [1] four-factor model. The data also showed strong internal consistency and gender differences that are consistent with other research on efficacy in sport. These results show that the REFS is a valid and reliable measure for a heterogeneous and widely representative sample of sport officials. Research utilizing this measurement is encouraged in a variety of contexts and on a variety of outcomes.

**Keywords:** Referee Self-Efficacy Scale (REFS), Sports officials, Self-efficacy.

### INTRODUCTION

Sport officials (i.e., referees, umpires, judges) occupy a challenging role that demands high self-confidence to perform their job well. Public scrutiny and elevated expectations on officials to make accurate decisions and apply the rules competently can create a disproportionate amount of pressure. Officials at all levels of sport competition make rapid decisions on incidents that are often ambiguous and communicate with sport participants in environments recognized for heightened emotions. Considerable research on sport officials has focused on factors related to stress and performance (e.g., judgement, decision-making, physical fitness) [2], but little attention has been given to psychological attributes and skills such as concentration, coping/self-regulation, and self-confidence that have important implications on officials' behavior, decisions, and communication.

*Self-efficacy* refers to an individual's judgments of their capabilities to organize and execute courses of action to produce specific outcomes [3]. Although confidence is a more common term used to describe a general strength of belief, perceived self-efficacy describes one's agentic capability of certainty in situation-specific attainments [3]. Self-efficacy is a psychological construct consistently linked to athlete, coach, and sport team performance representing a crucial mediator in effort expenditure, regulation of behavior, motivation and affective states, and resilience to failure [4, 5]. Researchers suggest there are many personal and performance benefits for more efficacious sports officials, such as lower overall stress, greater commitment to the role/profession, increased speed and accuracy of decision-making, less rule-infringing behavior from athletes, and greater satisfaction from others about the perceived quality of officials' performance [6, 7]. Importantly, Lirgg *et al* [7] points out the insulating effect self-efficacy can have for sport officials to stressors or adversity intrinsic to their role. Appropriate organizational supports exist as vital contributors to help enhance sport officials' self-efficacy and its possible role in skill development over time and intentions to sport dropout [8]. With accumulating evidence and suggestions concerning the range of beneficial outcomes of greater self-efficacy in sport officials (and consequences to the regulation of sport competitions), an improved clarity about the self-efficacy construct and its measurement in sport official populations represents a worthy line of research.

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Guillén and Feltz [6] investigated dimensions of officiating self-efficacy belief coining the phrase 'refficacy'. Their work derives from a focus group with American soccer referees (of different expertise levels) that suggested six areas of officiating self-efficacy, but particular to a soccer context. The six inter-related areas of officiating self-efficacy proposed included: *game knowledge* (knowledge of the basic rules and strategy of the game, proper mechanics); *decision making* (ability to make accurate judgments and quick decisions, being firm, making critical decisions); *strategic skills* (field movement and positioning to make accurate decisions and anticipate game play); *psychological skills* (the ability to remain calm and concentrate, handle pressure, coping and resilience to mistakes); *communication and control of the game* (to interact effectively with players, coaches, and co-officials and resolve disputes); *physical fitness* (physical condition, keeping up to play) [6]. This initial conceptualization provided a diverse map for thinking about self-efficacy beliefs in sports officials and provided a basis for informing the development of a measurement instrument. Notably [6] dimensions represented a situation-specific modeling isolated to officials' task perceptions from one specific sport setting. Officiating experiences in team and individual sport settings are fundamentally different considering the complexities of task requirements and emphasis for certain performance skills. Therefore, what constitutes situation-specific self-efficacy beliefs can be vastly different depending on the type of sport officiated.

Advancements in self-efficacy research in sport officials subsequently addressed the testing and validation of a measurement instrument using Guillén and Feltz's [6] initial findings. Myers et al [1] adapted Guillén and Feltz's [6] original conceptualization within a multi-stage, measurement validation study with 1609 officials from 15 different team sports, including basketball, soccer, and American football. Measurement construction was guided by content experts and formulated by drawing on seminal self-efficacy theory and research in sport [1]. A 13-item, four-factor model was consequently named the Referee Self-Efficacy Scale (REFS) [1]. The final factor structure of the REFS measure included: *game knowledge* (knowledge of the sport); *decision making* (the ability to make firm and accurate decisions); *pressure* (the ability to be uninfluenced by pressure); *communication* (the ability to communicate effectively) [1]. The original six proposed self-efficacy dimensions provided by Guillén and Feltz's [6] were collapsed into four, first-order concepts: 'strategic skills' was integrated into the 'decision making' dimension, while 'control of the game' was separated from 'communication' and combined with 'psychological skills' resulting in a new dimension termed 'pressure'.

Consequently, other studies have attempted to adapt the REFS with samples of sport officials from different cultural and sport contexts, thus validating particular structure arrangements. The 'D-REFS', validated with a sample of German soccer referees, suggested a 3-factor structure including game realization (a combination of game knowledge and decision making areas), pressure, and communication [9], while a 5-factor REFS structure retaining Guillén and Feltz's [6] original 'physical fitness' dimension was confirmed with Turkish basketball referees [10,11]. Overall, decisions testing the core REFS factor structure in other research has provided consistent validation in team sport officials, particularly emphasizing the cultural signification of the construct [11-13] and relevance to different expertise level [13].

While the REFS holds promise as a reliable measurement instrument for officiating self-efficacy, its early conceptual and measurement development has been characterized by a rather limited representation of officials which may affect the validity and usefulness of the scale. An important recommendation Myers et al [1] make at the conclusion of their study is for further testing of the REFS measure factor structure with officials from different sports. A one-size-fits-all conceptualization of self-efficacy for officials of all sports may be problematic considering expectations of officials differ to sport type [7]. Sports present a different set of relevant challenges and expectations, especially non-

team sports or non-invasion games where the requirements have different complexities and goals. MacMahon and Plessner [14] provide a categorization of sport officials that helps differentiate officials based on performance and task expectancy. 'Interactors' refer to types of officials who are subject to more complex and unpredictable decision-making demands and interact more frequently with players (i.e., team sport environments such as soccer, basketball, hockey and the focus of the REFS measurement development and validation). On the other hand, 'monitor' (tennis chair umpire, wrestling referee) and 'reactor' (tennis line judge, baseball umpire) officiating environments are characterized by more predictable and rigid decision cues and often less interaction with players. It is important to further understand the structure of self-efficacy beliefs as it pertains to officiating different sport types to better conceive and improve these areas most relevant to different officials' experiences. While there has been a growing validation and testing of a self-efficacy model in team sport officials, to date there have been no studies to examine the factor validity of the REFS in non-team (or, invasion-type games) sport officials.

The purpose of the current study was to further examine the psychometric properties of the Referee Self-Efficacy Scale (REFS; Myers et al) [1]. We specifically examined whether the dimensions of officiating self-efficacy validated with team sport officials [1] is consistent with a more heterogeneous sample of non-invasive sport officials who have been neglected in previous validation studies. A second study aim explored associations between non-invasive sport officials' self-efficacy relative to different self-efficacy dimensions and with other demographic factors linked to self-efficacy in previous officiating research (i.e., age, gender, sport experience).

## METHOD

### Participants

One hundred and seventy-four officials (70 female, 104 male) participated in the study. Participants ranged in age from 17 to 82 years ( $M = 45.83$ ,  $SD = 15.30$ ), and reported having officiated their sport for an average of 13.58 years ( $SD = 11.76$ ). Furthermore, they reported having experience coaching ( $M = 7.75$ ,  $SD = 10.72$ ) and playing ( $M = 18.22$ ,  $SD = 13.26$ ) their sports. Participants represented a variety of 'monitor' and 'reactor' officiating sports (MacMahon & Plessner, 2008), predominantly wrestling ( $n = 48$ ), figure skating ( $n = 36$ ), tennis ( $n = 50$ ) and boxing ( $n = 28$ ).

### Procedures

REB approval was granted by the institution of the one of the co-authors. A script describing the study and an invitation to participate was disseminated to officials through their provincial or territorial sport governing body. This included a link to a secure on line site that hosted the survey for this study. The survey began with informed consent; participants were instructed that all completed surveys would be interpreted as consent. One week after the initial email solicitation, a reminder was sent out through the same sport governing bodies. Participants were not paid or reimbursed in any way for completing the survey.

## MATERIALS

The REFS was used in the current study. This is a 13-item questionnaire that measures four interrelated factors of officiating self-efficacy (i.e., game knowledge, communication, decision making and pressure). Game knowledge refers to the confidence that an official has in his/her knowledge of their sport. This was measured by three items (e.g., understand the basic strategy of the game). Decision making was defined as the confidence that an official has in his/her ability to make decisions during and was measured with three items (e.g., make quick decisions). Pressure refers to confidence that an official has in his/her

ability to be uninfluenced by pressure competition and was measured by three items (e.g., be uninfluenced by pressure from coaches). Finally, communication was defined as confidence that an official has in his/her ability to communicate effectively and was measured with four items (e.g., communicate effectively with other officials). All items were answered on a 5-point scale with higher scores indicating greater confidence. Myers et al [1] provide support for the psychometric properties and factor structure of the scale.

## RESULTS

Table 1 gives the descriptive statistics for the items and factors of the REFS. Prior to assessing the fit of the model to the data, the data was checked to see if it upheld the assumptions of Confirmatory Factor Analysis (CFA). Specifically, Tolerance and Variance Inflation Factor (VIF) were interpreted for the presence of multicollinearity. It is suggested that VIF greater than 10 and tolerance below 0.1 are indicative of multicollinearity. None of the variables in the REFS reached either of these thresholds. Examination of Kolmogorov-Smirnov tests showed that none of the 13 REFS variables were normally distributed. However, since self-efficacy scores tend to be skewed towards higher self-efficacy, this represents what Tabachnick and Fidell (2018) term *expected non-normality*. To accommodate for this, the robust indices of the Maximum Likelihood method of extraction were interpreted.

The results showed an excellent fit of the model to the data. The Satorra-Bentler Chi-square for the model was 106.41 with 59 degrees of freedom. Although this was significant at  $p < .05$ , it is known that chi-square values are inflated by sample size (Tabachnick & Fidell, 2018). Global fit indicators were consistent with criteria for an excellent fit to the data – CFI = .928, RMSEA = 0.069, SRMR = 0.077. It is desirable that CFI values are closer to 1 whereas RMSEA and SRMR are closer to 0. More specifically, when RMSEA and SRMR values are less than .05 and .08, respectively, indicates a good fit of the model to the data (Kenny, 2015) [14]. Values of the CFI that are larger than .95 are considered good fitting models (Hu & Bentler, 1999). The Cronbach's alpha for the overall model was 0.89, and the alphas for each of the factors exceeded 0.70 (see Table 1), indicating acceptable internal consistency for the model. In addition, all factor loadings were significant at  $p < .05$ . Figure 1 gives the factor loadings of the tested model.

Secondary analyses examined REF factor scores by gender and experience. The only significant gender difference was found for the factor of Decision Making ( $t_{(169)} = -2.08, p < .05$ ) whereby males ( $M = 4.49$ ) were significantly more efficacious than females ( $M = 4.28$ ). Experience was significantly positively related with all REFS factors at  $p < .05$ , with correlations ranging from 0.17 to 0.29.

## DISCUSSION

The purpose of the current study was to extend the support for the psychometric properties of the REFS by incorporating a sample of officials from monitor and reactor sports. In this way, the study would complement the published literature on the validity of the scale with officials from interactor sports such as soccer, basketball, and hockey. The results showed that the four-factor model of the REFS fit the data of the current sample. Furthermore, the model showed acceptable internal consistency as well as patterns with demographic variables (i.e., age and gender) that are consistent with previous research on self-efficacy in officiating and other contexts.

This study offers further support to the factor structure of officiating self-efficacy, first articulated by Guillén and Feltz [6]. Our results support that officials' self-efficacy comprises several unique but interrelated constructs. On the one hand, the results are consistent with studies supporting the psychometric properties of the REFS [1,

13], on the other, our findings extend this support to a more heterogeneous and representative population of sports officials. While the interrelated four-factor model of officiating self-efficacy appears to be a robust one in reactor and monitor officials, the findings also draw attention to a need for improved conception self-efficacy beyond and including the self-efficacy factors tested in this study for these sports. How are the nature and magnitude of necessary self-efficacy beliefs unique to different officiated sport and more under-researched officiating populations.

There was a gender difference found in this study in that males were significantly more efficacious with respect to decision making than females. This is consistent with a previous research in self-efficacy in sport and other contexts [15,16] for meta-analysis of self-efficacy in physical and academic tasks, respectively). Within sport, Marback, Short, Short and Sullivan [17] found significant gender difference with respect to coaching confidence. Specifically, male coaches reported greater confidence with respect to game strategy and motivation than female coaches. The current results are intriguing in that although there is a gender difference consistent with coaching and other contexts, it is specifically with respect to one aspect of officials' self-efficacy (decision-making). It is noteworthy that females are as efficacious as male officials with respect to handling pressure, game knowledge and communication during performance. An analysis of sport officiating research finds female officials and understanding about their officiating experiences tend to be neglected compared to research on male officials' participation and performance (Hancock et al., 2019). Implications of the gender differences found here offer an entry point for further research to describe self-efficacy between male and female officials. Are certain areas, such as decision-making efficacy, more required in intervention design to improve officials' self-efficacy depending on officials' gender and the participation demands of their sport?

Providing more support for the validity, reliability and generalizability of the REFS represents a surge research on the psychology and behavior of officials. Potential research questions have been noted by researchers of sports officiating in general and officiating self-efficacy in particular [6,18]. For example, one commonly discussed outcome of officiating self-efficacy is performance [1,6,7]. Whilst athletic performance can be measured and described through more objective and measurable criteria (e.g., number or percentage of successful passes, shots, etc.), officiating performance can sometimes provide less clear and measurable performance variables within study design [7]. Spencer [19] used external ratings of senior assessor/officials about high-performing officials' performance (based on governing sport body-instituted assessment criteria) and found no significant relationships between self-efficacy and their operationalization of officiating performance. Officials' decision 'accuracy' often accounts for much of officiating performance and expectation, however with much uncertainty about what is defined as an 'accurate' judgement or decision (from coaches, players, and spectators) what is 'correct' is often a *perception* of official's decision performance [7,20]. Experimental research could use laboratory conditions to replicate officiating environments and manipulate officials' self-efficacy using different types of feedback on performance [19]. Such simulated settings could serve as an interesting control to officials' self-efficacy on, for example, decision making tasks.

Cognitive and emotional processes such as anxiety and stress exists as other performance factors potentially mediated by self-efficacy. Lirgg et al [7] points out athlete research finds that lower levels of anxiety have been linked with better distraction control and ability to focus on relevant cues in sporting environments. Self-efficacy beliefs may be a factor related to better attention control and cue utilization, depending on the decision cue complexities of different officiating environments (i.e., non-invasive vs. team sports) [18]. Other more humanistic performance factors of officiating, such as interaction with sport

participants and resilience to social pressure mark other outcomes potentially associated with greater self-efficacy.

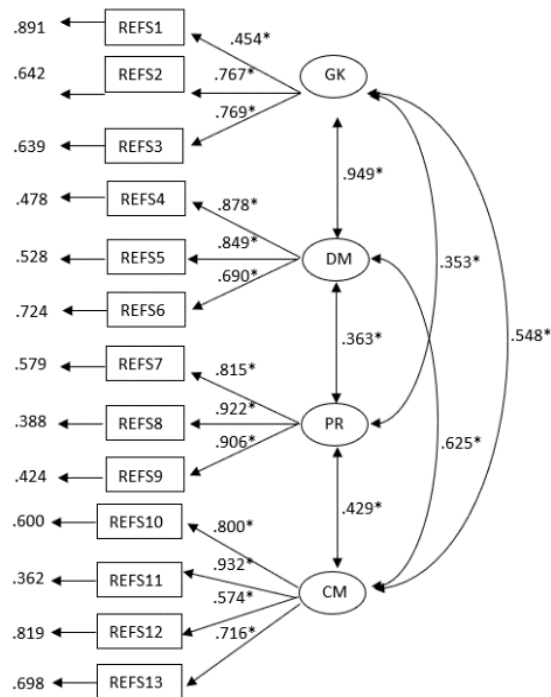
Lastly, more general self-efficacy belief and its sources are said to play a crucial role in sport officials' intention to leave their sport [8,21]. It can be expected that highly efficacious sports officials may be more satisfied and committed to their role [6]. For example, higher general self-efficacy in officials has been associated with intrinsic and extrinsic factors of job satisfaction [22], and also greater teamwork efficacy among handball referees (with other co-officials) is linked to higher sport enjoyment; a main contributor to sport commitment [12]. The REFS could serve utility to measure and track specific self-efficacy areas in officials as they are associated with officials' role commitment and performance. A final officiating outcome with possible associations to self-efficacy is burnout. Understanding the impact of general and specific forms of self-efficacy in officials can inform sources of burnout and types of mental health symptoms and indicators in officiating populations.

Future research could attempt to use the REFS to understand other sport participants' perceptions of officials' self-efficacy. This outsider point of view can inform understanding about ways athletes and coaches, for example, perceive self-efficacy beliefs in officials in different construct dimensions measured by the REFS. This information could act as the basis for intervention and inform official education about sport stakeholders' views about their confidence to perform (and associated with factors in their behavior with officials). Preparation and past experience have been found to be important sources of officiating self-efficacy [1]. Sources of self-efficacy should be further understood through future research to help formulate organizational supports aimed at enhancing and creating literacy around officials' self-efficacy. Livingston et al [8] emphasizes a need for future research to measure the effectiveness of organizational policy changes and long-term development programming through assessing

changes in self-efficacy, retention and attrition, and skill development over time. Testing the strength and impact of self-efficacy enhancement interventions can be coupled with periodic measurement of officials' self-efficacy using a self-report tool such as the REFS. Many possibilities exist for future research to build knowledge about the officiating self-efficacy construct and its measurement, conceptualization, and improvement in sport officials.

**Table 1:** Descriptive Statistics of REFS items

Item	Mean	SD	$\alpha$
REFS1	4.80	0.47	---
REFS2	4.41	0.73	---
REFS3	4.49	0.70	---
REFS4	4.39	0.76	---
REFS5	4.38	0.79	---
REFS6	4.45	0.74	---
REFS7	4.51	0.83	---
REFS8	4.63	0.81	---
REFS9	4.72	0.74	---
REFS10	4.41	0.76	---
REFS11	4.56	0.64	---
REFS12	4.64	0.62	---
REFS13	4.73	0.56	---
Game Knowledge	4.56	0.50	0.67
Decision Making	4.41	0.67	0.85
Pressure	4.62	0.73	0.91
Communication	4.59	0.53	0.83



**Figure 1:** Confirmatory Factor Analysis Model of REFS. Maximum Likelihood standardized solution reported. GK = Game Knowledge, DM = Decision Making, PR = Pressure, CM = Communication.

**Conflicts of interest:** None

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