

Coping with external stressors in handball and football elite refereeing: The relationship with referee efficacy

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Abstract

This study investigated the association between referee efficacy and self-reported coping with external stressors among elite handball and football referees. The participants were 224 Norwegian elite referees of handball ($n = 111$, m age = 35.3 years, 13.5% females) and football (113, m age = 30.8 years, 8% females) who had been referees for an average of 14.4 years and a referee at the present level for 6.8 years. Referee self-efficacy was measured using the Norwegian version of the Referee Self-Efficacy Scale. Self-reported coping with external stressors was measured using responses to statements related to the referee's self-perceived decision-making process in the presence of several sources of external stressors. Through Structural Equation Modelling, the results revealed that referee self-efficacy was positively associated with coping with external stressors. Football referees reported higher levels of coping with external stressors than handball referees, and the number of years of elite refereeing was positively related to coping with external stressors. The findings provide evidence of a positive relationship between referee efficacy and coping with external stressors when making decisions.

Keywords: *Referee Self-Efficacy Scale, Decision-Making, Social Pressure, Team Sport Referees*

Sport referees are responsible for interpreting and enforcing the rules of the game, and operate in a complex environment where they must make numerous decisions under pressure within time constraints (Samuel et al., 2020). While referees are expected to be impartial and largely errorless, the complexity of their role makes mistakes unavoidable. For instance, studies in the football context have indicated that 60%–79% of actual decisions in foul situations are supported by expert panels (see Schweizer et al., 2011). Thus, referees' decisions often influence the outcome of a sporting event (MacMahon et al., 2015), which subsequently becomes a focus of media attempts to create controversy (Johansen & Haugen, 2013; Mascarenhas et al., 2005). Furthermore, as supporters, players, and coaches seek to influence the referee to make decisions in their favour (Di Corrado et al., 2011), it is not surprising that referees' ability to cope with such external stressors is considered to be a key component of successful refereeing (Guillén and Feltz, 2011; Johansen & Haugen, 2013; Samuel et al., 2020).

Johansen and Haugen (2013) found in their study of Norwegian top-level football referees that anxiety levels were higher as the competitive level increased, indicating that the pressure on referees is likely to depend on the competitive context. Thus, coping with external stressors

(e.g., noise and disturbance from the crowd and players; see Johansen & Haugen, 2013) may be particularly important in elite sport refereeing. Furthermore, the referees in the abovementioned study were also asked to respond to statements related to their decision-making behaviours, with the findings indicating that top-level referees typically perceive themselves to be unaffected by noise and disturbance, failure in refereeing, and aggressive behaviour. Nevertheless, despite their intentions and perceptions, studies have indicated that referees tend to be biased (see e.g., Dohmen & Saueremann, 2016). For instance, several studies have yielded insight into referees' roles in the home-team advantage, finding that referees tend to be biased towards home teams when awarding penalties, allocating extra time (Dohmen, 2008; Sutter & Kocher, 2004), and imposing disciplinary sanctions (Buraimo & Maciaszczyk, 2012). The referee bias towards home teams seems to increase with crowd density (Goumas, 2014); suggested explanations for such findings are that referees are subconsciously influenced by the home crowd. This is supported by a recent study of matches played behind closed doors owing to the COVID-19 pandemic, where no referee biases in favour of the home teams were identified (Sors et al., 2021). Furthermore, research has identified a referee bias in favour of successful

teams (Erikstad & Johansen, 2020), possibly explained by the increased social impact that skilled individuals and teams may have (see also Social Impact Theory; Latané, 1981).

While referees' decision-making has been argued to be primarily automatic (Plessner et al., 2009), Samuel et al. (2020) have recently proposed a conceptual framework for better understanding referees' decision-making. Although the framework was originally developed for the football context, it seems to be valid for referees in other invasion sports (i.e. team sports where the aim is to invade the opponent's territory to score a goal/point), including handball. Inspired by the work of Tenenbaum (2003), the model highlights that referees' decision-making can be understood as a sequential process, starting with decisions regarding where to run, where to look and what to anticipate. When identifying and processing information from infringements, referees must match the situation with the rules to reach the most appropriate decision (i.e., what to call). To make an unbiased decision, referees must thus ignore input from external stressors such as pressure from the home crowd. Finally, the referee must decide whether to keep or change the decision. Furthermore, informed by previous studies (e.g., Guillén & Feltz, 2011; Samuel et al., 2018), Samuel et al. (2020) highlighted that the decision-making processes are influenced by multiple factors, including the referees' positioning skills, physical fitness, knowledge of rules, stress level, self-control, and self-efficacy.

Of relevance for the present work, self-efficacy in sport referees has attracted increased research interest over the past years (see e.g. Guillén et al., 2019; Johansen et al., 2018). Bandura's (1997) social-ecological theory proposes that perceived self-efficacy can influence an individual's ability to exert self-control, focus on the task at hand, and buffer feelings of stress. Building upon Bandura's (1997) self-efficacy theory, Guillén and Feltz (2011) presented a conceptual model of referee efficacy, defining the concept as 'the extent to which referees believe they have the capacity to perform successfully in their job' (p. 1). According to their conceptual model, referee efficacy—termed 'refficacy'—should be a positive predictor of referee behaviour and performance. An essential dimension of refficacy is making critical decisions, demonstrating accurate judgements, and being firm in one's decisions. These high-level decision-making skills of referees' self-efficacy include focusing attention, staying cool under pressure, and coping with mistakes and adverse situations (Myers et al., 2012). In line with these assumptions, refficacy is included in Samuel et al.'s (2020) conceptual model of sequential decision-making as a positive influence on referees' decision-making process.

Self-efficacy is widely studied in sport and exercise contexts (Guillén et al., 2019) and the conceptual work of Guillén and Feltz (2011) has stimulated the development and adaptation of the Referee Self-Efficacy Scale (REFS) for different countries (Eskiyecik et al., 2019; Guillén et al., 2019; Johansen et al., 2018; Karaçam & Pular, 2017; Labudek et al., 2019; Myers et al., 2012). Building upon such work, Diotaiuti et al. (2017) identified positive associations between the refficacy of handball referees and teamwork efficiency, awareness, enjoyment, and commitment. However, research on the associations between refficacy and other referee constructs is still in an early phase.

Refficacy is suggested to improve referees' decision-making processes (see e.g. Samuel et al., 2020), and thus contributes to correct decisions and impartial refereeing in the face of external stressors. For instance, coping with

pressure is believed to be a component of refficacy (Guillén & Feltz, 2011), which in turn may contribute to correct and impartial decisions as highly anxious referees seem to perform more poorly in pressing crowd conditions than less anxious referees (Sors et al., 2021). Although Johansen and Haugen (2013) have investigated external stressors such as the referees' perceptions of how crowd noise and disturbance from players and/or coaches influence their decision-making when they are officiating, the relationship between refficacy and coping with external stressors remains unexplored. Accordingly, the aim of this study is to investigate this association among elite handball and football referees.

Methods

Participants

The participants in the present study were 224 Norwegian elite referees (in the top two divisions) in handball ($n = 111$, m age = 35.3 years, $sd = 11.1$ years), 13.5% female) and in football (113, m age = 30.8 years, $sd = 7.0$ years), 8% female). The participants had been referees for an average of 14.4 years ($sd = 7.77$ years; min: 4, max: 37), and at the elite level for an average of 6.8 years ($sd = 6.20$ years, min: 1, max: 32). Notably, the sample of present study consists of elite referees from the two largest team sports contexts in Norway. Furthermore, due to the similarities between Norway, Denmark, and Sweden (e.g., population sizes and competitiveness of the top leagues) as well as the exchange program for top referee teams between the countries, the sample can arguably reflect a Scandinavian elite referee context (NFF, 2022).

Procedure

The Norwegian Social Science Data Services approved this study. The data were collected using SurveyXact, a web-based programme for conducting electronic questionnaires. The questionnaires were distributed by email before the handball and football league season started to all the referees ranked and listed by the Norwegian Handball Federation and the Norwegian Football Federation, respectively. The email provided a link to the questionnaire and was open for 30 days. The first page of the questionnaire informed the referees about the purpose of the study and emphasized that participation was voluntary and anonymous.

Instruments

Referee self-efficacy was measured using the Norwegian version of the Referee Self-Efficacy Scale (REFS; Johansen et al., 2018; Myers et al., 2012). Referees were asked to rate the extent to which each statement reflected their perceived self-efficacy as referees. On a five-point response scale ranging from 'very little' to 'very strongly' (Myers et al., 2012), referees responded on 13 items representing four first-order dimensions: 1) game knowledge (GKN), 2) decision-making (DEM), 3) pressure (PRE), and 4) communication (COM). GKN was defined as the confidence of a referee in his/her knowledge of his/her sport. DEM was defined as the confidence of a referee in his/her ability to make decisions. PRE was defined as the confidence of a referee in his/her ability to be uninfluenced by pressure. COM was defined as the confidence of a referee in his/her ability to communicate effectively. A second-order latent construct of global referee self-efficacy (REFS) was modelled in the present study, in accordance with the findings of Johansen et al. (2018).

Self-reported coping with external stressors was assessed by using the statements from Johansen and Haugen (2013, see Table 3). Specifically, the items related to referees' decision-making behaviours in presence of three sources of external stressors; (i.e., 1: Noise & Disturbance - noise and disturbance from the crowd, coaches, players, and substitutes; 2: Protesting - players and coaches protesting; and 3: Aggressive Behaviour - aggressive behaviour from players and coaches). The three items from each dimension were aggregated, and an overall 'coping with external stressor' factor (CES) was estimated as a latent construct based on three manifest variables. Negatively worded items (e.g., 'I find it hard to make decisions') were reversed so that the higher value for 'coping with external stressors' indicated more adaptive responses to external stressors in the referees' decision-making (e.g., 'I just keep on refereeing enthusiastically'). *Years of refereeing experience at current level* was measured by one item that asked, 'How many years have you been acting as a referee at your current level?' The response format was number of years.

Statistical analyses

All analyses were performed using Mplus 8.6 statistical software (Muthén & Muthén, 1998–2017). Bivariate correlations were calculated for all latent variables. Within the framework of Structural Equation Modeling (SEM; see e.g., Kline, 2015) we tested a research model containing three exogenous variables (referee efficacy, years of refereeing at the elite level, and sport

and one endogenous variable (coping with external stressors). Referee efficacy and coping with external stressors were measured as latent constructs, whereas the number of years refereeing (number of years—a count metric) and sport type (handball or football—a nominal metric) were manifest variables. The psychometric properties of the latent measures were assessed through independent clusters model confirmatory factor analyses (ICM-CFA) approach because there was sufficient *a priori* measurement theory to justify the constructs (Crawford & Henry, 2004; Johansen & Haugen, 2013; Johansen et al., 2018; Myers et al., 2012; Wang et al., 2010). The measurement models were estimated using a maximum-likelihood method with robust standard errors (MLR) because it is robust to non-normality (Satorra & Bentler, 1994). Item-level missing data were accounted for by the full-information MLR (Enders, 2010). The overall fit of each measurement model was assessed using the Satorra–Bentler chi-squared (S–B χ^2 ; Satorra & Bentler, 1994). Although non-significant S–B χ^2 values are deemed acceptable, they are sensitive to sample size. Hence, they should be inspected alongside other criteria, such as the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). A CFI greater than .90, an RMSEA lower than .08, and an SRMR lower than .08 represent good fit criteria (Little, 2013). Each latent variable was measured with its respective observed indicators. One indicator per latent variable was fixed at 1.0, allowing us to scale the latent variables to a common metric.

Table 1: Descriptive statistics of manifest variables from REFS and coping with external stressors

	M	SD	Skewness	Kurtosis	n
GKN1	4.54	0.65	-2.60	8.75	208
GKN2	4.20	0.63	-1.41	3.19	208
GKN3	4.40	0.55	-1.64	4.17	210
DEM1	4.60	0.50	-2.60	9.07	210
DEM2	4.47	0.58	-2.06	5.72	210
DEM3	4.49	0.54	-2.14	-6.71	210
PRE1	4.13	0.75	-1.13	1.53	210
PRE2	4.31	0.89	-1.75	3.05	210
PRE3	4.14	0.86	-1.18	1.21	210
COM1	4.03	0.62	-0.82	1.24	210
COM2	4.33	0.44	-1.27	4.36	210
COM3	4.13	0.53	-0.94	2.25	210
COM4	4.11	0.64	-1.06	2.07	210
Noise & Disturbance	4.34	0.57	-1.25	1.20	202
Protesting	3.32	0.39	0.07	0.95	202
Aggressive Behaviour	3.78	0.52	-0.31	-0.30	202

Note. GKN1-COM4 = items from the Referee Self-Efficacy Scale (REFS), Noise & Disturbance = parcelled item on noise and disturbance, Protesting = parcelled item of players and coaches protesting, Aggressive Behaviour = parcelled item of aggressive behaviour by players and coaches. N differs from 224 because of missing data at item-level.

Table 2: Bivariate correlations between the latent study-variables

	1.GKN	2.DEM	3.PRE	4.COM	5.REFS	6.CES	7.SPORT	8.EXP
1.GKN		.892**	.623**	.570**	.997**	.249*	.240**	.030
2.DEM			.554**	.507**	.891**	.221*	.213**	.027
3.PRE				.354*	.622**	.154*	.149**	.019
4.COM					.569**	.141*	.136*	.017
5.REFS						.248*	.239**	.064
6.CES							.273*	.263**
7.SPORT								-.260**
<i>a</i>	.778	.900	.898	.822	.909	.767	-	-

Note. GKN = game knowledge subdimension, DEM = decision-making subdimension, PRE = pressure subdimension, COM = communication subdimension, REFS = second-order referee efficacy, SPORT = type of invasion team sport, (coded: 1 – handball, 2 – football), EXP = years of refereeing experience at current level, CES = coping with external stressors. (* $p < .05$; ** $p < .01$). *a* = Cronbach’s alpha.

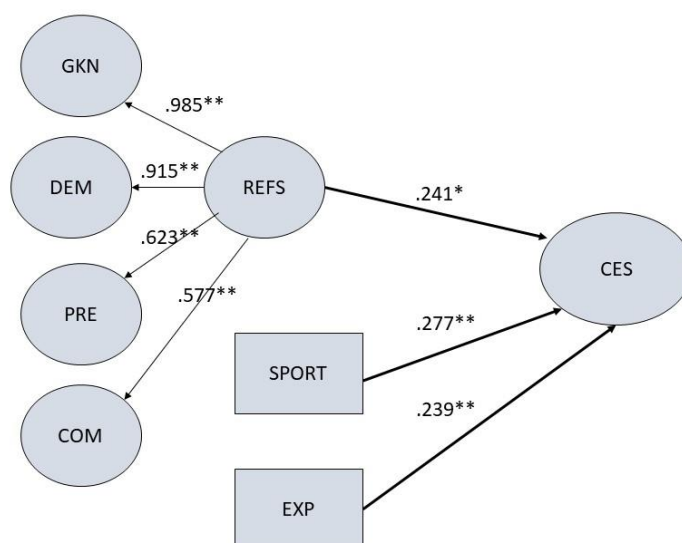
Results

First, ICM-CFA analyses were performed for the two latent constructs. All items loaded on their respective latent constructs. The two measurement models yielded acceptable fit indices (CFI > .90, RMSEA < .08, and SRMR < .08; Little, 2013). Table 1 presents item descriptives for the continuous manifest variables in the present study, and Table 2 presents the bivariate correlations between the study-variables. Although some of the kurtosis-values may be considered high, we assumed that the MLR-method of estimation would be less impacted by the deleterious effects of non-normality (Curran et al., 1996). Most variables correlated positively with the other variables, except for years of experience at current level, which was only related to coping with external stressors (positively) and type of sport (negatively, i.e., handball-referees had longer experience compared to football-referees in the present sample).

Second, within the SEM-framework, a regression-based model with one latent outcome (Coping with External Stressors), one latent second-order antecedent (General Referee Self-Efficacy), and two manifest antecedents (sport

type and years of experience at current level) was estimated. The model yielded acceptable fit (S-B $\chi^2 = 256.44$ [$df = 129, N = 210$], $p < .001$; CFI = .93; RMSEA = .069 [.06–.08], and SRMR = .08; Cronbach’s alpha > .70). The results (figure 1) identified a statistically significant relationship between all three antecedents and the outcome. More specifically, referee self-efficacy was positively associated with coping with external stressors (standardized β coefficient: .24, $se = .11, p = .021$), football referees reported higher levels of coping with external stressors (standardized β coefficient: .28, $se = .08, p = .001$) than handball referees, years of experience at current level was positively related to coping with external stressors (standardized β coefficient: .24, $se = .07, p = .001$). In total, the model accounted for 16.4% ($R^2 = .164, p = .003$) of the variance in coping with external stressors. The correlations between the exogenous variables were as follows (not shown, for clarity purposes): sport with refficacy; standardized β coefficient: .256, $se = .052, p < .001$, experience with refficacy: standardized β coefficient: .085, $se = .073, p = .241$, sport with experience: standardized β coefficient: -.214, $se = .059, p < .001$.

Figure 1: Visual illustration of the estimated structural model



Note. Values are standardized regression coefficients (* $p < .05$; ** $p < .01$). GKN = game knowledge subdimension, DEM = decision-making subdimension, PRE = pressure subdimension, COM = communication subdimension, REFS = second-order referee efficacy, SPORT = type of invasion team sport, (coded: 1 – handball, 2 – football), EXP = years of experience as a referee at the elite level, CES = coping with external stressors.

Discussion

The objective of the present study was to investigate the association between referee efficacy and self-reported coping with external stressors among Norwegian elite handball and football referees. The findings provide empirical support for aspects of the conceptual model of Guillén and Feltz (2011) among Norwegian elite referees in handball and football by providing evidence of a positive relationship between referee efficacy and coping with external stressors when making decisions.

In relation to the study's main antecedent, a positive association between referee self-efficacy and coping with external stressors was identified. Such findings can be seen as consistent with the theoretical assumptions of Bandura (1997) and Guillén and Feltz (2011) because high self-efficacy/efficacy is characterized by increased self-control, buffering feelings of stress, focusing on the task at hand, and being firm in one's decisions. Furthermore, because staying cool under pressure is believed to be a consequence of refficiency (see Myers et al., 2012), the findings can also be consistent with previous empirical findings of anxious referees being more likely to be influenced by social forces, such as aggressive players, protesting coaches, and/or crowd noise (Sors et al., 2019). Although studies have generally found that referees tend to be biased in their decision-making—arguably caused by external stressors such as pressure from the crowd and players (see e.g. Goumas, 2014; Lex et al., 2014)—the present findings may indicate that refficiency could buffer referees against biases.

To understand referees' decisions better, Samuel et al. (2020) have proposed a sequential model of the decision-making process, highlighting that referees' decisions are influenced by both contextual factors and personal characteristics. Indeed, sport referees use their competence and knowledge (i.e. physical fitness, positioning skills, visual attention, and search strategy) to identify relevant sources of environmental information (e.g. potential infringements) and ignore irrelevant information and cues (e.g. crowd noise). While failing to ignore irrelevant cues may lead to incorrect decisions, refficiency is a personal characteristic that may help referees to focus on relevant cues and ignore irrelevant cues (see Samuel et al., 2020).

Although one should aim to reduce the number of refereeing mistakes, the complexity of the referee's role inevitably makes mistakes a part of the game (see Samuel et al., 2020; Schweizer et al., 2011). While referee errors, in general, can influence the fairness of a game, this is particularly true for referee biases from external stressors. Indeed, whereas referee errors should be evenly distributed across teams, referee biases have shown that this is not the case (see e.g. Dohmen & Sauermann, 2016; Erikstad & Johansen, 2020). Whereas refficiency is believed to improve performance in general (e.g. reduce errors), the present findings also may indicate that refficiency can increase the fairness of the game through a more balanced distribution of errors due to increased ability to cope with external stressors such as pressure from the home crowd.

Furthermore, although it was not the main purpose of the study, the findings indicate differences between football and handball referees' perceptions of coping with external stressors, with football referees reporting higher levels of coping. Whereas Johansen and Haugen (2013) found that Norwegian elite football referees typically perceive themselves to be unaffected by noise and disturbances, comparisons with handball referees have previously been unexplored. Indeed, previous studies on

referee biases and stressors have tended to focus on the football context, with findings indicating that football referees often expect to be the target of social pressure (Wolfson & Neave, 2007) and that spectators/crowd densities are potential sources of stress (Goumas, 2014). Because football matches typically attract more attention from spectators and the media than handball, and rule differences make handball players more easily penalized for aggressive behaviour towards the referee, it may be that the external stressors are more prevalent in football than in handball. Whereas this could increase referee bias in football compared with handball, increased pressure on football referees could also provide experiences and inform training, making them more capable of coping with external stressors than those in sports where external stressors are less prevalent.

Limitations and conclusion

Taken together, the findings add to the knowledge of the relationship between individual and environmental factors that may affect the implementation of the decision-making process while officiating. However, limitations of the study must be considered when interpreting the findings. Although the sample consisted of referees at the two highest levels in Norway, a larger sample size would have strengthened the generalizability of the findings and allowed for rigor statistical comparisons between different subgroups (e.g., different sports, sex-differences). Moreover, it is important to emphasize that the present study investigated referees' perceptions of coping with external stressors, and that these perceptions may be different from their actual biases. Indeed, past studies have found that referees typically perceive themselves as being unbiased (Johansen & Haugen, 2013), whereas empirical investigations have generally found that referee biases occur (see e.g. Erikstad & Johansen, 2020). Thus, future studies could aim to also include a more objective measure of coping with external stressors, such as accuracy of decisions under various match conditions (e.g., determined by the degree of noise and disturbance from the crowd).

Whereas the main objective of the present study was to investigate the association between refficiency and coping with external stressors related to decision-making, it should also be noted that other beneficial outcomes have been associated with refficiency, including enjoyment and commitment (Diotaiuti et al., 2017). Thus, it would be interesting to understand how refficiency can be developed. Indeed, Guillén and Feltz (2011) have identified six components of refficiency (i.e. game knowledge, strategic skills, decision-making skills, psychological skills, communication/control of the game, and physical skills) as well as sources of refficiency (i.e. mastery experience, significant others, physical and mental preparation, and partner qualifications). Greater insight into how these components of refficiency can be developed would be valuable. Furthermore, whereas the present study addressed the recommendations of Guillén and Feltz (2011) on conducting research on exploring the importance of refficiency, more research is warranted. As refficiency is highlighted by Samuel and colleagues (2020) as one of multiple factors that influence the decision-making process, future studies could aim to investigate other dimensions highlighted (e.g., positioning skills, stress level, self-control) in relation to coping with external stressors.

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