

The Intervention Tone of Coaches' Behaviour: Development of the Assessment of Coaching Tone (ACT) Observational Coding System

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ABSTRACT

The importance of coaches' interactive behaviour with respect to athlete development has long been recognized. While a number of observational coding systems exist to record the instructional content of coaches' interactive behaviour, none is designed to explicitly capture the intervention tone of these interactions – 'how' coaches say what they say. The current project entailed the development of a new behavioural coding system designed to focus on the intervention tone of youth sport coaches' interactive behaviour. Behaviour categories were developed through an iterative combination of literature review and observation of recorded youth sport coaching sessions. A coder training protocol was developed and refined until coders consistently met a minimum standard of agreement with respect to both inter- and intra-rater reliability. The full coding system was then initially validated across six different team and individual youth sports in multiple contexts over a one year period.

Key words: Achievement Goal Theory, Autonomy Support, Coach-Athlete Rapport, Evaluation Climate, Self-Determination Theory, Systematic Observation, Youth Sport Coaching

INTRODUCTION

The purpose of the present study is to present a newly-developed observational coding system designed to capture the intervention tone of coaches' behaviour toward youth athletes. The study of coaching behaviour has long relied on behavioural observation as a primary method of study. In particular, the use of systematic observation protocols has a relatively long and productive history, dating back to the initial study of American college basketball coach John Wooden by Tharp and Gallimore¹. Since that initial study, the body of research examining youth sport coaching has relied primarily on two coding systems²: the

Coaching Behavior Assessment System (CBAS)³ and the Arizona State University Observation Instrument (ASUOI)⁴.

Smith et al.³ initially developed the CBAS with observation of youth baseball coaches and classified coach behaviour into 12 distinct categories within two larger groupings (spontaneous and reactive behaviours). Spontaneous behaviours are initiated by the coach without reference to a preceding athlete behaviour and include: 1) general technical instruction, 2) general encouragement, 3) organization, and 4) general communication. Reactive behaviours are those exhibited directly in response to either a desirable performance/effort or a mistake by the athlete(s). Responses to desirable performance/effort are: 5) reinforcement and 6) non-reinforcement, while responses to mistakes are: 7) mistake-contingent encouragement, 8) mistake-contingent technical instruction, 9) punishment, 10) punitive technical instruction, and 11) ignoring mistakes. Finally, the CBAS includes one category representing response to misbehaviour: 12) keeping control. Smith, as well as other authors, have used the CBAS as the foundation of an extensive line of research⁵ with coaches of youth sport athletes across several sports (e.g., baseball⁶, basketball⁷, softball⁸).

Similarly, the ASUOI⁴ was developed to systematically observe the teaching behaviours of coaches. Based on the premise that instruction is typically the most frequent general behaviour exhibited by coaches, the developers of the ASUOI sought to create a tool for more specific observation of instructional behaviours. The observation system itself contains 14 behavioural categories, 10 of which directly reflect different types of instruction. The categories are: 1) pre-instruction, 2) concurrent instruction, 3) post-instruction, 4) questioning, 5) manual manipulation, 6) positive modelling, 7) negative modelling, 8) use of first name, 9) hustle, 10) praise, 11) scold, 12) management, 13) silence, and 14) other. While the majority of published youth sport research has utilized the CBAS, ASUOI or various modifications of these two², a number of other coding systems have also been developed. Excellent examples such as the Coach Analysis and Intervention System (CAIS⁹) and the Computerized Coaching Analysis System (CCAS¹⁰) have made great strides in terms of contextualizing coaches' instructional behaviour by recording various environmental elements in addition to the behaviour itself.

However, it has been suggested that this extensive body of research has examined a relatively limited scope of coaching behaviours and behavioural qualities^{11, 12}. A significant majority of previous coach behaviour research has primarily targeted what might be termed 'pedagogical' behaviours – those explicitly involved in the teaching of motor skills. Analyses of these pedagogical behaviours have tended to centre on comparing the relative frequency of different positive and negative instructional/feedback behaviours. While this is obviously an important area of understanding for sport coaching, we argue that more and different dimensions of coaches' behaviour also need to be examined in order to more fully understand the influence that coaches have on their young athletes. In particular, not only are analyses of different 'whats' (i.e., the content of behaviour exhibited) necessary, but also analyses of the 'hows' (i.e., the presentational qualities – tone - of exhibited behaviours, regardless of content). The present coding system is one attempt to address this need, with a particular focus on the intervention tone of coaching behaviours. For the purposes of this work, intervention tone is defined as the psychological meaning conveyed by a given coach interactive behaviour. In this vein, several different coaching behaviours could convey a similar psychological meaning and would thus express the same intervention tone.

A number of psychological theories have highlighted the importance of tone-related qualities of interpersonal communication (e.g., self-determination theory^{13, 14}; achievement goal theory^{15, 16}; the multidimensional model of leadership¹⁷; transformational leadership¹⁸;

implicit theories of ability^{19,20}; positive youth development²¹), and many have been used to examine the qualities of coaches' behaviour specifically. This theoretically-guided research has linked differences in coaches' interactive tone with a number of psychosocial outcomes in young athletes (see [11] for a review). In particular, this body of work highlights that the effects of coach behaviour are dependent not only on content or frequency of expression but also on the psychological meaning conveyed to athletes. However, this research has relied heavily on perceptions of coaches' behaviour as rated by either athletes or the coaches themselves. Little research has directly observed the intervention tone of this behaviour in real-world coaching contexts. This may, in part, be due to the lack of a reliable and validated observation instrument capable of capturing these qualities.

PURPOSE

Thus, the purpose of the present study was the development and initial validation of an observational coding system explicitly targeted at the intervention tone of youth sport coaches' interactive behaviour – the Assessment of Coaching Tone (ACT) observational coding system. In contrast to existing observational research instruments, the ACT coding system was designed to capture the psychological meaning conveyed to athletes by coaches' behaviour, as manifested by intervention tone, rather than its pedagogical content. The ACT coding system is intended to aid in the extension of observational coaching research to encompass these meaningful presentational qualities of coach behaviour and provide a methodological link between the behavioural and perceptual-focused literatures addressing the influence of coach behaviour on youth athletes. The remainder of this article summarizes the development of the ACT observational coding system, presents an overview of the full final system, and then presents and discusses the results of initial testing of the coding system for research use.

METHOD

Brewer and Jones²² proposed a multi-stage process for developing contextually valid observation instruments for sport research, including: amending an existing observation instrument, establishing validity within the instrument, coder training, and establishing inter- and intra-rater reliability. Informed by this perspective, the ACT coding system was developed and tested by progression through five similar stages, adapted for the present purposes. The process of each stage is briefly described below; the first two stages outline the development of the system, while the subsequent four stages outline the initial testing of the system for potential research use. Specific results of each stage, including an overview of the full ACT coding system, are then presented within the subsequent separate results section.

First, the 'amending an existing observation instrument' stage began with a thorough review of observational systems used in previous youth sport coaching research. We then turned to a survey of major psychological theories that have been empirically linked to athlete outcomes, which represented the primary activity of this stage. The initial survey, discussed below, identified a number of theories postulating behavioural tone dimensions, some specific to coaching and other more general theories that address elements of coach/leader behaviour. After reviewing the basic content of each theory, we examined any questionnaires developed to examine the specific theoretical constructs as well as relevant theoretical or qualitative articles for each theory. The intent of this literature review was to identify any possible behavioural manifestations of tone that might apply to coaches' behaviour and look for commonalities across theories that might point toward particularly influential dimensions of behaviour. The review primarily focused on sport psychology

research but also included relevant work across the developmental psychology, organizational psychology, and education domains. The results of this review, in combination with the base provided by existing observational instruments, led to the formulation of a working version of the ACT observational coding system.

Second, using this working version of the ACT system, the ‘establishing validity within the instrument’ stage consisted of an integrated process of test coding, re-reviews of literature, and consultation with coaches and researchers to solidify conceptual definitions and interpretations as relevant to real-world coaching contexts. These validation strategies were intended to contribute to both the generalizability and comprehensiveness/exhaustive coverage of the finalized ACT observational coding system, which was the ultimate result of this second stage.

Third, once the finalized ACT observational coding system was established, the ‘coder training’ stage initiated the testing of the system. In order to reliably and accurately record coaching behaviours using the ACT coding system, coders must be trained to implement the system as intended. To this end, a six-stage competency-based coder training protocol was developed and tested.

Fourth, the ‘establishment of inter- and intra-rater reliability’ stage was conducted with coders, all of whom had successfully progressed through the coder training protocol. Given the competency-based nature of the coder training protocol, both inter- and intra-rater reliability were calculated with respect to a minimum standard threshold (explained in the results section below).

Finally, in addition to the stages outlined by Brewer and Jones²², a fifth ‘discriminant validity’ stage was added to provide preliminary evidence regarding the utility of the full new ACT coding system. In this stage, the ACT system was used to re-analyze existing video of youth sport coaches from a previous study to test if the new system could capture the differences noted in the previous study.

RESULTS

The following subsections present the results of each stage of the development and testing process for the ACT observational coding system. The two stages of system development (Stage 1: ‘amending an existing observation instrument’ and Stage 2: ‘establishing validity within the instrument’) are reported first, followed by presentation of the resulting final ACT coding system, before finishing with the results of the three stages of system testing conducted on the final coding system (Stage 3: ‘coder training’, Stage 4: ‘establishment of inter- and intra-rater reliability’, and Stage 5: ‘discriminant validity’).

STAGE 1: SYSTEM DEVELOPMENT - ‘AMENDING AN EXISTING OBSERVATION INSTRUMENT’

Review of Existing Observation Instruments

The development process of the ACT coding system began with a review of existing coaching observation instruments (e.g., CBAS³, ASUOI⁴, CAIS⁹, CCAS¹⁰, CAICS²³). Given the earlier noted lack of emphasis on tone-related qualities in this previous research, however, there were few coding categories or behavioural dimensions relevant to the novel tone qualities of behaviour targeted in the current project. As such, while the CBAS was chosen as a rough base (given its predominance in the youth sport coaching literature), creation of the ACT coding system required a larger focus on the development of new coding categories and dimensions. Review of non-observational literature therefore formed the primary basis for developing the ACT observational coding system.

Theoretical Review

The strongest body of literature with regard to what might be considered elements of tone in coaches' behaviour comes from two general theories of motivation: self-determination theory (SDT^{13, 14}) and achievement goal theory (AGT^{15, 16}). Despite their broad psychological foundation, both have been used extensively in sport research and place strong emphasis on leader (in this case, coach) behaviour as significant antecedents of athlete outcomes. Within self-determination theory, motivation is thought to exist on a continuum from fully extrinsic to fully intrinsic, differentiated by the degree to which one's motivation is self-determined or regulated. Being further along the continuum toward fully intrinsic motivation has been empirically linked with a number of positive psychosocial outcomes^{24, 25}. More intrinsic motivation is theorized to result from the satisfaction of three basic human needs: competence, relatedness, and autonomy. Of these, perceptions of individual autonomy has received significant research attention, both in youth sport and more generally, and been most strongly associated with the behaviour of leaders such as coaches. Coach behaviours that promote an athlete's sense of autonomy are known as autonomy-supportive, while behaviours that inhibit or detract from a sense of autonomy are known as controlling. Several authors have provided notable foundations in elucidating the behavioural components of autonomy-supportive and controlling coaching, both at the descriptive theoretical level (e.g., autonomy-supportive^{26, 27}; controlling²⁸) and with respect to athletes' perceptions of typical coach behaviour as assessed via questionnaires (e.g., autonomy-supportive^{29, 30}; controlling³¹). As noted by several of these authors, examination of these questionnaires and the theoretical work based on SDT suggests that autonomy-supportive and controlling coaching are not specific behaviours per se, but rather descriptive qualities of a range of possible behaviours. This qualitative description of coaching behaviour is representative of precisely the tone-related aspects that are the intended target of the present coding system. However, the behavioural manifestations of these interaction tones have yet to be concretely linked to specific units of coaching behaviour as they may be exhibited in real-time coaching situations. Working toward this end, the work of Sarrazin, Tessier and colleagues³²⁻³⁴ in physical education provides excellent examples of the utility of observing actual autonomy-supportive and controlling behaviour. However, their measures have yet to be translated to the coaching domain and do not distinguish the autonomy-supportive/controlling aspects of the full range of behaviours (e.g., praise, encouragement, negative comments). Similarly, Webster and colleagues^{35, 36} effectively developed and tested SDT-based observational methods with high school soccer coaches, but focused exclusively on autonomy-supportive behaviour.

Achievement goal theory^{15, 16} also provides strong theoretical and empirical support for the importance of the intervention tone of coaches' behaviour. According to AGT, individuals in any performance or achievement context such as sport are motivated to demonstrate competence or avoid the demonstration of incompetence. The nature of this motivation depends on the individual's definition of competence, the achievement goal to which they are striving. Mastery- or task-oriented goals represent a conceptualization of competence defined relative to effort, learning, and self-referenced improvement and are a process-based perspective. Ego- or performance-oriented goals, in contrast, represent a conceptualization of competence defined relative to the performance of others and are generally a competitive outcome-based perspective. Overall, adoption of a mastery or task goal orientation is associated with positive motivational outcomes^{16, 37}. One of the central tenets of AGT is that the larger situational motivational climate (again, mastery- or ego-oriented) is a primary determinant of an individual's goal orientation and is created by the evaluation-related

feedback from significant others within the context, such as coaches. As with autonomy-supportive or controlling coaching in SDT, the significant body of research examining coaches' influence on motivational climate^{e.g., 38-40} suggests that a number of different evaluative behaviours might promote a mastery-oriented or ego-oriented motivational climate. However, all behaviours promoting a mastery-oriented climate transmit the same message (i.e., that self-referenced effort and learning are valued) and produce similar motivational outcomes. Conversely, all behaviours promoting an ego-oriented climate transmit the opposite message (i.e., that other-referenced performance and ability are valued). Again, this would seem indicative of exactly the tonal qualities that the present coding system is intended to address, where it is not the specific content of a given behaviour but rather its intervention tone that determines the behaviour's influence on athlete development.

In addition to SDT and AGT, several other theories lend insight into the influence of tone qualities of coaches' behaviours. Interestingly, similar themes to those outlined by SDT and AGT emerge across the range of theoretically-orientated bodies of research. Targeted at coaching specifically, the multidimensional model of leadership (MML^{17, 41}) posits that coaching effectiveness is determined by the degree of congruence between coaches' actual behaviour, the behaviours desired by their athletes, and the behaviours necessitated by the coaching context. In classifying coaches' actual, desired, and context-driven behaviour, the MML specifies a number of different behavioural dimensions (training and instruction, democratic behaviour, autocratic behaviour, social support, and positive feedback) the relative utilization of which reflects a tendency towards a specific decision-making style (autocratic, consultative, or group). Differences in these MML constructs have been linked to a number of athlete outcomes⁴¹. Examination of the primary questionnaire designed to assess perceptions of the behavioural dimensions of the MML (the Leadership Scale for Sports⁴²) as well as research examining coaches' decision-making styles^{e.g., 43} revealed descriptions of a number of possible behavioural manifestations of tone. In particular, the democratic and consultative decision styles would seem to share much common ground with the concept of autonomy-support from SDT, with autocratic behaviour similar to controlling behaviour. Indeed, constructs from both theories have been found to be statistically linked in empirical studies^{e.g., 44}.

The theory of transformational leadership¹⁸ has more recently been applied to coaching settings and proposes a distinction between transactional and transformational leadership. Whereas transactional leadership centres on rewarding desired behaviour and punishing undesired behaviours in followers (i.e., athletes), transformational leadership focuses on creating an inspirational vision that helps and encourages followers to transcend their own current abilities to maximize their own and the group's potential. Though a relatively new area of study in sport, leadership that is more transformational in nature has been empirically or theoretically linked to positive athlete outcomes such as increased performance, motivation, effort, and self-worth⁴⁵⁻⁴⁷. Again, the accepted operationalizations of transformational leadership constructs such as individual consideration (elements of mastery-orientation), inspirational motivation (elements of autonomy-support and mastery-orientation), intellectual stimulation (elements of autonomy-support), and fostering acceptance of group goals and teamwork (elements of mastery-orientation) all include reference to what might be considered similar tonal qualities of leader behaviour.

Initially grounded in educational settings, the work of Dweck and colleagues on implicit theories of ability^{19, 20} also highlights the role of feedback in achievement settings from significant adults, such as teachers or coaches, on young peoples' motivation and

performance-related outcomes. The implicit theories framework posits that individuals, even young children, typically hold one of two different implicit theories of ability. Incremental theorists (also known as a growth mindset) believe that ability is malleable, dynamic, and subject to change based on learning and effort. Entity theorists (also known as a fixed mindset) believe that ability is static and fixed as an essential individual trait. In particular, the notion of process vs. person-focused feedback from adults (both praise and criticism) has been experimentally linked to children's endorsement and development of specific ability beliefs^{e.g., 48-50}, with process-oriented feedback (i.e., targeting modifiable factors like effort, specific to the performance in question) leading to more incremental beliefs and person-oriented feedback (i.e., targeting static factors like overall worthiness, reflecting global qualities of the performer) leading to more entity beliefs. This process vs. person distinction would seem remarkably similar to the mastery vs. ego distinction forwarded in AGT; evidence of this congruence can be found in the corresponding positive motivational and performance outcomes associated with process-oriented feedback and incremental beliefs, and negative outcomes associated with person-oriented feedback and entity beliefs^{e.g., 48-50}. Particularly germane to the present purpose, implicit theories research has demonstrated the unique effects of the even very subtle shifts in the psychological meaning or tone of such feedback (with respect to process vs. person focus), regardless of its content or valence^{e.g., 51}. While research guided by the implicit theories approach in sport is relatively limited, several researchers have highlighted its potential utility for understanding the influence of coaching behavior^{11, 52}.

Similarly, the wide body of research on prosocial and positive youth development in sport, education, and developmental psychology^{e.g., 21, 53} suggests that tone-related elements of the behaviour of significant adults (such as coaches) contributes to the development of personal responsibility⁵⁴, life skills⁵⁵, fun⁵⁶, character⁵⁷, prosocial behaviour, empathy, and sympathy⁵⁸. This collected body of work again highlights the importance of interactions that foster athletes' responsible independent decision making, engagement and empowerment (i.e., autonomy-support), as well as a general focus on the process of self-improvement rather than social comparison with respect to performance evaluation (i.e., mastery-orientation).

Thus, we suggest that intervention tone is a critical element of coaches' behaviour in determining the outcomes experienced by athletes, and can be represented by the concepts of autonomy support and evaluation climate. We propose collapsing elements of intervention tone from across several theories into these two central SDT and AGT concepts; however, this should not be seen as a selection or promotion of SDT and AGT over the other theories reviewed. Rather, we feel that the highly utilized terminology and conceptualizations of SDT and AGT simply provide a parsimonious framework within which to integrate the shared intersections of the several major theories addressing a common topic. The behavioural manifestations of these larger tone dimensions, as gathered from across the multiple theories reviewed, were then used as base for the category descriptions and decision rules within the evolving coding manual.

STAGE 2: SYSTEM DEVELOPMENT - 'ESTABLISHING VALIDITY WITHIN THE INSTRUMENT'

With a working list of potential behavioural codes derived from the initial literature review, we began viewing and informal test coding of videotaped coaching sessions. This next phase of developing the coding system then consisted of an iterative process of viewing and test coding videotaped coaching sessions and re-review of relevant literature by the first author in consultation with the second author and other colleagues, with the aim of ensuring that the

evolving coding system reflected and corresponded to both current theoretical knowledge as well as practical realities of real-world coaching. This process took place over the course of several months and continued until no further difficulties in coding, or inability to classify a given behaviour, were noted. In the same vein, the coding system was reviewed by several youth sport coaches from multiple sports as well as youth sport researchers experienced with behavioural observation. These processes supported the general structure based on SDT and AGT terminology, but led to further refinements of the specific coding instructions and decision rules within each category.

With respect to generalizability, both development and later testing of the coding system was conducted with videos from a wide range of youth sport settings, including both team (volleyball, basketball, soccer, synchronized swimming) and individual (swimming, tennis) sports, from both Canada and Australia, with male and female coaches of both single gender and mixed participation sport groups, and included both able-bodied athletes and athletes with disabilities.

As a validation strategy while working across all these videos, particular attention was paid to ensuring the comprehensiveness and exhaustiveness of the coding categories across the wide range of youth sport settings. If either the researchers or coders noted any instances where a behaviour exhibited by a coach could not be appropriately categorized within the existing system, modifications or adjustments were made to either the behavioural categories or the specific coding rules within each category. Again, any such modifications were reviewed by several coaches from multiple different sports as well as youth sport researchers experienced with behavioural observation, contributing to face and theoretical validity.

FINAL CODING SYSTEM

General Overview

As the result of the development and initial validation process, the final Assessment of Coaching Tone (ACT) observational coding system consists of a content dimension and three tone dimensions, with each content code being linked to specific applicable tone modifier options (see Figure 1 for overview). Thus, any given coach behaviour is coded as a two or three category sequence – a content code plus one or two associated tone modifiers. The coding system is intended to be both exhaustive and exclusive; exhaustive in that all possible coaching behaviours can be appropriately classified within the existing categories, and exclusive in that any given behaviour can only be appropriately classified by one specific category sequence. The full coding manual for the final coding system is available upon request from the corresponding author.

Coding Process

All three of the newly proposed intervention tone modifier dimensions require what Alexander et al.⁵⁹ classify as moderate levels of content meaning and coder inference in order to arrive at accurate coding. Content meaning refers to the degree to which the coder has freedom to use phenomenological meaning to independently define a given coding unit (i.e., what constitutes a behaviour to be coded) as opposed to pre-determined units of analysis (e.g., specified time intervals). In this case, a moderate level of content meaning indicates that coders are looking for discrete interaction segments but are free to decide whether a single sentence, part of a sentence, or many sentences together represent the meaning unit in question. Similarly, coder inference refers to the degree to which the coding system requires the coder to infer meaning from behaviour in order to classify it, as opposed to relying solely on the explicit content of the behaviour (e.g., word choice). In this case, a moderate level of

Content	Autonomy Support	Evaluation Climate	Rapport
1 - Organization	1 - Autonomy-supportive 2 - Neutral 3 - Controlling		
2 - Instruction/Feedback	1 - Autonomy-supportive 2 - Neutral 3 - Controlling	4 - Mastery-oriented 5 - Neutral 6 - Ego-oriented	
3 - Positive Evaluation/Encouragement	1 - Autonomy-supportive 2 - Neutral 3 - Controlling	4 - Mastery-oriented 5 - Neutral 6 - Ego-oriented	
4 - Negative Evaluation	1 - Autonomy-supportive 2 - Neutral 3 - Controlling	4 - Mastery-oriented 5 - Neutral 6 - Ego-oriented	
5 - Mental Skills	1 - Autonomy-supportive 2 - Neutral 3 - Controlling	4 - Mastery-oriented 5 - Neutral 6 - Ego-oriented	
6 - Social/Moral Behaviour	1 - Autonomy-supportive 2 - Neutral 3 - Controlling	4 - Mastery-oriented 5 - Neutral 6 - Ego-oriented	
7 - Non-sport Communication			7 - Personal 8 - General
8 - Observation			
9 - Not Engaged			
x - Uncodable			

Figure 1.

coder inference means that while the coding manual gives strict definitions for the intervention tone categories and examples of possible ways in which each could be manifested behaviourally, coders are required to make judgements about the autonomy-support, evaluation climate, or rapport meaning for any given behaviour, regardless of the specific phrasing chosen by the coach to express it. This moderate level of both content meaning and coder inference were deliberately chosen to reflect both the theoretical conceptualization and intended level of analysis for these new intervention tone dimensions.

The Assessment of Coaching Tone (ACT) Observational Coding System

The coding sequence for any coach behaviour is initiated with a content code. Though not the primary focus of this coding system and proportionately de-emphasized, this initial content code acts as a necessary context upon which to ground the subsequent intervention tone modifier categories. The content dimension consists of nine categories: 1) *Organization*

- communication from coach related to organization of practice tasks and athlete actions, *not* intended to directly influence performance, 2) *Instruction/Feedback* - technical and/or tactical and/or teaching instruction or feedback from coach, directed at athlete(s) motor performance or skill execution, 3) *Positive Evaluation/Encouragement* - non-technical positive reaction or motivational encouragement from coach directed at athlete(s) motor performance or skill execution, 4) *Negative Evaluation* - non-technical negative reaction by coach to an undesirable motor performance or skill execution by athlete(s), 5) *Mental Skills* - communication from coach related to individual mental/psychological skills, characteristics, qualities, or aspects of performance, 6) *Social/Moral Behaviour* - communication from coach related to inter- and intra-personal behaviour and conduct, *not* directed toward performance enhancement, 7) *Non-Sport Communication* - communication from coach not directly related to task, performance, or personal development in the current team/training/performance context, 8) *Observation* - coach engaged in observing/watching athletes during training/performance activities, though not directly communicating with athletes, and 9) *Not Engaged* - coach not engaged in training/competition activities directed at athletes and not directly communicating with athletes. There is also an *Uncodable* category to capture instances where the coach's behaviour is not visible or audible to be coded (only necessary when using continuous rather than event-based coding).

These categories are primarily taken directly from previous coach behaviour coding systems, most notably the CBAS and the more recent CAICS²³, which was itself a derivative of the original CBAS. There were, however, several modifications and new additions. First, as the function of the content dimension is merely to provide a contextual base for the more emphasized tone modifier dimensions, a number of content categories were collapsed to simplify the coding process. For example, instruction and feedback (from the CBAS) were combined into a single category representing all provision of technical/tactical information, as were positive evaluation and encouragement (from the CBAS) into a category representing all sport-related but non-technical positive communication. Additionally, the mental skills and social/moral behaviour categories were added to capture these important elements^{54, 57, 58} not explicitly represented in previous coding systems.

Once the initial content context is determined, the coder then proceeds to the critical intervention tone modifiers. Any organization, instruction/feedback, positive evaluation/encouragement, negative evaluation, mental skills, or social/moral behaviour content must be classified by the expressed degree of autonomy-support. The degree of autonomy tone modifier dimension has three categories: 1) *Autonomy-Supportive* - conveys view of athlete(s) as capable decision makers and contributing members of the situation, 2) *Neutral* - absence of autonomy-related tone, and 3) *Controlling* - conveys an autocratic tone, with coach as total decision maker. As outlined in the ACT coding manual, there are a number of ways a given behavior can be expressed as autonomy-supportive, including: provision of choice, soliciting of athlete opinion(s), questioning (provided a response is actually allowed and expected), acknowledgement of athletes' feelings or perspectives, provision of rationale or justification for decisions, encouragement of creativity/risk taking/independent problem solving, or acknowledgement of an individual's role/contribution. Behaviours to be classified as controlling, on the other hand, indicate no athlete input, consultation, or acknowledgement of athlete(s') perspective and typically take the form of directive statements, where the coach has already made the decision. Controlling behaviours can reflect current activities or coach-driven expectations for future behaviour (e.g., 'should' or 'must' statements) and can be positive statements (e.g., "I want you to keep that up next game"). Behaviours are to be classified as neutral on the autonomy tone

dimension only if no criteria from either the autonomy-supportive or controlling categories are met (e.g., “Good”³²). See Figure 2 for further examples within each category.

After the degree of autonomy support has been coded, any instruction/feedback, positive evaluation/encouragement, negative evaluation, mental skills, or social/moral behaviour content must then be classified according to the evaluation climate it promotes. The evaluation climate tone modifier also has three categories: 1) *Mastery-Oriented* - self (individual athlete/team)-referenced or focused on the process of skill execution, 2) *Neutral* - absence of evaluation climate-related tone, and 3) *Ego-Oriented* - other (comparative)-referenced or focused on the competitive outcome of skill execution. In order to be classified as mastery-oriented, a behaviour must reflect discussion of learning or performance relative to own past performance (self-referenced - e.g., “that was much better than yesterday”) or process, rather than competitive outcome, based feedback (e.g., “good follow-through on that one!”). Reference to effort is also considered process-based feedback. In contrast, behaviour that promotes an ego-oriented evaluation climate reflects discussion of relative

Tone Dimension	Coding Category	Examples
Autonomy Support	Autonomy-supportive	“How do you think we could fix that?” “I’m asking you to try this because I think you’re ready to take on a bigger challenge.”
	Neutral	“Good job.”
	Controlling	“Keep doing that.” “Do this instead.”
Evaluation Climate	Mastery-oriented	“That’s looking much better” “Even though the shot didn’t go in, the follow-through was great.”
	Neutral	“I like that.”
	Ego-oriented	“You’re the best I’ve seen.” “We’re going to get beat if we keep that up.”
Rapport	Personal	“How did the exam go?” “Hope you’re feeling better!”
	General	“Great weather we’re having.” “Check out the score of the Lakers game last night.”

Figure 2.

ability or performance in comparison to others, such as teammates or opponents (e.g., “nice work beating that defender!”) or competitive outcome, rather than process, based feedback (e.g., “Nice win”). Again, behaviours are to be classified as neutral on the evaluation climate dimension only if no criteria from either the mastery-oriented or ego-oriented categories are met (e.g., “Good”). Again, see Figure 2 for further examples within each category.

Not explicitly grounded in the SDT or AGT frameworks, a third and final modifier dimension – rapport - was created to describe the relatively distinct non-sport communication content code. While not to the same degree as autonomy-support and evaluation climate, the importance of coaches’ personal connection with athletes beyond the sport context is also highlighted in much of the reviewed literature across several theories^{42, 45, 56, 60}. Even within SDT, the degree of coaches’ interpersonal involvement with athletes has been posited as an influential element of these interactions²⁵. Within the rapport dimension, any non-sport communication is classified as either 1) *Personal* - communication from the coach making direct reference to personal information about the athlete, or 2) *General* - communication from the coach *not* making direct reference to personal information about the athlete (See Figure 2 for examples). Personal information refers to athlete’s feelings, perspectives/opinions, life circumstances, or experiences outside of sport (i.e., school, family, relationships, etc.). Personal non-sport communication can take the form of a question, requesting personal information (e.g., “how was school today?”, “what do you think of that movie?”, etc.), or can also take the form of a statement, reflecting previous knowledge of athlete’s personal information (e.g., “I know you were feeling pretty low last week”, “Congratulations on finishing exams!”, etc.).

STAGE 3: SYSTEM TESTING - ‘CODER TRAINING’

The six-stage training protocol began with an introductory discussion of systematic observation research and presentation of the coding manual (available upon request from the corresponding author) with detailed explanation of the overall purpose and of each behavioural dimension and specific behavioural category. Coders were then given a copy of the full coding manual for independent study for several days until they felt familiar with the descriptions of all the coding categories. At this point, the coders wrote a pencil-and-paper test requiring them to classify hypothetical coaching statements (also available from the corresponding author), using the full coding system with all dimensions. The written descriptions were purposely selected to provide maximal ambiguity with regard to behavioural criteria in order to target perceived ‘grey areas’ between adjacent code categories. The purpose of this test was twofold; both an initial check on coders’ understanding of the coding system as well as a cue for discussion of difficult coding decisions and clarification of category interpretations. As such, discrepant answers between coder trainees served as valuable teaching opportunities. Coders then proceeded to group-based verbal coding of videotaped coaching sessions, guided by the primary researcher, where all coders were given a chance to talk through their reasoning for any coding decisions. The next stage of training involved group-based full coding, again guided by the primary researcher, where each coder took turns running the coding software currently used by the research team (Noldus Observer⁶¹) but were able to discuss coding decisions as a collective. Thus, the introductory phases of the training protocol represent a progression of coding situations from most straight-forward (distinct statements transcribed on paper) to most complex (videotaped real-world coaching segments where temporal boundaries between different behaviours are not always clear).

Coders then progressed to independent coding assignments, where they were asked to

code short (i.e., approximately 10 minutes) videotaped segments of various coaching sessions. The 10-minute unit was selected as initial viewings of videos revealed a sufficient number of coach behaviours typically exhibited across a 10-minute span in most observed training sessions and this time unit is also consistent with previous observational methodology research^{e.g.} 62. Each of these assignments was used to calculate inter-rater reliability with a 'gold standard' coding of the same segment by the primary researcher. Any agreements and disagreements were reviewed as a group to further ensure accurate and consistent interpretation of the coding categories. This process of independent coding assignments followed by comparison to the 'gold standard' coding and group review was continued until coders reached a minimum reliability standard (see next section) on two consecutive coding assignments, at which point they were considered fully trained. Following training and after the initiation of coding videos to be used for analyses, periodic group coding sessions were held to combat observer drift (i.e., increasingly idiosyncratic interpretations of the coding categories) and ensure fidelity to the coding system as originally designed.

STAGE 4: SYSTEM TESTING – 'ESTABLISHING INTER- AND INTRA-RATER RELIABILITY'

Reliability analyses for the final coding system were conducted with respect to both inter- and intra-rater reliability. Reliability was based on a minimum standard of agreement set at 75% agreement⁶³, with agreement characterized by frequency, time of occurrence, and duration dimensions for each behaviour. Thus, agreement in the coding of any given behaviour required the activation of the same complete two or three code sequence by both coders within a three second window (relative to total elapsed time on the video) and subsequent deactivation by initiation of the next code when the coach's behaviour changes, again within a three second window. This represents an extremely stringent definition of agreement, in effect demonstrating concordance in four or five coding decisions (i.e., time of behaviour initiation, content, one or two tone modifiers, and time of behaviour termination) for any single coaching behaviour.

Inter-Rater Reliability

Inter-rater reliability was based on agreement with a 'gold standard' coding by the primary researcher. Seven independent (i.e., not involved in the coding system development) undergraduate coders (five female, two male) were trained to the minimum reliability standard of 75% agreement on two consecutive 10-minute video segments (range on final coding tests = 76-89% agreement, Kappa range = .63-.80) within 2 months, with no trained coders failing to meet this standard. Re-tests of inter-rater reliability were conducted approximately 2 months after initial completion of coder training and the minimum 75% agreement standard was maintained (range = 75-87% agreement, Kappa range = .62-.77).

Intra-Rater Reliability

Intra-rater reliability was assessed by having all seven coders recode two different 10-minute segments of video at minimum two weeks subsequent to their initial coding of the same segments. All coders reached at least the minimum 75% agreement standard on both video segments (range = 76-80% agreement, Kappa range = .67-.71).

STAGE 5: SYSTEM TESTING – 'DISCRIMINANT VALIDITY'

Finally, the full coding system was used to recode video from an earlier study by Erickson

et al.²³ which compared the coaches of two competitive youth synchronized swimming teams, one more successful with respect to both personal development and team performance than the other, observed across three training sessions. Simple analysis of this recoding offers preliminary support for the discriminant validity of the newly developed ACT coding system, in that the two environments could be differentiated based on relative utilization of different intervention tones captured by the new system. Given the small number of sessions compared, full statistical analysis was not possible; however, even a relatively superficial direct comparison of means revealed several possible differences between the two coaches.

On the evaluation climate dimension, despite exhibiting fewer overall interactive behaviours (more successful [MS] = 310.33 behaviours/session vs. less successful [LS] = 465.67 behaviours/session), the coach of the more successful team spent a greater duration of time interacting in a *Mastery*-oriented manner across all content categories (MS = 1024.00 seconds/sess. vs. LS = 981.00 seconds/sess.). This discrepancy was most noticeable with respect to *Instruction/Feedback* content (MS = 964.33 sec/sess. vs. LS = 911.67 sec/sess.), again despite the coach of the more successful team exhibiting fewer instances of *Instruction/Feedback* overall (MS = 121.00 beh./sess. vs. LS = 199.33 beh./sess.). Further, not once across all three observed practices did the coach of the more successful team utilize an *Ego*-oriented tone with any content category, in contrast to the coach of the less successful team (10.33 beh./sess.). With respect to the degree of autonomy support dimension, the coach of the less successful team spent much more time interacting in a *Controlling* tone with both *Positive Evaluation/Encouragement* (MS = 9.00 sec/sess. vs. LS = 39.33 sec/sess.) and *Negative Evaluation* (MS = 3.33 sec/sess. vs. LS = 48.67 sec/sess.) content. Finally, the coach of the more successful team spent more time in *Non-Sport Communication* characterized by *Personal*-oriented rapport (MS = 49.33 sec/sess. vs. LS = 5.33 sec/sess.).

DISCUSSION

With the development of the ACT observational coding system as presented here, we suggest that this represents the first observational coding system explicitly targeted at the intervention tone of youth sport coaches' interactive behaviour. We also present preliminary evidence for the validity and reliability of the ACT. This coding system can potentially allow for the examination of new aspects of coaching behaviour and begin to answer previously unavailable research questions. It should be noted that the investigation of intervention tone is intended to extend, not replace, pedagogical understanding of coach behaviour. In fact, the two are not necessarily completely distinct but rather complementary (e.g., questioning/athlete input may promote reflective learning^{64,65}). It is also important to note that the driving impetus in the creation of this coding system was not to develop a tool to specifically test SDT or AGT predictions. Rather, we sought to improve our ability to examine new and different qualities of coaches' behaviour, and in the process settled on the use of SDT and AGT general concepts and terminology as the most parsimonious integration of several relevant theoretical conceptualizations.

While development and initial validation strategies were focused within youth sport contexts, the ACT coding system is intended to be flexible in its utility, providing a validated framework for context/research question-specific modifications²². For example, the system could potentially be used to observe coaches in other sport contexts (e.g., high performance) or physical educators, as the theoretical foundations of SDT, AGT, and related concepts have been validated across these contexts as well⁶⁶. Within the authors' line of research for which this coding system was developed, the intervention tone of coaches behaviour will be further qualified by recording the recipient (i.e., specific athlete or group of athletes) to which the

behaviour is directed. Future research might also consider collapse or expansion across categories (e.g., expansion of types of autonomy-supportive behaviours, such as questioning or provision of rationale, into separate codes). Regardless of the specific context or research question under study, the ACT coding system is intended to be suitable for use in a full spectrum of observational data collection procedures (i.e., from full detail, continuous computerized coding from video to time constrained, live hand-recorded coding with various event-based or time-sampling procedures). Across all potential uses of the ACT, however, further testing and validation is needed to verify the initial evidence presented here.

CONCLUSION

This paper presents the development of the Assessment of Coaching Tone (ACT) observational coding system, explicitly targeted to capture the intervention tone of youth sport coaches' interactive behaviour toward their athletes. The results of several strategies employed to establish the preliminary reliability and validity of the system are also presented. While acknowledged as a significant component of coaches' interactions, intervention tone has yet to be comprehensively examined from a behavioural observation perspective, perhaps due to a lack of validated observation instruments designed for this context. While certainly not the final word in the examination of coaching behaviour, we feel the ACT coding system begins to address this gap and improves our ability to observe and understand the complexity of coaching behaviour beyond instructional strategies. It is our hope that this and related tools can be used to better predict the influence of coaches on athlete development, and in doing so enable more effective training of youth sport coaches.

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