

Factors that Influence Coaches' Use of Sound Coaching Practices

Wendy Rodgers¹, Ian Reade¹ and Craig Hall²

¹Faculty of Physical Education and Recreation, E488 Van Vliet Centre,
University of Alberta, Edmonton, AB, T6G 2H9, Canada

E-mail: wendy.rodgers@ualberta.ca

E-mail ian.reade@ualberta.ca

²School of Kinesiology, The University of Western Ontario,
London, ON, N6A 3K7, Canada

E-mail chall@uwo.ca

ABSTRACT

The purpose of this research report is to explore factors that may influence whether coaches adopt desired behaviours. This research was conducted with a census survey of Canadian coaches who had completed all or part of their National Coaching Certification Program Competition-Introduction coach education. The results indicate that several factors may influence desired coaching behaviour. The factors include competitive experience as an athlete, hours of coaching per week, and whether the coaches are coaching individual or team sports. The results provide empirical evidence that factors beyond coach education probably influence whether coaches actually engage in sound coaching practice.

Key words: Coaching Behaviour, Coach Education, Coaches' Characteristics

INTRODUCTION

Sound coaching practice has been represented by a set of coaching behaviours [1,2,3] believed to be important in achieving the goal of improving athlete performance. Desired coach behaviours include communication [1], decision-making [2,3], instruction [4], and technical and tactical strategy and mental preparation [5]. Much of the literature has attempted to describe and model the behavioural aspects of the coaching process in terms of the coach-athlete relationship [6,7,8,9,10,11,12]. Cumming, Smith and Smoll [11] recently described the two measurement traditions addressing coach behaviour. They also clearly indicate that the majority of coach assessment has highlighted the athlete's perceptions and reactions to coach behaviour [13]. Furthermore, the categories of behaviour assessment have heavily focused on communication behaviour (e.g., decision making style, delivery of positive feedback, responses to athlete mistakes, and situational nature of instruction). Whereas, Coté et al. [14] pointed to the importance of examining contextual factors that influence both coach behaviour and athlete perceptions, they also focused on the coach-

athlete relationship. Demers, Woodburn and Savard [15] describe the development of a competency-based approach to coach education that focuses on the development and implementation of specific desirable skills by coaches. However, relatively little research has addressed coaches' own perceptions of the content of their coaching, yet this is the dominant focus of coach education.

Coaching practice, comprising these desired competencies [15], is seen to be continuous and consistent within coaches within domains [10]. There has been considerable research on these behaviours [16], often with the aim of showing the importance of one behaviour over others in terms of producing successful athletes [12, 17]. It is generally accepted that coach education, at the broadest conceptualization, should contribute to the adoption of desired behaviours, and there is some evidence that it does [18, 19]. In fact, the new Competency Based Evaluation and Training system being adopted for coach education in Canada is based on the assumption that coaches can be evaluated based upon behaviours that are considered accepted practice [15]. The extent to which coaches engage in these desired, or sound, practices is believed to be evidence of their effectiveness. The idea that coaches who more regularly perform what are regarded as sound practices at the time of assessment is not a new one, and has been foundational to a number of coaching evaluation systems [12, 20]. Gilbert [21] noted that there is, overall, a lack of published research addressing the effectiveness of coach education. A foundational question seems to be whether or not coaches are adopting the practices recommended in coach education, and what other factors might also be influencing coaches' use of those recommended practices. Coté et al. [12] have developed competency-based guidelines for evaluating coaches, but these are from the perspective of the athlete.

It is possible, however, that there may be factors in addition to coach education that influence whether coaches adopt the desired behaviours, such as the coach's athletic experience [22]. In describing current coaching practice with a broader goal of eventually developing effective coach training, a sound description of relevant influences on practice is necessary. A basic foundational approach to the identification of factors influencing coach behaviours will (a) offer future routes for intervention to be more relevant and realistic to coaches that (b) help us to decide on what characteristics of coaches might be useful in grouping them to achieve not only sport-specific, but also coach-specific education programs that are more likely to produce effective coaches.

Research on factors that influence coach practice, such as the coach's knowledge of the sport sciences, is rather limited with respect to specific coaching content. Werthner and Trudel [23] noted that coaches learn both through formal education as well as personal experience, yet few studies have examined personal and situation factors that might comprise a coach's experience. Factors that might influence the extent to which coaches engage in effective practice, independent of formal coach education, might be considered as person factors – or characteristics of the coach him or herself – and context factors – or characteristics of the specific coaching environment in which the coach works. When Gould et al. [24, 25] asked elite U.S. coaches (Olympic and national team) to list the most important preparations in becoming a coach, the top two were coaching experience and knowledge of the sport sciences (and therefore, by inference, application of the sport sciences), which would both be considered person factors or characteristics of the coach. However, these are not bases on which coach education is modified. At the person level, other relevant characteristics might include the age and sex of the coach, the coach's years of experience, their levels of formal education and coach specific education, as well as their competitive background (i.e., personal sport involvement as an athlete). With respect to the latter, Gilbert

et al. [22] found that successful coaches had accumulated thousands of hours as athletes and questioned whether this pre-coaching experience correlated with future coaching competency.

A few of these factors have been examined previously, but research has tended to consider only one sport or one characteristic at a time. For example, both Lacy and Goldston [26] and Millard [27] examined gender differences, but focused only on basketball and soccer, respectively. They also considered broad behavioural categories such as technical instruction, general encouragement, and reinforcement patterns. Similarly, years of coaching experience has been examined in basketball [16], but from the athlete perspective and not with respect to coaches' own reports of their use of effective content. The majority of coaching evaluation has been from the perspective of the athlete [12, 13].

Additionally, factors in the socio-physical context of the coach's practice might also be important. These might include the age of the athletes being coached, the sex of the athletes, the competitive level of the athletes and the nature of the sport itself, such as whether it is a team or an individual sport. Again, some of these factors have been considered in previous research, but studies tend to consider the athlete perspective or only one sport at a time. In one multiple sport study, Cumming et al. [11] found no difference between male and female US varsity level athletes in their perceptions of coach effectiveness, but the study considered high-level coach behavioural categories and athlete satisfaction with coaches. Solomon et al. [28] examined the experiences of high and low expectancy athletes' (based on coaches' designations of high and low performing athletes) perceptions of coach feedback in consideration of coaches' years of experience. Again, the focus was on athlete perceptions within a single sport, high-school basketball. The research reviewed, by and large, does not consider coaches' own reported use of behavioural competencies targeted in coach education. By considering these types of factors, in addition to a coach's exposure to some basic formal coach education, it should be possible to determine which ones, if any, relate to coaches' reported use of desired competencies. The nature of any observed relationships, then, can be used as preliminary evidence to support a reconceptualization of the coach education process along lines that are most likely to maximize the effectiveness of educational workshops by building on strengths and redressing weaknesses.

The purpose of this exploratory study was to look for factors likely to influence desired practices within a sample of Canadian coaches. Both personal and context factors were considered. To the extent that we can improve our understanding of factors influencing coach behaviours, we can increase the likelihood of identifying effective means for intervention.

A general practice or "foundational behaviours" approach was taken in this study. A large amount of research concerning coach behaviours has tended to examine "teaching episodes" [10]. That is, a scenario-like approach has been taken in order to determine what coaches would do in specific circumstances. Whereas this might be a useful means of determining whether or not coaches "know" what to do, it doesn't address the extent to which they actually engage in particular behaviours. A foundational behaviours approach, where coaches were asked the extent to which they engaged in desired coach behaviours in their regular practice was used here. This is more holistic in the sense that the interest is in whether or not the coach uses various techniques in general, regardless of a specific teaching goal or the lack of use of a specific technique in any one coaching session or episode. This is more congruent with the idea of a coach as a consistent performer across situations.

METHODS

PARTICIPANTS

A census survey methodology was used to collect the required data. The population for the study was coaches being trained in the Competition-Introduction context of the National Coaching Certification Program (NCCP) in Canada. Previous studies have examined differences in the behavior of coaches who have completed various levels of the NCCP program [29], and our strategy was to study a group of coaches with similar NCCP training, within a similar time frame.

Coaches who had completed all or part of the Competition-Introduction program of the NCCP within an 18-month period were included. The known similarity of the individuals in the population was their attendance at one or more coach education workshops with Part A and/or Part B of the NCCP program comprising the workshop content. These workshops are the first two for coaches intending to work with competitive athletes at any level. Topics covered include introductory levels of basic physiology, psychology and management relevant to coaching in a variety of contexts. A sample of 821 coaches responded to the questionnaire. Detailed information regarding the respondents is presented as part of the Results section.

MEASURES

A questionnaire was developed, including both scaled and open-ended questions as part of a larger exploratory study. The questionnaires were created by a team of academics and graduate students (all current or former athletes, coaches or coach educators) representing two large Canadian Universities. Additionally, several NCCP Master Learning Facilitators from across Canada and staff from the Coaches Association of Canada had significant input to the questionnaire development.

Coach and Context Characteristics

The following characteristics were considered: coach age (six categories: 16-18, 18-24, 25-34, 35-44, 45-54, 55+); coach sex (two categories: male or female); highest level of formal education (six categories: Grade 8, High School, College, Undergraduate, Master's, Doctoral); team or individual sport (three categories: team, individual, or both); current coaching level (four categories: community, city, provincial, national) (these were assessed separately to allow for responses to indicate multiple levels of current involvement); highest level ever coached (four categories: community, city, provincial, national); coaches' highest level of competition as an athlete (five categories: community, city, provincial, national, international); hours trained per week (five categories: none, 1, 2, 3, more than 3 hours); weeks in a season (less than 4 to 24+); years as a coach (seven categories: Less than 1, 1-2, 2-3, 3-5, 5-7, 7-10, 10+ years); age of athletes coached (seven categories: young children aged 3-5, children aged 6-9, pre-pubertal aged 10-11, puberty stage 1 aged 12-15, puberty stage 2 aged 16-18, young adults aged 19-22, adults aged 22+) (again, these were assessed separately to allow endorsement of multiple age groups); sex of athletes coached (three categories: males, females or both); and the number of competitions per week (five categories: less than 1, 1, 2, 3 or 3+) for a total of 21 characteristics of the coach and the coaching context scored categorically.

Desired Coach Practices

Recently, Graydon [30] operationalized "sound coaching practices" as a list of behaviours identified as important outcomes of the NCCP. These behaviours were based on desired coach competencies targeted by the NCCP, as well as relevant sport science literature

concerning effective coach behaviours. Eleven of the behaviours from this list were from the areas of exercise physiology and sport psychology and these were employed in the present study to assess the extent to which coaches applied sport science knowledge. Knowledge from these sport science disciplines were examined as Woodman [31] found the sport sciences contributing most frequently to coaching were sport physiology and the associated disciplines of biochemistry and nutrition; sport psychology, including motor control and learning; and biomechanics. Each item was assessed on a 7-point Likert-type scale anchored with 0 = not at all and 6 = all the time. Graydon produced some evidence for the validity and reliability of these items and the 11 items are shown in Table 1.

Since one intention of the present study was to investigate a group of coaches with similar NCCP training, it was deemed appropriate to use a measure that specifically incorporated material and concepts from the NCCP. The measure developed and employed by Graydon was based on material covered in the NCCP and desired coach competencies targeted by the NCCP. It also has sound psychometric characteristics (e.g., alpha coefficients > .70). While the items on the Graydon [30] measure covered the areas of exercise physiology, sport psychology and biomechanics, only items from the first two areas were included in the present study. These two areas were specifically targeted since the coaches who participated in the present study (i.e., coaches who had completed all or part of the Competition-Introduction program of the NCCP) should have covered these behaviours (see Table 1).

Although there is some overlap in the behaviours being assessed by the Graydon instrument and other instruments such as the Coaching Behaviour Scale for Sport (CBS-S) [12], the Graydon instrument is specific to material covered in the NCCP while the CBS-S covers a broader range of coaching behaviours. Furthermore, the Graydon instrument was designed to be completed by coaches while the CBS-S is completed by athletes. Therefore, it made sense to simply employ the Graydon [30] instrument in the present study rather than modify some other instrument such as the CBS-S.

Table 1. Means and Standard Deviations of the Eleven Coach Practices

Item	M	SD	N
How frequently do you re-evaluate athletes' practice goals?	4.70	1.76	796
How often do you assess your athletes' nutritional habits?	2.84	1.67	806
To what extent do you use collaborative goal-setting with your athletes?	4.47	1.80	802
To what extent do you incorporate training designs that are specific to the physical athletic abilities (maximum speed, speed-endurance, aerobic stamina, maximum strength, speed-strength, strength-endurance) important to your sport?	5.15	1.75	803
How frequently do you include flexibility in your athletes' training regimes?	5.31	1.82	797
How often do you assess your athletes' self-improvement goals?	4.36	1.70	796
How often do you encourage your athletes to practice controlled breathing?	3.19	2.05	792
How often do you alter the intensity and duration of your athletes' training regimes?	4.86	1.66	799
To what extent do you stress the use of vivid images by your athletes?	3.82	2.01	789
How often do you assess your athletes' changes as a result of your practices?	4.96	1.61	800
How frequently do you encourage your athletes to use positive self-talk?	5.22	1.90	788

PROCEDURES

The questionnaire was administered by e-mail to all coaches who had an active e-mail address registered on the Coaching Association of Canada (CAC) database during the first three weeks of October in 2005. There were approximately 6,200 individuals in the

population being studied to whom an e-mail was directed.

The questionnaire was delivered using a web-based survey tool. The data were collected and stored electronically eliminating the possibility of out of range responses by the participants or data entry errors by the researchers.

ANALYSIS AND RESULTS

The total number of participants who received the e-mail cannot be determined. A total of 821 coaches provided at least some information, including 438 male and 371 female respondents (12 did not provide their sex). There were 159 who were coaching only male athletes, 160 who were coaching only female athletes and 409 who were coaching both. The coaches came from across Canada showing fairly good regional representation. The largest age category was 35-44 with 27% of the sample and the smallest category was 55+ with 3.7% of the sample; and the next smallest category was 16-18, with 13.5% of the sample, showing a good age range. Their coaching experience ranged from less than one year (8.8%) to more than 10 years (15.1%) with the largest category being 3-5 years (23.6%). Their coaching levels covered all options from community (30.3%), to city (32%) to provincial (28.6%) to national level (9.1%) representing the full competitive spectrum. They ranged in formal education from Grade 8 (7.7%) to doctoral degree (1.2%) with the largest categories being high school diploma (32.8%) and undergraduate degree (30%). This was clearly a large heterogeneous sample of coaches, thus generalizable to the population of coaches in Canada.

A data reduction process was undertaken to eliminate characteristics not related to the coach behaviours and to allow further investigation of the characteristics showing influence. The effects on the set of 11 desirable coach behaviours were first examined in a series of MANOVAs with each of the 21 possibly influential characteristics as an independent variable. A Bonferroni correction was applied to the alpha level yielding a critical $p = .002$. Only seven of the 22 independent variables showed a significant pattern of variance across the dependent variables (coach behaviours), these were: sex of the coach, team or individual sport, sex of the athletes, highest level coached, highest level coach competed as athlete, hours per week, and weeks per season. All subsequent analyses consider only these seven characteristics. Due to the total amount of data considered in the analyses, descriptive statistics regarding each variable of interest are presented only for the significant univariate analyses. Additional descriptive information will be made available upon request.

A significant multivariate effect of sex of the coach was observed, $F(11,697) = 3.55, p < .0001, \text{Eta}^2 = .05$. The univariate analyses revealed that the female coaches used significantly more positive self-talk than the males, $F(1,707) = 12.09, p < .001, \text{Eta}^2 = .017$; and that the male coaches altered the duration and intensity of their sessions significantly more than females, $F(1,707) = 10.16, p < .001, \text{Eta}^2 = .014$. The mean and standard deviations are presented in Table 2.

Table 2. Effect of Sex of Coach on Coach Behaviours

	Males n = 363		Females n = 310	
	Mean	(SD)	Mean	(SD)
Altering Intensity/Duration	5.04	(1.58)	4.65	(1.74)
Encourage Positive Self-Talk	4.95	(2.00)	5.45	(1.78)

Team or individual sport showed a significant multivariate effect, $F(22,1370) = 5.33, p < .0001, \text{Eta}^2 = .08$. The univariate analyses revealed that individual sport coaches reported

more assessment of athlete’s self-improvement goals, $F(2, 694) = 14.99$, $p < .0001$, $\text{Eta}^2 = .04$; more use of controlled breathing, $F(2, 694) = 23.52$, $p < .0001$, $\text{Eta}^2 = .06$; and more recommendations to use vivid imagery, $F(2, 694) = 12.06$, $p < .0001$, $\text{Eta}^2 = .03$. Descriptive information is presented in Table 3.

Table 3. Effect of Team or Individual Sport on Coach Behaviours

	Team (n = 371)		Individual (n = 311)		Both (n = 15)	
	Mean	(SD)	Mean	(SD)	Mean	(SD)
Self-Improvement Goals	4.01	(1.67) _a	4.70	(1.66) _b	4.60	(1.18) _{ab}
Controlled Breathing	2.68	(1.8) _a	3.72	(2.19) _b	3.67	(1.95) _{ab}
Vivid Images	3.47	(1.91) _a	4.21	(2.03) _b	3.47	(1.81) _{ab}

Note: Scores with different subscripts are significantly different from each other according to Tukey’s LSD post-hoc test.

Level of athletic competition achieved by the coach also had a significant multivariate effect, $F(55, 3520) = 2.38$, $p < .0001$, $\text{Eta}^2 = .04$. Significant univariate effects were present for assessing athlete’s nutritional habits, using collaborative goal setting, using sport-specific training, altering the intensity and duration of training sessions, and use of imagery by athletes. Descriptive information is provided in Table 4.

Table 4. Effect of Level of Athletic Competition of Coach on Coach Behaviour

	Never Competed (n = 31)	Community (n = 81)	City (n = 136)	Provincial (n = 268)	National (n = 133)	International (n = 67)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Nutritional Assessment	2.52 (1.79) _b	2.09 (1.24) _b	2.68 (1.57) _{bc}	2.81 (1.69) _{bc}	2.90 (1.59) _{bc}	3.84 (1.75) _a
Collaborative Goal-Setting	3.55 (1.95) _a	3.73 (1.71) _a	4.49 (1.85) _b	4.56 (1.77) _b	4.68 (1.85) _b	4.85 (1.66) _b
Sport-Specific Training	4.29 (2.05) _a	4.79 (1.81) _{acd}	5.04 (1.71) _{bcd}	5.26 (1.71) _{bde}	5.20 (1.86) _{bcde}	5.63 (1.43) _{bc}
Altering Intensity and Duration	3.74 (1.93) _a	4.46 (1.80) _b	4.89 (1.59) _{bc}	4.89 (1.64) _{cd}	5.02 (1.60) _c	5.54 (1.41) _e
Vivid Images	3.35 (1.80) _{acde}	3.40 (2.02) _{acd}	3.72 (1.98) _{acde}	3.70 (2.01) _{acd}	4.11 (2.04) _e	4.52 (1.75) _e

Note: Scores with different subscripts are significantly different from each other using Tukey’s LSD post-hoc test.

There was a significant effect of sex of the athletes, $F(22, 1402) = 2.18$, $p < .001$, $\text{Eta}^2 = .03$. Only one univariate effect was observed for encouraging athletes to use controlled breathing such that coaches of both did this most, followed by coaches of females followed by coaches of males. Descriptive information is provided in Table 5.

Table 5. Effects of Sex of Athletes on Coach Behaviours

	Male Athletes (n = 132)	Female Athletes (n = 132)	Both (n = 409)
Item	Mean (SD)	Mean (SD)	Mean (SD)
Encourage Controlled Breathing	2.45 (1.67) _a	2.97 (1.99) _b	3.45 (2.12) _c

Note: Scores with different subscripts are significantly different from each other according to Tukey’s LSD post-hoc test.

There was a significant difference between different numbers of hours of training per week, $F(33, 2049) = 4.51, p < .0001, \text{Eta}^2 = .07$. For these analyses, coaches responding that they “never” coach (indicating they are currently in an administrative role) were eliminated. Univariate effects were observed for re-evaluating practice goals, $F(3, 691) = 3.96, p < .008, \text{Eta}^2 = .02$; assessing nutritional habits, $F(3, 691) = 19.01, p < .0001, \text{Eta}^2 = .08$; use of collaborative goal setting $F(3, 691) = 14.21, p < .0001, \text{Eta}^2 = .06$; include flexibility in training, $F(3, 691) = 6.33, p < .0001, \text{Eta}^2 = .03$; using sport-specific regimes, $F(3, 691) = 11.62, p < .0001, \text{Eta}^2 = .05$; altering intensity and duration of training, $F(3, 691) = 19.80, p < .0001, \text{Eta}^2 = .08$; using vivid images, $F(3, 691) = 9.03, p < .001, \text{Eta}^2 = .04$; and assessing change as a result of practice, $F(3, 691) = 5.54, p < .001, \text{Eta}^2 = .02$. Descriptive information is presented in Table 6.

Table 6. Effect of Hours of Training on Coach Behaviours

	1 hour/wk (n = 162)	2 hours/wk (n = 268)	3 hours/wk (n = 140)	More than 3 hrs/wk (n = 25)
Item	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Re-evaluate Practice Goals	4.48 (1.93) _a	4.67 (1.70) _a	4.79 (1.60) _b	5.17 (1.70) _b
Nutrition	2.17 (1.46) _a	2.76 (1.57) _b	2.94 (1.53) _b	3.58 (1.88) _c
Collaborative Goals	3.93 (1.89) _a	4.25 (1.74) _a	4.93 (1.69) _b	5.06 (1.73) _b
Sport-Specific Training	4.59 (1.93) _a	5.12 (1.73) _b	5.56 (1.43) _c	5.61 (1.60) _c
Flexibility	4.90 (2.06) _a	5.28 (1.74) _b	5.79 (1.57) _c	5.45 (1.85) _c
Alter Intensity/Duration	4.14 (1.86) _a	4.98 (1.57) _b	4.92 (1.43) _b	5.56 (1.37) _c
Vivid Images	3.38 (1.91) _a	3.62 (2.01) _{ab}	4.00 (1.94) _b	4.50 (1.92) _c
Assess Change	4.62 (1.73) _a	4.91 (1.62) _{ab}	5.16 (1.50) _{bc}	5.34 (1.52) _c

Note: Values with different subscripts are significantly different from each other.

Weeks in the competitive season had a significant effect, $F(66, 4182) = 1.94, p < .0001, \text{Eta}^2 = .03$. Significant effects were observed for evaluating practice goals, $F(6, 702) = 3.98, p < .001, \text{Eta}^2 = .03$; sport specific training, $F(6, 702) = 6.07, p < .0001, \text{Eta}^2 = .05$; using flexibility, $F(6, 702) = 5.64, p < .0001, \text{Eta}^2 = .05$; and using controlled breathing, $F(6, 702) = 3.54, p = .002, \text{Eta}^2 = .03$. In general, a longer season is associated with more use of the practices. Descriptive information is presented in Table 7.

Table 7. Effect of Weeks in Season on Coach Behaviours

	<4 wk/season (n=7)	4-8 weeks (n=25)	8-12 weeks (n=71)	12-16 weeks (n=83)	16-20 weeks (n=109)	20-24 weeks (n=124)	>24 wks/season (n=290)
Item	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Eval. Pract.	3.57 (2.07) _a	3.84 (1.82) _a	4.44 (1.83) _a	4.40 (1.70) _a	4.53 (1.84) _a	4.69 (1.61) _a	5.01 (1.73) _b
Goals							
Sport Spec.	3.29 (2.43) _a	4.32 (2.02) _{abf}	4.62 (1.81) _{adf}	5.10 (1.80) _{cdefh}	4.88 (1.80) _{bdefg}	5.14 (1.70) _{cefg}	5.51 (1.60) _{ceh}
Train.							
Flex.	3.29 (2.36) _a	4.12 (2.09) _{ab}	4.83 (1.95) _{bce}	5.35 (1.63) _{cdef}	5.46 (1.69) _{cdef}	5.11 (1.85) _{bcd}	5.59 (1.79) _{cdf}
Cont. Breath.	3.57 (2.07) _a	2.36 (1.85)	2.93 (1.74)	3.06 (2.12) _a	2.75 (1.92)	2.94 (1.93)	3.54 (2.15) _a

Note: Values with different subscripts are significantly different from each other.

The highest level of athlete ever coached also had a significant effect, $F(33, 2097) = 3.53$, $p < .0001$, $\text{Eta}^2 = .05$. Univariate effects were observed for re-evaluating practice goals, $F(3, 707) = 7.54$, $p < .0001$, $\text{Eta}^2 = .03$; assessing nutritional habits, $F(3, 707) = 21.15$, $p < .0001$, $\text{Eta}^2 = .08$; using collaborative goal setting, $F(3, 707) = 5.37$, $p < .001$, $\text{Eta}^2 = .02$; using sport specific training, $F(3, 707) = 8.23$, $p < .0001$, $\text{Eta}^2 = .03$; including flexibility, $F(3, 707) = 5.36$, $p < .001$, $\text{Eta}^2 = .02$; assessing self-improvement goals, $F(3, 707) = 5.77$, $p < .001$, $\text{Eta}^2 = .02$; altering intensity and duration, $F(3, 707) = 12.26$, $p < .0001$, $\text{Eta}^2 = .05$; and stressing use of vivid images, $F(3, 707) = 6.36$, $p < .0001$, $\text{Eta}^2 = .03$. The general pattern is that coaches at higher levels use more of the practices than those at lower levels. Descriptive information is presented in Table 8.

Table 8. Effect of Highest Level Coached on Coach Behaviours

	Community Level (n = 210)	City Level (n=225)	Provincial Level (n = 211)	National Level (n = 65)
Item	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Re-evaluate Practice Goals	4.37 (1.90) _a	4.58 (1.76) _a	4.91 (1.62) _b	5.42 (1.57) _c
Assess Nutritional Habits	2.30 (1.47) _a	2.69 (1.54) _b	3.10 (1.65) _c	3.95 (1.98) _d
Collaborative Goal Setting	4.15 (1.95) _a	4.40 (1.78) _a	4.63 (1.67) _b	5.08 (1.76) _b
Sport-Specific Training	4.73 (1.91) _a	5.08 (1.73) _b	5.47 (1.54) _c	5.62 (1.77) _c
Flexibility	5.06 (2.01) _a	5.13 (1.87) _a	5.70 (1.56) _b	5.42 (1.92) _{ab}
Self-Improvement Goals	4.18 (1.87) _a	4.11 (1.65) _{ab}	4.49 (1.58) _{ac}	4.98 (1.50) _d
Alter Intensity and Duration	4.43 (1.76) _a	4.97 (1.59) _b	4.94 (1.60) _b	5.78 (1.43) _c
Vivid Images	3.62 (1.94) _a	3.64 (1.98) _a	3.89 (2.01) _a	4.77 (2.01) _b

Note: Scores with different subscripts are significantly different from each other according to Tukey’s LSD post-hoc test.

At least some association among these seven variables was expected. Despite the pattern of results associated with each one individually, some attenuation of the individual effects would be expected if they were considered together. Therefore, a multivariate approach was necessary to identify sources of shared variance. To begin sorting the nature of the

association among the variables, which is helpful in understanding “coaching” more thoroughly as well as to reduce the variables to only those that would be expected to have an independent effect on coach behaviours, a two-step procedure was followed. First, the zero-order associations among the variables were examined using Spearman’s *rho* coefficients (which are non-parametric correlations). This procedure tells us how the independent variables relate to each other, but not how they relate to the dependent variables in a multivariate way. To accomplish the latter, a series of ANCOVA analyses was undertaken examining the combined influence of the independent variables on the dependent variables.

Examination of the Spearman’s *rho* coefficients, revealed some strong associations among these seven variables. These are reported in Table 9.

Table 9. Association Among Seven Independent Variables, Spearman’s *rho*

Variables	Sex of Coach	Team/Ind	Sex of athletes	Highest Level Coached	Highest Level of Competition	Hours/Wk
Sex of Coach	1					
Team/Ind	.385	1				
Sex of Athletes	.195	.504	1			
Highest Level Coached	-.158	.021	-.035	1		
Highest Level of Competition	-.018	.109	.085	.376	1	
Hours/Wk	-.138	-.086	-.100	.331	.252	1
Wks/Season	.058	.187	.047	.238	.101	.025

Based on this data set, these correlations suggest that there is a strong association of the sex of the coach with whether they coach a team or an individual sport. There is also a strong association of the sex of the athlete with whether or not they participate in a team or an individual sport.

Post-hoc chi-squared analysis revealed that there was a significant difference in the pattern of men and women in team versus individual sports in our sample, with men more likely to coach team sports and women more likely to coach individual sports as demonstrated in Table 10. $\chi^2(2) = 127.02, p < .0001$.

Table 10. Frequency of Men and Women Coaches in Team and Individual Sports

Sex of Coach	Team or Individual			
	Team	Individual	Both	Total
Male	304	111	10	425
Female	113	235	9	357
Total	417	346	19	782

The distribution of sex of athletes coached across team and individual sports also showed a significant pattern such that coaches in our sample who coach “both” male and female athletes are predominantly involved with individual sports whereas there are more coaches involved in team sports overall: $\chi^2(4) = 204.74, p < .0001$. These frequencies are presented in Table 11.

Table 11. Sex of Athletes Coached by Team and Individual Sports

Sex of Athletes	Team or Individual			Total
	Team	Individual	Both	
Male	149	7	1	157
Female	111	40	2	153
Both	161	299	16	476
Total	421	346	19	786

Other correlations of interest included that between highest level of competition and highest level coached. Examination of the distribution of coaches across levels coached, it can be seen that a disproportionate number of non-competitors and community competitors coach at the bottom level whereas a disproportionate number of the national level athletes coach at the third level, and international athletes coach at the third and fourth levels, $\chi^2(15) = 176.68, p < .0001$. The frequencies are presented in Table 12.

Table 12. Coaches Highest Level of Competition as an Athlete by Highest Level Coached

Highest Level of Competition	Highest level Coached				Total
	Community	City	Provincial	National	
Never Competed	17	9	6	2	34
Community	50	28	14	2	94
City	56	74	26	3	159
Provincial	86	100	102	13	301
National	29	36	49	27	141
International	6	11	33	26	76
Total	244	258	230	73	805

The correlation between highest level coached and hours per week is explained by a disproportionate number of coaches having 1 or 2 hours per week with their athletes at the two lowest levels of competition. Similarly, the coaches with the highest personal competition achievements as athletes also had more weekly contact hours with the athletes than those who had lower competitive achievements. This was also the case for weeks in the season, with the largest single cell being coaches at level 3 who coach more than 24 weeks per season. It can be easily understood, then, that at more advanced levels of competition, the seasons are longer – probably this reflects coaches reporting year-round training, the athletes train with the coach for more hours per week, and the coaches tend to be those who have the highest levels of experience as both athletes and as coaches.

To simultaneously examine the influences of each of these variables on the coaching behaviours of interest, a series of ANCOVAs were conducted. Each of the seven variables was tested separately as an independent variable controlling for the other six variables. In ANCOVA, the variance in the dependent variables associated with the covariates is accounted for before the independent variable through a regression procedure. Therefore, these analyses reveal any effect of each of the seven variables on the dependent variables after the variance associated with the other six has been controlled for. Due to the multiple analyses, the critical $p = .007$.

Four of the seven variables did not achieve a significant effect on the coach behaviours

when considered after the variance associated with the other six variables had been controlled. These were, sex of coach, $F(11, 655) = 2.31, p = .009, \text{Eta}^2 = .04$; weeks in the season, $F(66, 3930) = 1.26, p = .08, \text{Eta}^2 = .02$; highest level coached, $F(33, 1965) = 1.50, p = .03, \text{Eta}^2 = .02$; and sex of the athletes $F(22, 1310) = .94, p = .55, \text{Eta}^2 = .01$.

Three of the variables did exert a significant effect on coach behaviours after the other six had been controlled for. These were, team or individual sport, $F(22, 1310) = 3.83, p < .0001, \text{Eta}^2 = .06$; the highest level the coach achieved as an athlete, $F(55, 3275) = 1.63, p = .002, \text{Eta}^2 = .03$; and hours of training per week, $F(44, 2620) = 2.79, p < .0001, \text{Eta}^2 = .05$.

In summary, these analyses indicate that, when all the variance in the dependent variables associated with the other six variables is accounted for, the three variables that have a significant independent effect are team or individual sport (largest effect size of the three), the highest level of competition the coach achieved as an athlete, and the hours of training per week. The rest of the variables do not account for significant variance in the dependent variables when they are considered in multivariate analyses.

DISCUSSION

Our primary interests were in the effects, on coaches' reported use of sound coaching practices, of the personal characteristics of the coach and the context within which the coach is practicing. Whereas previous research has examined coach behaviours, these assessments have tended to be of more general categories of behaviours (e.g., percentage of time in technical instruction), or communication behaviours [13,32]. Three variables emerged as significantly related to the performance of the coach behaviours: team or individual sport, the highest level of competition the coach experienced while an athlete, and hours of practice per week.

INDIVIDUAL OR TEAM SPORT

It has been suggested that a one-on-one coach-athlete relationship would produce different communication opportunities than a one-on-many coach-athlete relationship – and the consideration of whether the context is team or individual seems warranted. The research results suggest that there are different practices in team versus individual sport – so it is possible that coaching delivery models could be adjusted to “take the best of both worlds”. It appears that individual level coaching in team contexts might allow coaches to better apply some of their skills and knowledge.

Coaching scientists appear to have focused most of their attention on team sport coaches (basketball, volleyball, football, soccer) and school-based coaches (college and high school) [16]. Research with coaches in individual sports, in particular, appears to be lacking. Coaching athletes one-on-one versus in a group environment may present very different challenges and opportunities for coaches, and hence it can be assumed that coaching practice will likely vary in some important ways between coaching contexts.

COACHES HIGHEST LEVEL OF COMPETITION AS AN ATHLETE

Researchers have rarely had the opportunity to undertake large sample exploratory studies to determine coach characteristics (beyond formal coach education) that might be influencing coaching behaviour. The current work by Gilbert, Coté, and Mallett [22] appears to be yielding interesting results on this topic, and the results of this research study appear to corroborate their initial findings. The coach's experience as an athlete seems an obvious personal characteristic that might influence coach behaviours. Our results support the use of “deeply integrated past experiences” discussed by Cushion [10] and Saury and Durand [32]. The influence of the coaches' own past competitive level on coaching practice would reflect

the coaches' experience of being coached as well as the coaches' own beliefs about the connections of certain practices (such as goal setting and imagery use) to effective performance. These results also support the suppositions of Werthner and Trudel [23] that coaches indeed learn through experience – their “participation metaphor”. In particular, the present data support their argument for recognition of informal learning, meaning learning that takes place outside formal coach education efforts. Whether athletic experience can truly be deemed “informal”, particularly since elite athletes engage in a great deal of formal training, probably needs to be questioned. Another possible approach might be consideration of what would have constituted each of procedural and declarative knowledge in experiences as athletes and as coaches, and how multiples of knowledge might be contributing to a more enriched whole among those with more sources.

Those coaches who were elite competitors are more likely to have experienced success in their performance and are also more likely to have been coached by elite coaches. As athletes, they were more likely to have engaged in the very behaviours representing desirable coaching practice. They are more likely to have associated those practices with positive outcomes. Also, the sport science literature [33, 34] suggests that higher-level competitors engage in more behaviours such as imagery, goal setting and self-evaluation, and it is reasonable that these individuals would translate these behaviours from their athletic careers to their coaching careers.

It seems reasonable to suggest, therefore, that high-level competitors who become coaches should receive different preparation than non- or low-level competitors. In the case of the first group, there is a strong possibility that their effectiveness as coaches could be “fast-tracked” by taking advantage of their strong foundational knowledge and focusing on the application of their knowledge as coaches rather than as athletes. In the second group, it seems intuitive that a great deal more teaching as well as possibly “convincing” regarding the effectiveness of skills such as goal-setting, training specificity and variation as well as self-evaluation might be necessary in order to provide for them some of the foundations that the competitive athletes already have.

HOURS OF TRAINING PER WEEK

The second critical context variable was hours of training per week. It would appear that time, particularly one-on-one time, is probably necessary for coaches to put the desired coach behaviours into practice. The individual sport context and having more hours of practice per week create environments more conducive to doing this. It seems probable, therefore, that offering coach training that is specific and relevant to their coaching context would be useful. In particular, additional attention could be given to incorporating the desired coach behaviours into team sports in a broad application, but probably most specifically to team-sport coaches who have limited weekly practice time. Coach education, therefore, might be geared to providing different application strategies to coaches working in environments where they have limited practice hours compared to those with more time at their disposal.

CONCLUSIONS

The purpose of this paper was to examine characteristics of coaches and their contexts that might influence their performance of coaching behaviours that have been associated with positive coaching outcomes. The identification of such influences should be useful in supporting the current trend toward developing sport- or context-specific coach education programs. Supported by research outcomes, the move toward developing training opportunities of higher relevance to coaches seems reasonable.

Coach education could be modified to address areas of strength and weakness that might be associated with a coach's particular experience and contexts. This is consistent with Cushion's [10] recommendation that coach education be less concerned with generic guidelines and more concerned with the development of critical thinking to allow coaches to develop a "processual toolbox". A relevant and accessible "toolbox" might need to be compiled in consideration of a) the coaches' total resources, including personal experience; as well as b) the opportunity to apply their skills, such as time available and one-on-one time with athletes.

Probably due to the prevalence of research designs that focus on a single sport context (such as university basketball, or minor hockey) [16], a comparison of coaching behaviours between types of sports (such as team and individual) is rarely considered in the empirical studies on coaching. Our comparative analysis of contexts suggests that one reason for the seemingly inconsistent results of coach practice might be a contextual effect of team versus individual sports. The opportunity for individual sport coaches to spend one-on-one time with their athletes might result in those coaches' more frequent use of desired coaching behaviours. By contrast, to expect team sport coaches to have the time to employ these same behaviours may be unrealistic.

Our study has some limitations that need to be considered in interpreting the data. First, this is not a random sample of coaches. Coaches were selected based on the NCCP database and who had access to e-mail. As ever, there will be bias among those who chose to reply to the email appeal that might make them dissimilar from those who did not reply, even if it is only in their desire to contribute to research. Secondly, our data are self-report. All self-report data can be criticized for inaccuracies due to self-presentation biases and recall error. There has been some suggestion that coaches provide imperfect self-report [20, 35]. This is not unusual and is a validity risk of all survey data. Additionally, much of the research considering the inaccuracy of coaches self-reported behaviour reports differences between coach and athlete recall of coach behaviour or addresses the broad categories of behaviour addressed by observational instruments such as the Coaching Behaviour Assessment System [11, 36]. Future researchers may wish to corroborate these findings through objective observation with a smaller sample of purposively selected coaches.

Based on our data, it seems that individuals with playing experience at a high level of competition are more likely to apply the coaching techniques that are generally considered to be good practice. Whether this is a differential response to the coach education these individuals received, or is a function of their understanding of the needs of an athlete is unclear. It does suggest that coaches who have been high-level competitive athletes may require a different type of training. Sport organizations may be advised to allocate financial resources to encourage successful, retired athletes from their sport to become coaches and/or coach educators.

It is interesting to note that many professional sports employ head coaches solely on the basis of their experience as an athlete, regardless of their formal education, revealing an important inconsistency in the preparation of elite coaches across sport organizations. While those sports are often criticized for this particular practice, our data suggest that there may be some merit in hiring ex-athletes as coaches.

The results of this study are useful in understanding that characteristics of coaches and their coaching contexts can influence coaching practice. This study gives some direct practical implications regarding possible delivery and assessment of coaches that might both improve the delivery of coach education as well as ease the process for new coaches who have other important qualifications. This study is limited to a cross-sectional design,

however, and so also provides direction for future research regarding the short- and long-term implications of the findings.

ACKNOWLEDGEMENT

This research was funded by a grant from the Endowment Fund for the Future of the University of Alberta.

REFERENCES

1. Bloom, G. A., Schinke, R. J. and Salmela, J. H., The Development of Communication Skills by Elite Basketball Coaches, *Coaching and Sport Science Journal*, 1997, 2(3), 3-10.
2. Jones, D. F., Housner, L. D. and Kornspan, A. S., Interactive Decision Making and Behavior of Experienced and Inexperienced Basketball Coaches During Practice, *Journal of Teaching in Physical Education*, 1997, 16(4), 454-468.
3. Chelladurai, P. and Quek, C. B., Decision Style Choices of High School Basketball Coaches: The Effects of Situational and Coach Characteristics, *Journal of Sport Behavior*, 1995, 18(2), 91-108.
4. Brunner, R. and Hill, D., Using Learning Styles Research in Coaching, *Journal of Physical Education, Recreation and Dance*, 1992, 63(4), 26-28.
5. Baker, J. Yardley, J. and Coté, J., Coach Behaviors and Athlete Satisfaction in Team and Individual Sports, *International Journal of Sport Psychology*, 2003, 34(3), 226-239.
6. Côté, J., Salmela, J.H. and Russell, S., The Knowledge of High-Performance Gymnastic Coaches: Methodological Framework, *The Sport Psychologist*, 1995, 9, 65-75.
7. Côté, J., Salmela, J.H. and Russell, S., The Knowledge of High-Performance Gymnastic Coaches: Competition and Training Considerations, *The Sport Psychologist*, 1995, 9, 76-95.
8. Côté, J., Salmela, J. H., Trudel, P., Baria, A. and Russell, S., The Coaching Model: A Grounded Assessment of Expert Gymnastic Coaches' Knowledge, *Journal of Sport and Exercise Psychology*, 1995, 17(1), 1-17.
9. Lyle, J.W.B., *Sports Coaching Concepts: A Framework for Coaches' Behavior*, Routledge, London, 2002.
10. Cushion, C.J., Armour, K.M. and Jones, R.L., Locating the Coaching Process in Practice: Models For and Of Coaching, *Physical Education and Sport Pedagogy*, 2006, 11(1), 83-99.
11. Cumming, S.P., Smith, R.E. and Smoll, F.L., Athlete-Perceived Coaching Behaviors: Relating Two Measurement Traditions, *Journal of Sport and Exercise Psychology*, 2006, 28, 205-213.
12. Mallett, C. and Coté, J., Beyond Winning and Losing: Guidelines for Evaluating High Performance Coaches, *The Sport Psychologist*, 2006, 20, 213-221.
13. Smith, R.E. and Smoll, F.L., Coaching the Coaches: Youth Sports as a Scientific and Applied Behavioral Setting, *Current Directions in Psychological Science*, 1997, 6(1), 16-21.
14. Coté, J., Salmela, J., Trudel, P., Baria, A. and Russell, S., The Coaching Model : A Grounded Assessment of Expert Gymnastic Coaches' Knowledge, *Journal of Sport and Exercise Psychology*, 1995, 17(1), 1-17.
15. Demers, G., Woodburn, A.J. and Savard, C., The Development of an Undergraduate Competency-Based Coach Education Program, *The Sport Psychologist*, 2006, 20, 162-173.
16. Gilbert, W.D. and Trudel, P., Analysis of Coaching Science Research Published from 1970-2001, *Research Quarterly for Exercise and Sport*, 2004, 75, 388-399.
17. Claxton, D.B., A Systematic Observation of More and Less Successful High School Tennis Coaches, *Journal of Teaching in Physical Education*, 1988, 7, 302-310.
18. Malette, L. and Feltz, D.L., The Effect of a Coaching Education Program on Coaching Efficacy, *The Sport Psychologist*, 2000, 14, 410-417.
19. Barnett, N. P., Smoll, F. L. and Smith, R. E., Effects of Enhancing Coach-Athlete Relationships on Youth Sport Attrition, *The Sport Psychologist*, 1992, 6, 111-127.
20. Williams, J.M., Jerome, G.J., Kenow, L.J., Rogers, T., Sartain, T.A. and Darland, G., Factor Structure of the Coaching Behaviour Questionnaire and its Relationship to Athlete Variables, *The Sport Psychologist*, 2003,

17, 16-34.

21. Gilbert, W. D., Introduction to Special Issue: Coach Education, *The Sport Psychologist*, 2006, 20, 123-125.
22. Gilbert, W., Coté, J. and Mallett, C., Developmental Paths and Activities of Successful Sport Coaches, *International Journal of Sports Science and Coaching*, 2006, 1(1), 69-76.
23. Werthner, P. and Trudel, P., A New Theoretical Perspective for Understanding How Coaches Learn to Coach, *The Sport Psychologist*, 2006, 20, 196-212.
24. Gould, D., Giannini, J., Krane, V. and Hodge, K., Educational Needs of U.S. National Team, Pan American and Olympic Coaches, *Journal of Teaching Physical Education*, 1990, 9, 332-344.
25. Gould, D., Hodge, K., Peterson, K. and Petlichkoff, L., Psychological Foundations of Coaching: Similarities and Differences Among Intercollegiate Wrestling Coaches, *The Sport Psychologist*, 1987, 1, 293-308.
26. Lacy, A.C. and Goldston, P.D., Behavior Analysis of Male and Female Coaches in High School Girls' Basketball, *Journal of Sport Behavior*, 1990, 13(1), 29-40.
27. Millard, L., Differences in Coaching Behaviors of Male and Female High School Soccer Coaches, *Journal of Sport Behavior*, 1996, 19(1), 19-32.
28. Solomon, G.B., DiMarco, A.M., Ohlson, C.J. and Reece, S.D., Expectations and Coaching Experience: Is More Better? *Journal of Sport Behavior*, 1998, 21(4), 444 – 456.
29. Hall, N., Jedlic, B., Munroe-Chandler, K. and Hall, C., The Effects of an Education Program on Coaches' Encouragement of Imagery Use, *International Journal of Coaching Science*, In Press.
30. Graydon, A., *An Examination of the Application of NCCP Knowledge by Coaches*, Unpublished Master's Thesis, The University of Western Ontario, 2004
31. Woodman, L., Coaching: A Science, an Art and an Emerging Profession, *Sport Science Review*, 1993, 2, 1-13.
32. Saury, J. and Durand, M., Practical Coaching Knowledge in Expert Coaches: On-Site Study of Coaching in Sailing, [*Research Quarterly for Exercise and Sport*](#), 1998, 69, 254-266.
33. Hall, C., Imagery in Sport and Exercise, in: Singer, R., Hausenblas, H. and Janelle, C., eds., *Handbook of Sport Psychology*, 2nd ed., John Wiley and Sons, Inc., New York, NY, 2001, 529-549.
34. Crews, D. J., Lochbaum, M. R. and Karoly, P., Self-Regulation: Concepts, Methods and Strategies in Sport and Exercise, in: Singer, R., Hausenblas, H. and Janelle, C., eds., *Handbook of Sport Psychology*, 2nd ed., John Wiley and Sons, Inc., New York, NY, 2001, 566-581.
35. Wandzilak, T., Ansoorge, C.J. and Potter, G., Comparison Between Selected Practice and Game Behaviours of Youth Soccer Coaches, *Journal of Sport Behavior*, 1988, 2, 78-88.
36. Smoll, F.L. and Smith, R.E., Leadership Behaviors in Sport: A Theoretical Model and Research Paradigm, *Journal of Applied Social Psychology*, 1989, 19(18, pt 2), 1522-1551.