

Academic Paper

Awareness and use of motivational interviewing reported by Canadian university sport coaches

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Abstract

Motivational Interviewing (MI) is a communication strategy to facilitate behaviour change yet MI research in sport is scant. This study investigated awareness and use of MI by coaches in Canadian university sport using a non-experimental design. Less than one-third of the male (30.2%) and one-quarter of the female (20.0%) coaches reported awareness of MI with a similar pattern noted for male (32.0%) and female (25.8%) coaches' reported use of MI. No sex-based differences in MI awareness and use were evident (p 's > .05). Overall, low awareness and use of MI reported by coaches have implications for designing coach education programs.

Keywords

self-motivation, coach-athlete communication, behaviour change, coach education,

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Introduction

Understanding coach-athlete interactions has become an important research priority in sport (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2011; Pope & Wilson, 2012, 2015). This is hardly surprising given that athletes report a host of psychological maladies – including elevated worry and greater concentration disruption (Ramis, Torregrosa, Viladrich, & Cruz, 2017) or diminished vitality (Gucciardi, Stamatis, & Ntoumanis, 2017) – when coaches attempt to control or coerce their behavior. On the contrary, adaptive psychological processes, such as more internalized motives for sport (Pope & Wilson, 2012, 2015) or enhanced well-being (Bartholomew et al., 2011) have been empirically linked to positive coach-athlete interactions. Researchers studying coach-athlete interactions within sport contexts have stressed the importance of highlighting the key components of successful (or positive), as well as, unsuccessful (or negative) transactions (Bartholomew et al., 2011; Pope & Wilson, 2012, 2015).

Communication has emerged as one important component of coach-athlete interactions worthy of consideration in sport (Amorose, 2007). It is now well-documented that the overt nature (and perception) of coach-athlete communications in sport can affect various parameters influencing both development and performance. For example, athletes who experience pre-game speeches delivered by coaches prior to competition as informational (as opposed to emotionally riling) report greater self-efficacy for sport performance (Vargas-Tonsing, 2009). Additional research demonstrates that coaches who deliver change-orientated feedback using an autonomy-supportive style (i.e. considerate tone of voice, setting realistic objectives with options for attainment, etc.) promote more adaptive outcomes such as higher self-esteem and diminished negative affect in athletes (Carpentier & Mageau, 2013). Taken together, the aforementioned studies provide evidence that coach-athlete communication is an important phenomenon in sport holding the potential to impact a host of psychological processes (e.g. motivation) and outcomes (e.g. well-being) of theoretical and practical importance to sport practitioners.

One communication strategy that has received minimal attention to date in the sport psychological literature is motivational interviewing (MI). Originally developed as an approach to counselling behavior change in addictions therapy (Miller, 1983), MI is predicated on the idea that motivation for behaviour change can either be developed (or hindered) using conversations that take place between a practitioner (e.g. coach) and an individual (e.g. athlete). More specifically, conversations that permit an individual to actively endorse the idea of changing their behaviour, whereby they integrate the decision to change, and act in an autonomous manner, are considered to be more effective than direct instruction and 'advice-giving' when discussing behaviour change (Miller & Rollnick, 2013). The approach taken within MI uses various communication strategies that engineer conversations towards enhancing autonomous motives for behaviour change (Miller & Rollnick, 2013). Previous research has shown MI to be an effective communication strategy for improving behaviour change in areas such as substance use, gambling, smoking, and also behaviours linked to weight loss, dental health, reduced blood pressure, cholesterol, and viral load management (Miller & Rollnick, 2014). Perhaps of greater relevance to this study is research showing MI can be effective in changing physical activity behaviours (e.g. walking, etc.) in patients enrolled within primary care clinics (Hardcastle, Taylor, Bailey, Harley, & Hagger, 2013) and caloric expenditure in cancer survivors (Bennett, Lyons, Winters-Stone, Nail, & Scherer, 2007).

Given the purpose of using MI is to help individuals formulate internal reasons (or motives) for behavior change (Miller & Rollnick, 2013), and the available evidence attesting to the benefits athletes report when coaches interact with them in a manner that promotes autonomy (Pope & Wilson, 2012, 2015), it seems plausible to contend that MI may be a pertinent skill for coaches to use in sport. Augmenting this line of thinking is the contention of pioneers in MI who argue that coaches can (and perhaps should) integrate MI into their communication repertoire when discussing performance (Miller & Rollnick, 2013) and/or behavior change (Rollnick, n.d.) issues with athletes. Despite the inherent appeal of these arguments it seems that MI has been largely overlooked as a topic of research interest within the sport psychology literature to date. Stated differently, the available evidence concerning the use of MI in sport is largely restricted to contentions forwarded by MI experts rather than empirical work showcasing the effectiveness (or pervasiveness) of MI as a communication tool in sport, or any research evidence describing the current status quo of MI amongst sport coaches. As such, there appears to be considerable scope to explore the role of MI in sport to determine if this technique is known and/or used by coaches when interacting with athletes.

The main aim of this study was to explore the degree of awareness and use of MI expressed by coaches actively involved in sport. A secondary aim of this investigation was to test differences in awareness and use of MI reported by male and female sport coaches. Previous studies have reported differences in select coaching practices endorsed by male coaches compared to female coaches including, but not limited to, issues of coaching philosophy (Eitzen & Pratt, 2013), leadership styles (Kim & Cruz, 2016), and patterns of non-verbal communication with athletes (Kneidinger, Maple, & Tross, 2001). On the basis of these previous studies, this investigation tested

differences in awareness and use of MI reported by male and female coaches. No a priori hypotheses were advanced in this study given that (a) the investigation was atheoretical in nature, (b) there is insufficient data published in sport psychology concerning MI and coaching, and (c) this study was primarily exploratory and descriptive in nature.

Methods

Study Design

This study used data from a non-experimental, descriptive research design with non-probability based (purposive) sampling.

Instrumentation

Demographics

Items assessing personal factors (e.g. age, sex, etc.) and sport-related variables (e.g. length of tenure coaching sport, etc.) were asked of each participant. Please see Table 1 for details.

Table 1: Demographic profile of sport, coaching level, and certifications by sex of coach

Variables	Male Subsample	Female Subsample
Sport		
Football	5.7	0.0
Wrestling	1.9	0.0
Volleyball	13.2	11.4
Field Hockey	0.9	2.9
Basketball	14.2	17.1
Soccer	19.8	8.6
Swimming	5.7	5.7
Athletics	5.7	8.6
Fencing	1.9	5.7
Lacrosse	3.8	2.9
Rugby	5.7	11.4
Golf	1.9	2.9
Curling	3.8	11.4
Ice-Hockey	9.4	5.7
Baseball	2.8	0.0
Water Polo	1.9	0.0
Squash	0.9	2.9
Tennis	0.9	0.0
Rowing	0.0	2.9
Coaching Level		
Olympic Games	3.5	2.6
World Championships	2.6	0.0
Professional/Semi-Professional	6.1	0.0
International/National Team	50.0	39.5
University Sport	37.7	57.9
Certifications		
NCCP Certified	40.0	57.1

Note: Male subsample (n = 106) and female subsample (n = 35) providing data for this study. Items used to assess these variables were as follows: Sport (Item: "What sport do you currently coach?"); Coaching Level (Item: "What is the highest level of competition you have coached this sport?"); Certifications (Item: "What level of certification do you hold for coaching this sport?"). All of the

items measuring these variables were answered using an open-ended response format. NCCP = National Coaching Certification Program (program operated by the Coaching Association of Canada).

Awareness and Use of MI

Participants were asked to respond to a single-item designed to measure awareness of MI (Item: "Are you aware of the communication technique called Motivational Interviewing?") and a single-item designed to measure use of MI (Item: "Have you used motivational interviewing in your coaching practice?"). Both items were presented following this instructional stem: "Coaches often use different ways to communicate with the athletes they train and develop in sport. We would like to know more about the way you communicate with the athletes you are coaching in your sport. The following questions have no right or wrong answers – so please be as honest and open as possible in your responses." Each item was accompanied by a forced-choice dichotomous response scale that included 'Yes' and 'No' as options. The items measuring MI-Awareness and MI-Use were modified for this study based on the work of Spence, Plotnikoff, and Mummery (2002).

Data Collection

Recruitment for this study occurred in four stages. In Stage 1, a complete list of the accessible population (Trochim, 2006) was compiled from internet sites hosted by athletics departments at all Canadian universities advertising the contact information for each head/assistant coach on staff. In Stage 2, an email was sent to each head/assistant coach per sport using the email address displayed on the university website. In Stage 3, any responses to the initial email sent in Stage 2 from head/assistant coaches were vetted to ascertain further involvement in this study (e.g. coach had resigned, invalid email address, etc.). All head/assistant coaches identified in Stage 3 were removed from additional consideration in this study and no longer contacted during participant recruitment. Stage 4 of the recruitment process involved sending a second and final email to each head/assistant coach retained following Stage 3 to remind them of the project and invite their participation. The time lag between the initial and final email was two weeks in total based on Dillman's (2007) recommendations. This iterative recruitment process resulted in a response rate of 14.5 percent for the MI-Awareness item and 13.5 percent for the MI-Use item in this study. Response rates were calculated by dividing the number of participants who provided data per item gauging MI-Awareness ($n = 141$) and MI-Use ($n = 131$) by the total number of coaches initially contacted during Stage 2 ($N = 970$). All study protocols and procedures were reviewed and cleared by a Research Ethics Board (REB) in Canada prior to any contact with study participants (REB File No. #16-074). A copy of the instrument used to collect data in this study is available from the first author upon request.

Participants

A total of 141 certified coaches working in the Canadian university-sport system provided data for this study (see Table 1 for details). Male ($n = 106$) coaches ranged in age from 25.0 to 67.0 years ($M_{age} = 44.5$ years; $SD_{age} = 11.1$ years) and reported working as a head (80.2%) or assistant (19.8%) coach at the time of data collection. Eighteen different sports were represented within the male subsample. Soccer (19.8%), Basketball (14.0%), and Volleyball (13.2%) were the most common sports coached in the male subsample whereas Tennis, Squash, and Field-Hockey (all 0.9%) were the least common. Male coaches reported, on average, a total of 20.0 years ($SD = 9.9$ years; Range = 3.0 to 46.0 years) of time spent coaching their chosen sport.

Female ($n = 35$) coaches ranged in age from 24.0 to 65.0 years ($M_{age} = 41.2$ years; $SD_{age} = 11.2$ years) and reported working as a head (74.3%) or assistant (25.7%) coach at the time of data collection. Fourteen different sports were represented by the female subsample. Basketball (17.1%), Volleyball (11.4%), Rugby (11.4%), and Curling (11.4%) where the most common sports

coached by the female subsample whereas Field Hockey, Lacrosse, Rowing, Golf, and Squash (all 2.9%) were the least common. Female coaches reported, on average, a total of 17.0 years (SD = 8.9 years; Range = 5.0 to 41.0 years) of time spent coaching their chosen sport.

Data Analyses

Data analyses proceeded in stages. First, the data were examined for missing values across the MI-Awareness and MI-Use items. Second, participants with missing data were scrutinized in depth to determine their status (i.e. retain or remove) for subsequent analyses planned in this study. Third, prevalence rates for MI-Awareness and MI-Use were calculated using percentage of responses indicating 'Yes' to each item. Fourth, chi-square analyses (χ^2) were computed to evaluate differences in MI-Awareness and MI-Use between male and female sport coaches. The fourth stage of the analyses computed effect size statistics using phi-coefficients (Φ) recommended for use with nominal data (Vogt & Johnson, 2011). Bootstrapping was employed to generate 95 percent bias-corrected confidence intervals (95%BCI) around the point estimates for responses to the MI-Awareness and MI-Use items. A total of 5000 bootstrapped samples with replacement were requested from the original sample providing data for this study (Kang, 2013).

Results

Preliminary Analyses

Few missing values were evident in the data provided by either male or female coaches who participated in this study. No missing data was evident in either the male or female subsamples for the item used to measure MI-Awareness. With regards to the item used to gauge MI-Use, six male coaches (5.7 percent of this subsample) and four female coaches (11.4 percent of this subsample) elected not to respond. Pairwise deletion (see Kang, 2013, for details) was employed rather than listwise deletion given the small amount of missing data evident in the study and the desire to preserve the maximum amount of data available for subsequent analyses focused on MI-Awareness and MI-Use.

Table 2: Demographic characteristics of university-sport coaches reporting awareness and/or use of MI

Variables	Percent Aware of MI		Percent Use MI	
	Male	Female	Male	Female
Age (Years)				
18-25	3.0	0.0	3.1	0.0
26-35	25.0	57.1	25.0	62.5
36-45	31.3	28.6	31.3	25.0
46-55	25.0	0.0	25.0	0.0
56-65	15.6	14.3	15.6	12.5
66-75	0.0	0.0	0.0	0.0
Coaching Level				
Olympic Games	0.0	12.5	0.0	12.5
World Championships	3.1	0.0	3.1	0.0
Professional/Semi-Professional	12.5	0.0	12.5	0.0
International/National Team	46.9	37.5	46.9	37.5
University Sport	37.5	50.0	37.5	50.0
Certifications				
NCCP Certified	26.7	42.9	26.7	50.0

Note: These data represent the percentage of coaches from this study per subsample responding 'Yes' to either item querying MI-Awareness or MI-Use in coaching. NCCP = National Coaching Certification Program (program operated by the Coaching Association of Canada).

Main Analyses

In the total sample providing data for this study (N = 141), thirty-nine coaches (27.7%; 95%BCI = 22.9% to 36.6%) reported awareness of MI while forty coaches (30.5%; 95%BCI = 23.7% to 37.4%) reported using MI. Male coaches (30.2%; 95%BCI = 21.7% to 38.7%) reported overall greater awareness of MI than female coaches (20.0%; 95%BCI = 8.6% to 34.3%). Male coaches (32.0%; 95%BCI = 23.1% to 41.1%) also reported more use of MI in coaching than female coaches (25.8%; 95%BCI = 9.7% to 41.9%). Chi-square analyses provided no evidence of a statistical difference in either awareness ($\chi^2 = 1.4$, $df = 1$, $p = 0.2$; $\phi = 0.1$; 95%BCI around $\phi = 0.0$ to 0.3) or use ($\chi^2 = 0.4$, $df = 1$, $p = 0.5$; $\phi = 0.1$; 95%BCI around $\phi = 0.0$ to 0.2) of MI by male and female sport coaches. Table 2 provides a synopsis of the male and female coaches who indicated they were aware of and used MI in sport by select demographic considerations.

Discussion and Conclusion

Building on the work of Miller and Rollnick (2013) who spearheaded the development of MI, the main aim of this study was to describe awareness and use of MI reported by sport coaches representing post-secondary educational institutions across Canada. Using a non-experimental (descriptive) research design, one-hundred and forty-one head/assistant sport coaches were recruited from the Canadian University sport system to provide their personal insights concerning awareness and use of MI when communicating about sport-related issues with athletes. Overall, the results of this study indicate less than one-third of the university sport coaches providing data for this study were aware of, and/or using, MI in communicating with athletes when coaching sport. The secondary aim of this study was to determine if male and female coaches differed in their reported awareness and use of MI when coaching university-based athletes in sport. Overall, the results of this investigation provide no support for any systematic differences in awareness and/or use of MI reported by male or female coaches operating in university sport programs across Canada. Taken together, it would appear given the results of this preliminary study that MI is not a pervasive communication strategy deployed by university-level sport coaches in Canada.

Perhaps of greatest interest in this study are the findings concerning overall levels of awareness and use of MI reported by coaches representing university sport programs across Canada. Within the context of this study, which is perhaps the first investigation focused on MI in Canadian sport, it seems reasonable to contend the prevalence of awareness and use of this communication technique reported by coaches is low at best. One plausible explanation for these prevalence rates concerns the limited availability of MI research focused on sport as a context where this communication strategy may be helpful for coaches. Compared to other contexts (e.g. medicine, physical activity, etc.) and practitioners (e.g. nurses, camp counsellors, etc.), it is very reasonable to contend that insufficient research has been conducted specific to sport in order to determine the efficacy or effectiveness of MI as a communication tool for coaches. The absence of MI research focused on sport likely means that coach education programs (CEP's) – which guide the certification of coaches across various sports in Canada – have yet to develop and deploy sport-specific resources focused on MI for coaches. On the basis of this argument, which remains speculative and worthy of empirical validation, the small percentage of coaches in this study reporting awareness and use of MI in sport is not unreasonable.

It is also possible that the prevalence rates observed for both awareness and use of MI reported in this study by sport coaches from across Canada is higher than anticipated given the work of Spence et al. (2002). In their research focused on awareness and use of Canada's Physical Activity

Guide (CPAG) in residents of Alberta (Canada), Spence et al. (2002) found that only 20.7 percent of the sample were aware of CPAG's while only 5.5 percent reported using the CPAG's to guide their own physical activity decisions. Using the data reported by Spence et al. (2002) as a point of comparison, it would seem reasonable to assert that the observed prevalence rates concerning both awareness and use of MI reported by this sample of Canadian-based sport coaches is higher than might have been expected yet at best suboptimal assuming MI is at least as effective in changing behavior in sport as it has been in other contexts (Miller & Rollnick, 2014). Overall, it is perhaps feasible to consider both the awareness and use rates described in this study as a baseline to gauge future impact of CEP's that may choose to develop and deploy MI resources for coaches working at various levels of sport across Canada.

No evidence favoring any systematic differences in awareness and use of MI reported by male versus female coaches emerged from this study. Notable differences comparing male versus female coaches on a variety of dimensions – such as coaching philosophy (Eitzen & Pratt, 2013), leadership styles (Kim & Cruz, 2016), and non-verbal communication patterns in sport (Kneidinger et al., 2001) – have been forthcoming in previous research yet it seems MI in sport does not vary as a function of biological sex. A few explanations may account for this preliminary finding. First, it is possible this observation is nothing more than a methodological artefact stemming from either sampling bias or error of measurement. Inspection of the response rates noted in this study make it apparent only a small percentage of the male and female coaches working in Canadian university sport elected to participate in this study with less female compared to male coaches providing data. Yet the ratio of male-to-female coaches providing data in this study aligns with previous work on Canadian Interuniversity Sport (CIS) coaches (e.g. Reade, Rodgers, & Hall, 2008), as well as, data published in 2005 stratifying coaches working in the CIS system by sex. As such, the extent to which sampling bias or measurement error impacted the data collected in this study remains unclear yet worthy of attention in subsequent investigations. Second, it is possible that items used to measure awareness and use of MI were interpreted uniquely by males and females thereby nullifying any expected differences between these subgroups. Future work evaluating the construct validity of scores derived from the items used to measure both awareness and use of MI in this study is warranted. Finally, it is also plausible that perceptions of MI do not engender the same differences between male and female sport coaches as other salient features of sport including coaching philosophy or leadership styles. Additional studies that focus on other issues related to MI (e.g. knowledge of this technique, use of basic MI skills, etc.) reported by male and female sport coaches may assist in determining if these subgroups differ regarding MI.

A major strength of this study is that it represents the first attempt to capture issues germane to MI endorsed by coaches in Canadian university sport. While it is challenging to interpret the prevalence rates concerning awareness and use of MI reported in this study, it is reasonable to contend that the key contribution of this investigation concerns the potential for initiating a line of MI research focused exclusively on the domain of sport. Future studies could use this investigation as a platform to develop research initiatives targeting MI's utility in sport (i.e. Does MI change problematic behaviors displayed by athletes in sport? If so, what are the mechanisms responsible for this change?) and feasibility within the coaching community (i.e. What is needed to transform the available MI research into useful practice guidelines for coaches?). Suffice it to say this preliminary study provides evidence that MI research can (and perhaps should) be explored further in sport to determine the practical and empirical merit of this communication strategy for coaches.

While this study is novel and informative it is not without limitations that warrant consideration alongside future directions that can advance the study of MI in sport. First, the sample providing data for this study may not fully represent the target population especially since it was generated using non-probability (purposive) based procedures that likely restrict the generalizability of the findings. Future studies exploring issues of awareness and use of MI exhibited by professional sport coaches or those working in other sport systems (e.g. National Collegiate Athletic Association) would be a welcome addition to the literature especially if they use probability-based sampling approaches to recruitment. Second, this study relied on self-report data generated from

items modified from research in physical activity monitoring not sport that have not undergone extensive construct validation. Future studies could explore potential avenues for further instrument development that considers a broad array of factors germane to MI (e.g. MI micro-skills, etc.) plus recommendations for construct validation. Finally, it is plausible that the coaches providing data for this study over- (or under-) reported levels of awareness and use of MI. Future research measuring 'actual' knowledge of MI techniques combined with proficiency testing focused on MI techniques will be useful to understand both awareness and use issues pertaining to MI in university sport coaches.

In summary, this preliminary study was an initial attempt to explore issues of awareness and use of MI reported by university-sport coaches, as well as, test reported differences in both issues by comparing male versus female coaches. Overall, the results of this study could be used to suggest that coaches seem to be, at least in part, aware of and using MI in their approach to communicating with athletes. Alternatively, it is equally plausible that sport coaches based at Canadian universities remain largely unaware of (and not using) MI as a potential way to interact with their athletes. These prevalence rates appear independent of the coaches' biological sex yet it remains to be seen if other sociodemographic or educational factors may determine the level of awareness and degree of use concerning MI by coaches in sport.

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References

- Amorose, A.J. (2007) 'Coaching effectiveness: Exploring the relationship between coaching behavior and self-determined motivation', in Hagger, M.S. and Chatzisarantis, N.L.D. (eds.) *Intrinsic motivation and self-determination in exercise and sport*. Champaign, IL: Human Kinetics, pp.209-227.
- Bartholomew, K.J., Ntoumanis, N. and Thøgersen-Ntoumani, C. (2011) 'Self-determination theory and the darker side of athletic experience: The role of interpersonal control and need thwarting', *Sport & Exercise Psychology Review*, 7(2), pp.23-28. DOI: [10.1177/0146167211413125](https://doi.org/10.1177/0146167211413125).
- Bennett, J.A., Lyons, K.S., Winters-Stone, K. and et al, (2007) 'Motivational interviewing to increase physical activity in long-term cancer survivors: A randomized controlled trial', *Nursing Research*, 56(1), pp.18-27. PMID: 17179870. DOI: [10.1097/00006199-200701000-00003](https://doi.org/10.1097/00006199-200701000-00003).
- Carpentier, J. and Mageau, G.A. (2013) 'When change-oriented feedback enhances motivation, well-being and performance: A look at autonomy-supportive feedback in sport', *Psychology of Sport and Exercise*, 14(3), pp.423-435. DOI: [10.1016/j.psychsport.2013.01.003](https://doi.org/10.1016/j.psychsport.2013.01.003).
- Dillman, D.A. (2007) *Mail and internet surveys: The tailored design method* (2nd edn.). Hoboken, NJ: John Wiley & Sons.
- Eitzen, D.S. and Pratt, S.R. (2013) 'Gender differences in coaching philosophy: The case of female basketball teams', *Research Quarterly for Exercise and Sport*, 60(2), pp.152-158. DOI: [10.1080/02701367.1989.10607430](https://doi.org/10.1080/02701367.1989.10607430). PMID: 2489836.
- Gucciardi, D.F., Stamatidis, A. and Ntoumanis, N. (2017) 'Controlling coaching and athlete thriving in elite adolescent netballers: The buffering effect of athletes' mental toughness', *Journal of Science and Medicine in Sport*, 20(8), pp.718-722. DOI: [10.1016/j.jsams.2017.02.007](https://doi.org/10.1016/j.jsams.2017.02.007).
- Hardcastle, S.J., Taylor, A.H., Bailey, M.P. and et al, (2013) 'Effectiveness of a motivational interviewing intervention on weight loss, physical activity and cardiovascular disease risk factors: A randomised controlled trial with a 12-month post-intervention follow-up', *International Journal of Behavioral Nutrition and Physical Activity*, 10(40), pp.1-17. DOI: [10.1186/1479-5868-10-40](https://doi.org/10.1186/1479-5868-10-40). PMID: 23537492.
- Kang, H. (2013) 'The prevention and handling of the missing data', *Korean Journal of Anesthesiology*, 64(5), pp.402-406. DOI: [10.4097/kjae.2013.64.5.402](https://doi.org/10.4097/kjae.2013.64.5.402).

- Kim, H.D. and Cruz, A.B. (2016) 'The influence of coaches' leadership styles on athletes' satisfaction and team cohesion: A meta-analytic approach', *International Journal of Sports Science and Coaching*, 11(6), pp.900-909. DOI: [10.1177/1747954116676117](https://doi.org/10.1177/1747954116676117).
- Kneidinger, L.M., Maple, T.L. and Tross, S.A. (2001) 'Touching behavior in sport: Functional components, analysis of sex differences, and ethological considerations', *Journal of Nonverbal Behavior*, 25(1), pp.43-62. DOI: [10.1023/A:1006785107778](https://doi.org/10.1023/A:1006785107778).
- Miller, W.R. (1983) 'Motivational interviewing with problem drinkers', *Behavioural and Cognitive Psychotherapy*, 11(2), pp.147-172. DOI: [10.1017/S0141347300006583](https://doi.org/10.1017/S0141347300006583).
- Miller, W.R. and Rollnick, S. (2013) *Motivational interviewing: Helping people change* (3rd edn.). New York: Guilford Press.
- Miller, W.R. and Rollnick, S. (2014) 'The effectiveness and ineffectiveness of complex behavioral interventions: Impact of treatment fidelity', *Contemporary Clinical Trials*, 37(2), pp.234-241. DOI: [10.1016/j.cct.2014.01.005](https://doi.org/10.1016/j.cct.2014.01.005).
- Pope, J.P. (2010) 'Understanding motivational processes in university rugby players: A preliminary test of the hierarchical model of intrinsic and extrinsic motivation at the contextual level', *International Journal of Sports Science & Coaching*, 7(1), pp.89-107. DOI: [10.1260/1747-9541.7.1.89](https://doi.org/10.1260/1747-9541.7.1.89).
- Pope, J.P. and Wilson, P.M. (2015) 'Testing a sequence of relationships from interpersonal coaching styles to rugby performance, guided by the coach-athlete motivation model', *International Journal of Sport and Exercise Psychology*, 13(3), pp.258-272. DOI: [10.1080/1612197X.2014.956325](https://doi.org/10.1080/1612197X.2014.956325).
- Ramis, Y., Torregrosa, M., Viladrich, C. and Cruz, J. (2017) 'The effect of coaches' controlling style on the competitive anxiety of young athletes', *Frontiers in Psychology*, 8, pp.1-8. DOI: [10.3389/fpsyg.2017.00572](https://doi.org/10.3389/fpsyg.2017.00572).
- Reade, I., Rodgers, W. and Hall, N. (2008) 'Knowledge transfer: How do high performance coaches access the knowledge of sport scientists?', *International Journal of Sports Science & Coaching*, 3(3), pp.319-334. DOI: [10.1260/174795408786238470](https://doi.org/10.1260/174795408786238470).
- Rollnick, S. (no date) *Stephen Rollnick Sport*. Available at: <http://www.stephenrollnick.com/sport.php>.
- Spence, J.C., Plotnikoff, R.C. and Mummery, W.K. (2002) 'The awareness and use of Canada's physical activity guide to healthy active living', *Canadian Journal of Public Health*, 93(5), pp.394-396. DOI: [10.17269/cjph.93.335](https://doi.org/10.17269/cjph.93.335).
- Trochim, W.M. (2006) *The research methods knowledge base*. Available at: <http://www.socialresearchmethods.net/kb/>.
- Vargas-Tonsing, T.M. (2009) 'An exploratory examination of the effects of coaches' pre-game speeches on athletes' perceptions of self-efficacy and emotion', *Journal of Sport Behavior*, 32(1), pp.92-111.
- Vogt, P. and Johnson, R.B. (2011) *Dictionary of statistics and methodology: A nontechnical guide for the social sciences* (4th edn.). London: Sage.

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