

Jan-Erik Romar¹
Emma Samuelsson¹

EXPLORING THE COACHING ECOLOGY IN YOUTH SWIMMING: A MULTIPLE CASE STUDY

PREUČEVANJE »EKOLOGIJE« TRENINGA MLADIH PLAVALCEV: ŠTUDIJA VEČ PRIMEROV

ABSTRACT

Previous studies with systematic observation tools in the coaching context have reported that the pattern of coaching behaviour can be understood as a sequential cycle of unplanned and reactive behaviours where coaches most frequently instructed, provided feedback and encouragement while simultaneously managing the training environment. Nonetheless, there is a clear limitation when the coaching process is viewed as unidirectional without accounting for how athletes' behaviour can inform coaching processes. Therefore, the purpose of this study is to describe and interpret the ecology of youth swimming training sessions. The following research questions framed the study: (a) How did the coaches structure the training sessions? (b) What kind of coach instructional and managerial behaviours were prevalent in this context? and (c) How active were athletes during the training sessions? Two youth swimming coaches and their athletes were videotaped during five training sessions each. A modified version of the task structure observational instrument was used to systematically observe the swimming training sessions. Results showed that both coaches provided much time for athletes to practice motor skills, and little time was used for management and instruction. In addition to describing tasks and explaining how to perform them, the coaches instructed while athletes practiced and provided both positive and corrective feedback. Finally, athletes were actively engaged and showed high levels of compliance in instructional and managerial tasks.

Keywords: Coaching, youth sport, classroom ecology, swimming

¹*Faculty of Education and Welfare Studies, Åbo Akademi University*

Corresponding author:

Jan-Erik Romar

Faculty of Education and Welfare Studies,

Åbo Akademi University, 65101 Vasa, Finland.

(+35863247371)

E-mail: jromar@abo.fi

IZVLEČEK

Predhodne raziskave z orodji za sistematično opazovanje trenažnega procesa so poročale, da se lahko vzorec vedenja trenerja razume kot zaporeden cikel nenačrtovanih in reaktivnih vedenj, kjer trenerji najpogosteje dajejo navodila, povratne informacije in spodbude, pri tem pa sočasno upravljajo okolje treniranja. Ne glede na to pa obstaja jasna ločnica, kdaj je trenerski proces enosmeren in ne upošteva, da lahko vedenje športnikov zaznamuje postopke treniranja. Zato je bil namen te raziskave opisati in interpretirati »ekologijo učnega procesa« na treningih mladih plavalcev. Okvir raziskave so tvorila naslednja raziskovalna vprašanja: (a) Kako so trenerji strukturirali treninge? (b) Katera vedenja trenerja glede dajanja navodil in vodenja so prevladovala v tem kontekstu? ter (c) Kako aktivni so bili športniki med treningi? Dva trenerja in njuni mladi plavalci so bili posneti z videokamero med petimi treningi. Za sistematično opazovanje plavalnih treningov smo uporabili prilagojeno različico instrumenta za opazovanje strukture nalog. Rezultati so pokazali, da sta oba trenerja športnikom omogočila veliko časa za trening motoričnih spretnosti, malo časa pa namenila vodenju in dajanju navodil. Poleg opisovanja nalog in razlag, kako jih izvesti, sta trenerja dajala navodila med tem, ko so plavalci vadili, pri čemer sta posredovala tako pozitivne kot korektivne povratne informacije. Kot nazadnje, športniki so se aktivno udeleževali in pokazali visoko raven doslednosti pri izvajanju navodil in sledenju vodstvu.

Gljučne besede: treniranje, šport mladih, »ekologija« učnega procesa, plavanje

EXPLORING THE COACHING ECOLOGY IN YOUTH SWIMMING: A MULTIPLE CASE STUDY

Coach behaviour, practice activities, context and the relationship between these are seen as essential components in athlete development and learning, and they shape participants' athletic experiences. Athlete development and learning is described as going beyond just the physical performance of motor skills and techniques (Metzler, 2005). Sport participation provides athletes with the opportunity to develop decision making skills (Grehaigine, Richard, & Griffin, 2005). Furthermore, participation also includes affective benefits, such as enjoyment, increased self-esteem, and social learning (Rylander, 2015). The coaches and athletes all have central positions in achieving these effects.

Therefore, to understand coaching and develop coach education, research has, in recent decades, focused specifically on coach behaviour in the coaching context (Gilbert & Trudel, 2004; Harvey, Cushion, Cope, & Muir, 2013). Here, one accepted line of research is the use of systematic observation tools in describing coaching behaviours. Findings indicate that coaches most frequently instructed, provided feedback and encouragement as well as managed the training environment (Cope, Partington, & Harvey, 2017; Ford, Yates, & Williams, 2010; Smith & Cushion, 2006). However, the pattern of coaching behaviour can also be understood as a sequential cycle of unplanned and reactive behaviours (Kahan, 1999). Turnnidge, Côte, Hollenstein, and Deakin (2014) reported that the most frequently occurring behavioural sequence was observation followed by organisation. In addition, coaches often combined observation with subsequent positive reinforcement, technical instruction with modelling, or general communication to individual athletes, which again was followed by silent observation. However, the relationship between coach behaviour and athlete activity is relatively under-researched.

Research on traditional team games from college, high school, and youth sport contexts tend to dominate the coaching education literature (Gallimore & Tharpe, 2004; Kahan, 1999; Smith & Cushion, 2006). The structure and content of coaching sessions varies between different sports and contexts (e.g., differing situations of competition, organisation, and training) (Côté, Salmela, Trudel, Baria, & Russel, 1995; Cushion, Harvey, Muir & Nelson, 2012; Harvey et al., 2013). Furthermore, within practice sessions various instructional strategies might be used to provide appropriate instruction to different individual athletes (Erickson, Côté, Hollenstein, & Deakin, 2011). Hall, Gray, and Sproule (2016) also reported a large variance in individual coaching activities from session to session and across the season as well as between training and match day. Consequently, it is important to consider context when reviewing the research literature and little is currently known about coaching in individual sports and particularly about coaching in swimming. Only one study has looked at competitive and recreational level athletes in swimming through systematic observation and the researchers had a focus on coach-athlete interactions (Turnnidge et al., 2014).

Systematic observation can provide rich information about coach behaviour. Nonetheless, current observation data remain, to some extent, incomplete, as the focus is on direct styles of coaching and the behavioural aspects of the coach. This is a clear limitation of the existing coaching behaviour literature, where the coaching process is viewed as unidirectional (Kahan, 1999). While the mainstream research has mainly concluded that coaches' behaviours influence athletes' experiences without accounting for how athletes can actively inform coaching pro-

cesses, Turndidge et al. (2014) proposed that examining athletes' behaviours as well as coaches' behaviours may contribute to a more in-depth understanding of the broader coaching processes.

There is an evolving acknowledgement and acceptance of coaching as being educational or pedagogical, which assumes that coaching has more to do with teaching and learning than anything else (Cassidy et al., 2009; Jones, 2007; Smith, Ward, Rodrigues-Neto, & Zhang, 2009). Within research on physical education, the ecological paradigm has emerged as a powerful and helpful framework for understanding physical education teaching and learning (Hastie & Siedentop, 1999, 2006) and on the work students do in their classrooms (Hastie & Siedentop 2006). Therefore, in this article we analyse coaching in swimming through the theoretical lens of an ecological approach to teaching physical education. In our coaching ecology research, the coach was seen as equivalent to the teacher, the athletes to the learners, and training tasks to the academic tasks. As a consequence, this study fits well within the suggestions from the review of Hastie (2016) who proposed that the ecological model can serve as a useful heuristic for studying physical activity engagement sports coaching settings.

Fundamental to the study of a classroom ecology is the notion that teaching consists of a series of tasks, and researchers have identified three important task structure systems (Doyle 1983, Doyle & Carter, 1984). The instructional task system focuses on student learning and consists of the various learning activities in which students engage (Doyle, 1986, Hastie & Siedentop, 2006). The managerial task system is about all non-subject matter functions, such as routines and classroom rules, necessary for students and teachers to work productively together over a given period of time. This system brings order and organisation to a classroom and facilitates student engagement in instructional tasks. The student-social task system relates to the intentions for social interaction that students seek. These systems are interrelated, influence each other in dual directions, and organize academic work in classrooms (Hastie, 2016; Leriche, Desbiens, Amade-Scott, & Tinning, 2016). Thus, the ecological paradigm provides an understanding about the interactions between students and teachers in a learning environment: How is content organised and presented, and what are the student responses to that content? The academic work in a classroom has a program of actions that describes how subject-matter content and management come together in ways that are not easily separated (Hastie et al., 2007). It includes the sequence of content presentation and the organisation of the class in connection with the setup of the content (Hastie & Siedentop, 2006, Tannehill, Van der Mars, & MacPhail, 2015). Studies in physical education show that the strength of the program of action in a physical education class seems to be related to the work that eventually gets done in class (Hastie, 2016; Tannehill et al., 2015). Accountability is a key concept within the ecology framework and Doyle (1983) indicated that how a teacher accepts and rewards students' answers defines the academic work. A strong program of action is characterized by consistently high engagement and low off-task and task modifying behaviours by students coupled with high levels of accountability. Thus, students attempt to change tasks, the conditions under which tasks are performed, or the performance standards for task completion, which is defined as task negotiation (Doyle, 1986).

Researchers in physical education have also identified momentum, pacing, and signal systems as concepts that relate to the maintenance of the program of action (Hastie, 2016; Hastie et al., 2007). Momentum is defined as a continuous flow of student work with a high level of student engagement. Fast pacing occurs when a majority of time is allocated to activities in which teacher and student transitions are fast and activities require little modification in equipment and space. Finally, the concept of signal systems relates to how a teacher maintains pace with

accountability and feedback about task requirements, performance standards, and using other statements to energize student efforts. The signal system can also be seen in a coaching setting through the number of accountability checks, feedback on errors, hustle statements, incidents of public recognition, and task reminders during a practice session. Therefore, a verbal hustle from a coach and directed at a particular athlete or group might serve to either reinforce appropriate pacing or signal the need to increase the pace (Hastie, 2016).

Within physical education, the ecological paradigm has been used in research with a focus on task presentation, teacher responses to student work, and teacher accountability strategies, as well as on students' responses to tasks and their negotiation (see Hastie & Siedentop 2006 and Hastie, 2016 for a review). From a coaching perspective, Hastie and Saunders (1992) noted that similar task systems operate in physical education and coaching, and that the concept of accountability is important in understanding both teaching and coaching processes. While they also found that the tasks were clearly defined, Pereira, Mesquita, and Graça (2009) reported a presence of weak and ambiguous accountability systems and no coach reaction to unaccomplished tasks. Although some work has been carried out on task systems and accountability in volleyball coaching (Hastie & Saunders, 1992; Pereira et al., 2009), little is currently known about coach and athlete behaviours in an individual sport context. Therefore, to better understand the holistic nature of coaching, research should focus on individual coaches and athletes and how they operate within given contexts.

Consequently, the main purpose of this study is to contribute to the existing coaching database by providing descriptive data relating to coaching behaviours in a youth swimming context. Therefore, the specific purpose of this study is to describe and interpret the ecology of youth swimming training sessions with an in-depth, multiple case study of two swimming coaches and their athletes. More precisely, the following research questions framed the study: (a) How do the coaches structure training sessions? (b) What kind of coach instructional and managerial behaviours were prevalent in this context? and (c) How active were athletes during the training sessions?

METHODS

Participants

The participants in the study were two coaches and their athletes from a local swimming club in western Finland. This sample of coaches and athletes was purposefully sampled, that is, they were located close to the university, were willing to be observed during practice, and the club had private swimming practice sessions, which were conducive to observation. Coach Johan (all names used are pseudonyms) had been a member of the youth and adult national swimming team in Finland. He had six years of coaching experience and had levels 1, 2, and 3 swimming coaching qualifications. Coach Johan's group consisted of four boys and six girls age 12 to 16 years. This group had practiced competitive swimming three to four years and, at time of the observations, had six practice sessions a week. These athletes had a focus on participation in the national championship for their age group. Coach Niklas was ranked in the top four in youth-age swimming in Finland. He had 10 years of coaching experience, and he had levels 1, 2, and 3 coach education in swimming as well as further coach education in triathlon and diving. His group consisted of five boys and seven girls age 12 to 14 years. Athletes in coach Niklas's groups had

practiced competitive swimming from two to five years and, during participation in the study, they had four practice sessions a week. Most of these athletes participated in regional competitions. As a whole, this study context could be described as a performance domain of coaching with an emphasis on commitment to a preparation for competition and an attempt to influence performance variables (Lyle, 2002). Informed consent was obtained from all participants and parents prior to the start of data collection, and is thus in line with the authors' institutional review board policies on human subjects.

Data Collection

While the intension was to not disrupt the practice sessions, the coaches were given the authority to make all the planning and practice decisions they wished. To reduce the potential impact of researchers' presence and equipment (microphone and camera) on the behaviours of coaches and athletes, one practice session of each coach was also recorded prior to actual data collection. In addition, the second author was familiar to the athletes, as she was also a coach for another group in the club and, during data collection, she followed the practice from a nonobtrusive location. This ensured that participants were more familiar with a researcher being present during practice sessions. The observations for the study were conducted by the second author, who visited the practice sessions for a period of eight consecutive weeks. Practice sessions typically lasted approximately 90 minutes and were organized to include sets of swimming tasks with various points of focus (see examples of practice sessions in Table 1). Thus, the organization of practice sessions followed what is typical for swimming practice (Hannula, 2003).

Each coach and his group was observed and video recorded five times. A total of 971.4 minutes were recorded, which exceeds the three coaching sessions of 90 minutes that has been established as a sufficient amount of observation time in coaching education research (Brewer & Jones, 2002; Cope et al., 2017). During practice, the coach wore a cordless microphone that transmitted his voice to a receiver on a video camera mounted on a tripod, which allowed for simultaneous recording of video and audio signals.

To capture relevant information, data collection about coach and athlete behaviour was guided by the constructs within the ecological task structure (Doyle, 1986; Siedentop & Hastie, 2006). A modified version of the task structure observation system was the systematic instrument used to describe the ecology in this coaching setting (Romar, 1994; Siedentop, Doutis, Tsangaridou, Ward, & Rauschenbach, 1993). The main adaptation is the inclusion of swimming focus and categories to identify coach signal system. This is in line with previous coaching and pedagogical research where the instrument is adapted according to the particular research goal and context (Dyson & Strachan, 2004; Hall et al., 2015; Layne & Hastie, 2015; Pereira et al., 2009). The focus of the task structure observation instrument was on the instructional and managerial system, which allows for coding related to time on task, task type, coach signal system, and athlete compliance. Figure 1 displays the actual coding sheet, while Table 2 offers the operational definitions of each component.

The following sequence was used to code each instructional and managerial task of every practice session in this study. Each task was initially classified as a managerial or instructional task. Instructional tasks were coded either as coach instruction or athlete practice. The instrument also considered secondary detail of time related to the technical focus of swimming practice, which was butterfly, backstroke, breast, crawl, and medley (a mix of various skills). The total time was

Table 1. Description of practice tasks and content from one practice session for each coach.

Practice task	Content
<i>Johan, practice 3</i>	
400 m	Warm up, self-selected technique
4 x 100 m	Kicking (medley)
4 x 100 m	75 m arms + 25 m sculling
12 x 25 m	Back swimming
8 x 25 m	Sidekicks with balls and fins (strength training)
3 x 4 x 50 m	Start every minute (1. Back, 2. Crawl, 3. Own choice)
100 m	Easy
3 x 4 x 50 m	Start every minute (1. Back, 2. Crawl, 3. Own choice)
Relay	
<i>Niklas, practice 3</i>	
400 m	Warm up, self-selected technique
2 x 200 m	Medley
200 m	Medley kicking
4 x 25 m	Butterfly
5 x 3 x 50 m	Breast swim; (1. Kicking, 2. Skill focus, 3. Fast)
150 m	Easy
6 x 50 m	Breast swim with a start jump
200 m	Back swim with fins
2 x 25 m	Back swim fast with fins
300 m	Crawl with fins
2 x 25 m	Crawl fast with fins
200 m	Breast swim kicking
4 x 25 m	Butterfly fast
200 m	Cool down
Relay	

Time		Start			End		
Task type	Org	Inst	Breast	Crawl	Back	Butterf	Medl
Coach	Name	Concurrent instru			Post-instruction		
behav	Posit model	Negat model			FB positive		
	Pre-instr (What)	Pre-instr (How)			FB negative		
	Questioning	Physical assist			FB corrective		
	Praise	Scold			Hustle		
Athlete	Appropriate	Inappropriate			Non-engagement	Off Task	
2	Appropriate	Inappropriate			Non-engagement	Off Task	
3	Appropriate	Inappropriate			Non-engagement	Off Task	
4	Appropriate	Inappropriate			Non-engagement	Off Task	

Figure 1. Coding sheet

based on duration coding with start and end times of each activity recorded. Thus, it allowed the observers to view the elements of a practice session and determine the amount of time spent in different categories. For each task, one athlete was first randomly selected for observation for one minute. After the end of one minute, another athlete from the group was observed. This process continued until the task was completed. Athletes not being observed would be identified for observation in the following task. If the task was of long duration, some athletes would be observed multiple times, thus the order of athlete observation would be followed. If the task was managerial (non-academic tasks related to the organization and direction of athlete behaviour) or coach instruction, athlete compliance was measured in terms of congruence between the stated task and the behaviour of athletes, with those behaviours being classified as either on-task or off-task. The percentage of time one athlete was in either category was calculated for each practice session. To quantify athlete compliance in practice tasks, the engagement of one athlete was coded according to their behaviour in one of four categories: (a) appropriate practice, (b) inappropriate practice, (c) non-engagement, or (d) off-task behaviour. Table 2 shows the definitions of each of these categories. In addition, field notes were taken to describe non-engagement and off-task behaviour. The coach signal system was event coded with categories mainly from the Coach Analysis and Intervention System (CAIS) instrument (Cushion et al., 2012). In line with Ford et al. (2010), the instrument used for recording coach behaviour focused on 15 key 'instructional' behaviours, which have been consistently reported as the most utilized by coaches (Cope et al., 2017).

Table 2. Definitions of terms

Type of task	Definition
Managerial	Content related to organizing athletes and equipment
Coach instruction	Content related to the coach providing instructions and demonstration of practice tasks
Athlete practice	Tasks where different techniques were practiced in drills or sets with various speed, and the coach provided instructions about the technique to be used
Coach signal system	Definition
Name	Use of name when speaking directly to an athlete
Pre-instruction (What)	Initial information given to athletes about what to do
Pre-instruction (How)	Initial information given to athletes about how to perform the skill (critical elements)
Concurrent instruction	Cues or reminders given during the execution of the task to all athletes
Post-instruction	Corrections, re-explanation, or a summary given after the execution of the task
Positive modelling	A demonstration of a correct performance of a skill
Negative modelling	A demonstration of an incorrect performance of a skill
Physical assistance	Physically moving an athlete to the correct position or through the correct range of movement
Questioning	Any questions to athletes or listening and responding to athletes questions, unless falling under instruction or feedback
Positive feedback	Verbal or non-verbal positive information about the athletes' performance

Type of task	Definition
Negative feedback	Verbal or non-verbal negative information about the athletes' performance
Corrective feedback	Specific verbal communication about errors in the performance, including feedback aimed at improving performance execution
Praise	Compliments and statements about general behaviour, such as attitude and effort
Scold	Displeasure about general behaviour
Hustle	Verbal statements aimed at intensity effort
Athlete compliance	Definition
Appropriate	The athlete is appropriately engaged carrying out an assigned task, such as moving to correct space, getting equipment, or listening to instructions (managerial and coach instruction tasks)
Inappropriate	The athlete's performance is consistent with the correct execution of the skill as described and demonstrated by the coach (Athlete practice tasks)
Non-engagement	The athlete's performance is not consistent with the task as described and demonstrated by the coach [task modification] (Athlete practice tasks)
Off-task	The athlete showed no overt signs of being active, yet was not misbehaving (Athlete practice tasks)
	The athlete was involved in an activity in a clearly unsuitable action (all tasks)

Data analysis

Data obtained from the modified task structure observation instrument was arranged to provide an indication of the type of tasks, duration, frequency, percent, and athlete compliance. The observed tasks were first classified as to type and duration within the managerial and instructional task categories. The instructional tasks were further classified into coach presentation and practice tasks. Coach behaviour was analysed as the signal system that structures athlete practice. The athletes' responses to these tasks were recorded based on their engagement. The length of each practice session was recorded, and the duration and proportion spent in each of the three task forms and five content categories were subsequently calculated. To determine the mean percentage of time spent in tasks and content categories across all sessions, the time variables for each practice session were summed and divided by the total number of sessions. Coach behaviour data were coded and quantified for each behaviour category. Overall totals, percentages, and rates per minute for each category were calculated and summed. The rate per minute for each behaviour was calculated by dividing the total for each category by the total number of minutes observed. Coach behaviour studies have frequently reported findings in terms of percentages (Cope et al., 2017), and it was recommended as a reliable variable (Ford et al., 2010).

Pilot work was done to verify the validity of the instrument through preliminary observations of trial recordings. As a result, no categories were added, deleted, or amended. The pilot work also constituted the training for the observers, which was supervised by an experienced researcher (the first author). Additionally, intra-observer and inter-observer agreement checks were calculated for 20 % of randomly selected practice sessions. For intra-observer agreement, the second author analysed the video on two separate occasions with at least a two-month gap for memory lapse to occur (Darst, Zakrajsek, & Mancini, 1989). Another trained and experienced observer served in analysing inter-observer agreement for time, coach behavioural, and athlete compliance data.

Both the inter-observer (88.1%) and intra-observer (93.9%) agreement for this study exceeded the determined criterion level of 80% and the overall mean was 91.6% (van der Mars, 1989).

RESULTS

The data represent how the coaches and athletes create a working ecology in swimming practice. Results from the systematic observation are broken down into a separate case for each coach. The coaching ecology for Johan is followed by the ecology for Niklas.

The Coaching Ecology for Johan

Johan's practice sessions totalled 476 minutes, with a mean duration of 95.2 minutes. A total of 9 managerial, 41 coach presentation, and 66 practice tasks, with an average of 23 tasks per session, were identified for Johan. Table 3 shows a comparison of the time spent in instructional tasks during practice sessions under Johan's direction. At first, these data show that Johan provided much time for athlete practice (91%), while little time was used in managerial and coach presentation tasks. Second, the coach allocated much time (71%) to practice sets with a focus on medley (a mix of all techniques). A specific focus on backstroke and crawl techniques had a similar amount of time, while no practice set had a key focus on breast technique.

Table 3. Coach use of practice time by task type and swimming focus

	Johan		Niklas	
	Time (min)	%	Time (min)	%
Task type				
Managerial	2.03	2.1	3.32	3.3
Coach presentation	6.65	7.0	10.37	10.5
Athlete practice	86.52	90.9	85.39	86.2
Swimming focus				
Butterfly	1.33	1.6	9.56	11.2
Backstroke	11.63	13.4	8.85	10.4
Breast	0	0	19.43	22.8
Crawl	12.46	14.4	9.77	11.4
Medley	61.78	70.6	37.78	44.2

A total of 1,289 event behaviours were coded from Johan's practice sessions. Five behaviours comprised almost three-fourths of his signal system during coaching (see Table 4). Most of these were related to providing instruction, while less emphasis was on accountability, particularly through corrective feedback (14%). In structuring practice sessions, Johan most frequently employed 'concurrent instruction', 'pre-instruction (what)', and 'pre-instruction (how)'. Conversely, he used 'post-instruction' and 'physical assistance' only one time each during all practice sessions. Similarly, 'praise', 'scold', and 'hustle' were infrequently employed during Johan's practice sessions.

Table 4. Overall total behaviours, percent of behaviour (%) and rate per minute (RPM) for Johan and Niklas.

	Johan			Niklas		
	Total	%	RPM	Total	%	RPM
Name	120	9,3	0,25	301	15,6	0,61
Pre-instruction (What)	226	17,5	0,47	386	20,1	0,78
Pre-instruction (How)	163	12,7	0,34	169	8,8	0,34
Concurrent instruction	268	20,8	0,56	376	19,6	0,76
Post-instruction	1	0,1	0,002	0	0	0
Positive modelling	88	6,8	0,18	103	5,3	0,21
Negative modelling	44	3,4	0,09	46	2,4	0,09
Physical assistance	1	0,1	0,002	0	0	0
Questioning	84	6,5	0,18	133	6,9	0,27
Positive feedback	57	4,4	0,12	83	4,3	0,17
Negative feedback	5	0,4	0,01	30	1,6	0,06
Corrective feedback	180	14,0	0,38	156	8,1	0,31
Praise	14	1,1	0,03	31	1,6	0,06
Scold	17	1,3	0,04	63	3,3	0,13
Hustle	21	1,6	0,04	46	2,4	0,09

Athlete compliance within the managerial and coach instruction task was particularly high, with only a few incidences of off-task behaviour (see Table 5). When athletes were off-task during coach instruction tasks, this involved being slow to respond to a particular protocol or not paying full attention to coach instruction. In term of athlete engagement during practice tasks, Table 5 shows

Table 5. Athlete compliance by each coach

Tasks	Appropriate		Inappropriate		Non-engagement		Off-task	
	Time (min)	%	Time (min)	%	Time (min)	%	Time (min)	%
Johan								
Managerial	10.14	100					0	0
Instructions	33.16	99.7					0.11	0.3
Practice	281.47	65.1	0.58	0.1	150.28	34.7	0.25	0.1
Niklas								
Managerial	16.58	100					0	0
Instructions	50.67	97.8					1.36	2.2
Practice	283.48	66.3	4.86	1.1	137.60	32.2	1.02	0.2

the time spent in the four categories. On average, the athletes spent about two thirds of their time participating appropriately in swimming practice tasks, few tasks modifications occurred, and few off-task behaviours were observed. However, athletes were non-engaged about one third of their time in practice, which means they were passively waiting for their turn to swim or receive feedback from the coach.

The Coaching Ecology for Niklas

Niklas's practice sessions equalled 495 minutes, where the average length of one practice session was 99.1 minutes. Niklas had a total of 16 managerial, 51 coach presentation, and 71 athlete practice tasks, with an average of 28 tasks per practice session. The ways Niklas spent time in instructional tasks during practice sessions are shown in Table 3. On average, he provided a majority of time to athlete practice tasks. In addition, about 10% of practice session time was in coach presentation task, while only about 3% was used for managerial tasks. Niklas also allocated most time (44%) to practice sets with a focus on medley (a mix of all techniques). However, breast technique received the second-most focus during his practice sessions. In addition, Niklas spent similar amounts of time on crawl, butterfly, and backstroke techniques.

A total of 1,923 event behaviours were coded from Niklas's practice sessions. Table 4 shows that five behaviours comprised about 72% of his signal system. Of these, 'pre-instruction (what)' and 'concurrent instruction' were the most employed behaviours overall. 'Name' was the third most employed coach behaviour. As with Johan, Niklas did not use 'post-instruction' and 'physical assistance'. However, he more frequently employed 'scold' and 'hustle' than Johan.

Table 5 shows athlete compliance in time during practice all practice sessions. Within managerial tasks, athletes were 100% compliant with coaching instruction, while during coach instruction tasks, athletes were off-task at 2.2%. In terms of athlete engagement during practice tasks, the athletes spent on average 66.3% of practice time in appropriate swimming practice. The athletes showed about one minute of total practice time in off-task behaviour, where they were diving or talking to other athletes. Similarly, there were few task modifications. Nevertheless, non-engagement occupied about 32% of the time for practice tasks.

DISCUSSION

The purpose of this study is to examine the ecology of two coaches and their athletes during youth swimming practice sessions so as to provide some tentative explanations based on previous research within the ecological paradigm. This paradigm suggests a shift in thinking from coaches to the practical work as the central element of athletes' experiences in the coaching setting. The key findings from this case study was that the two coaches showed more similarities than differences, where management and coach instruction time was low and much time was provided to athlete swim practice. In addition, the coaches created a working climate where athletes were most of the time on task, although they sometimes waited for their turn. Our findings are particularly relevant given previous existing coaching studies in team sports (Cope et al., 2017; Ford et al., 2010), where little focus was on the unidirectional athlete role in the coaching process (Kahan, 1999; Turnidge et al., 2014). Thus, the discussion of coach and athlete behaviour are grounded within the ecological paradigm, specifically concentrating on the concepts of program of action, signal systems, momentum, and pacing.

The concept of program of action, introduced by Doyle (1986), is used to describe the notions of teaching or coaching content and the organization merging together in ways that are not easily separated (Hastie & Siedentop, 2006). These two coaches were effective managers and created a strong and robust program of action with high athlete engagement, few task modifications, and little off-task behaviour. This was noticed in managerial, coach instruction, and athlete practice tasks. It can be assumed that these coaches were capable of guiding management, content, and participants along a course toward high-quality performance (Hastie, 2016). The management of the coaching setting might be different compared to physical education classes, as the athletes are in the swimming pool and they utilize little equipment to detract from the establishment and maintenance of the program of action. Thus, the coaching ecology in this setting was characterized by strong program of action, which is different to many physical education classes, which lack intensity and require little effort from students (Siedentop et al., 1994). However, it also needs to be recognized that all athletes participate voluntarily several times a week, and that each group was about ten athletes, which may enhance productivity and reduce the potential for disruptive and non-focused behaviour.

The coaches were working directly with the athletes, and although the athletes were sometimes required to wait for a turn to swim, they showed few off-task behaviours while the coach could still observe them. This supports Hastie's (2016) notion about monitoring, that unsupervised students tend to become deviant or to avoid involvement. Similarly, athlete modification of practice tasks was low, which means tasks were seldom modified to make them more or less challenging, to increase chances of success, or to hide their social interactions. The high congruence between tasks as stated and those practiced by athletes, showed a program of action, which has strong work orientation (Hastie et al., 2007). This might be related to that athletes worked toward some authentic athletic goals, which is typical in the sporting setting. However, emphasis in practice was different for the two coaches: One coach had a focus on mixing swimming techniques into each practice set, while the other coach had practice sets with a single technical focus.

Signal systems, momentum, and pacing are all concepts that relate to the maintenance of the program of action. In a coach-centred approach, the coach manages, instructs, and monitors athletes through the signal system. The signal system can also be seen in a coaching setting through the number of accountability checks, feedback on errors, hustle statements, incidents of public recognition, and task reminders during a practice session. Therefore, a verbal hustle from a coach and directed at a particular athlete or group might serve to either reinforce appropriate pacing or signal the need to increase the pace (Hastie, 2016). These two coaches informed athletes concerning practice task requirements and performance standards through specific tasks, for example, explicitly describing how many times an athlete had to swim a certain distance. They also frequently pointed out the technical swimming focus for practice tasks in task presentations. Hastie and Saunders (1992) also reported that ambiguity was low when tasks were clearly defined in a volleyball coaching setting. They noted that most drills required players to perform a specific number of repetitions or to continue until success was reached. Thus, the coach would always designate the criteria for a perfect pass. Athlete accountability for practice performance was further improved in our study with coach monitoring and subsequent feedback within these coaching settings' signal systems. Although there were some differences in the signal systems for these coaches, they showed similar instructional patterns as coaches in previous research (Cope et al., 2017; Harvey et al., 2013). They showed high frequency of instructional behaviour, and the athletes were held accountable for swimming effort through feedback and other prompts.

Consequently, although coaches can create solid signal systems that keep athletes focused on improving their swimming performance, we did not measure this in our current study. Our results clearly differ from Pereira et al. (2009) where volleyball coaches basically failed to monitor players' task accomplishment and there was a weak and ambiguous signal system. Accordingly, in the case of youth swimming practice, these various signals are the communications presented by the coach as well as tasks that are relatively clear and routine; athletes tend to practice actively with little hesitation or resistance. Thus, we employed the concept of signal systems to explain how different activity structures and tasks influence athlete involvement.

This continuous flow of athlete work has been defined as momentum within the ecological paradigm (Hastie et al., 2007). That is, there will be high levels of student engagement that can be observed from athlete engagement and response rates during practice sessions (Hastie, 2016). This youth swimming context was characterized by a continuous flow of athlete work similarly showing a considerable momentum where the level of athlete on-task behaviour for practice tasks was almost 100%. The results suggest that there is no decrease in compliance compared to studies in physical education settings (Siedentop et al., 1994.) Thus, in the current study, athletes showed high success rates, thereby providing evidence that practice tasks were at an appropriate level of difficulty. One explanation for the high compliance can be that athletes were part of a strong program of action implemented by experienced coaches. Taking the context into consideration, we conclude that our findings may represent the higher end of practice engagement (Romar, Ranta-Aho, & Williams., in review; Smith et al., 2009; Turnnidge et al., 2014). However, swimming is regarded as an endurance sport and, as this study shows, practice sessions are built of interval sets of rather high intensity. Thus, there need to be rest periods for athletes between intensive repetitions, which also was evident in our results, as about one third of time for practice tasks was in non-engagement.

Finally, the athletes' high opportunities to practice was also related to the fast pacing in this coaching ecology. Hastie et al. (2007) defined fast pacing as when the majority of time is allocated to activities in which coach and student transitions are smooth and activities require little change in equipment and space. These coaches provided about 85% of practice session time for athlete swimming practice, which meant that time for management and instruction was low. Other studies in the coaching context support our findings (Romar et al., in review; Smith et al., 2009), although there are also some conflicting results from team sports research (Cope et al., 2017; Ford et al., 2010). Based on our study, we suggest the format used—swimming practice sessions with athletes in the pool completing routine task repetitions—may be typical for the context. Nevertheless, Hastie (2016) suggested that individual tasks are not retained over long periods in a fast paced ecology. Thus, in the current study, the coaches averaged about ten practice tasks during one practice session of 90 minutes, which conflicts with fast paced ecology in physical education. This might be related to different sociocultural contexts: Coaching-motivated athletes can sustain productive practice through a strong program of actions, whereas physical education classroom lessons have shown weaker programs of action leading to lower student effort.

In interpreting the results of this study, it is important to note that the study is not without limitations. Due to the use of only two coaches and their groups from one swimming club and a small sample of practice sessions, there is a potential for limited generalizability of the results and conclusions. Given that the ecological analysis in this study can help us understand the athlete engagement and learning in youth swimming, the next challenge is to also include the social task system, where athletes social agenda and the negotiation process is analysed. Consequently,

this analysis could include a mixed methodology implementing coach and athlete interviews to gather more information regarding coach intension and athlete responses in practice sessions.

CONCLUSION

This study contributes to our understanding of coach and athlete work in a youth swimming context. It provides clear descriptions of the tasks and how practice is structured in an individual sport. The analysis using the ecology paradigm demonstrated that coaches can create strong programs of action that guide athletes through practice sessions. In addition, coaches' signal systems, pacing, and momentum are all concepts that relate to the maintenance of the program of action.

REFERENCES

- Brewer, C. J., & Jones, R. L. (2002). A five-stage process for establishing contextually valid systematic observation instruments: the case of rugby union. *Sport Psychologist, 16*(2), 138-159.
- Cassidy, T., Jones, R., & Potrac, P. (2009). *Understanding sports coaching: the social, cultural and pedagogical foundations of coaching practice*. Abingdon: Routledge.
- Cope, E., Partington, M., & Harvey, S. (2017). A review of the use of a systematic observation method in coaching research between 1997 and 2016. *Journal of Sports Sciences, 35*(20), 2042-2050.
- Coté, J., Salmela, J., Trudel, P., Baria, A., & Russel, S. (1995). The coaching model: A grounded assessment of expert gymnastic coaches' knowledge. *Journal of Sport & Exercise Psychology, 17*(1), 1-17.
- Cushion, C., Harvey, S., Muir, B., & Nelson, L. (2012). Developing the Coach Analysis and Intervention System (CAIS): Establishing validity and reliability of a computerised systematic observation instrument. *Journal of Sports Sciences, 30*(2), 201-216.
- Darst, P. W., Zakrajsek, D. B., & Mancini, V. H. (1989). *Analyzing physical education and sport instruction*. Champaign, IL: Leisure Press.
- Doyle, W. (1983). Academic work. *Review of Educational Research, 53*, 159-199.
- Doyle, W. (1986) Classroom organization and management. In M.C. Wittrock (Ed.), *Handbook of research on teaching*, (3rd edn.), (pp. 392–431). New York: Macmillan.
- Doyle, W. & Carter, K. (1984). Academic tasks in classrooms, *Curriculum Inquiry, 14*: 129-149.
- Dyson, B., & Strachan, K. (2004). The ecology of cooperative learning in a high school physical education programme. *Waikato Journal of Education, 10*, 117-139.
- Erickson, K., Côté, J., Hollenstein, T., & Deakin, J. (2011). Examining coach–athlete interactions using state space grids: An observational analysis in competitive youth sport. *Psychology of Sport and Exercise, 12*(6), 645-654.
- Ford, P. R., Yates, I., & Williams, A. M. (2010). An analysis of practice activities and instructional behaviours used by youth soccer coaches during practice: Exploring the link between science and application. *Journal of Sports Sciences, 28*(5), 483-495.
- Gallimore, R., & Tharp, R. (2004). What a coach can teach a teacher, 1975-2004: Reflections and reanalysis of John Wooden's teaching practices. *The Sport Psychologist, 18*(2), 119-137.
- Gilbert, W. D., & Trudel, P. (2004). Analysis of coaching science research published from 1970–2001. *Research Quarterly for Exercise and Sport, 75*(4), 388-399.

- Gréhaigine, J.F., Richard, J-F., & Griffin, L. (2005). *Teaching and learning team sports and games*. New York: Routledge Falmer.
- Hall, E. T., Gray, S., & Sproule, J. (2016). The microstructure of coaching practice: behaviours and activities of an elite rugby union head coach during preparation and competition. *Journal of Sports Sciences*, 34(10), 896-905.
- Hannula, D. (2003). *Coaching swimming successfully*. Champaign, IL: Human Kinetics.
- Harvey, S., Cushion, C. J., Cope, E., & Muir, B. (2013). A season long investigation into coaching behaviours as a function of practice state: The case of three collegiate coaches. *Sports Coaching Review*, 2(1), 13-32.
- Hastie, P. (2016). The classroom ecology paradigm and its contribution to understanding context in physical education. *Recherches & éducatives*, 15, 29-50.
- Hastie, P., Saunders, J. (1992). A study of task systems and accountability in an elite junior sports setting. *Journal of Teaching in Physical Education*, 11(4), 376–388.
- Hastie, P., & Siedentop, D. (1999) An ecological perspective on physical education. *European Physical Education Review*, 5(1), 9–27.
- Hastie, P., & Siedentop, D. (2006). The classroom ecology paradigm. In D. Kirk, D. Macdonald, D., & M. O’Sullivan, (Eds.), *The handbook of physical education* (pp. 214–225). London: Sage.
- Hastie, P., Sinelnikov, O., Brock, S., Sharpe, T, Eiler, K., & Mowling, C. (2007). Kounin revisited: Tentative postulates for an expanded examination of classroom ecologies. *Journal of Teaching in Physical Education*, 26(3), 298-309.
- Jones, R. (2007). Coaching redefined: an everyday pedagogical endeavor. *Sport, Education and Society*, 12(2), 159-173.
- Kahan, D. (1999). Coaching behaviour: a review of the systematic observation research literature. *Applied Research in Coaching and Athletics Annual*, 14, 17e58.
- Layne, T., Hastie, P. (2015). A task analysis of sport education physical education season for fourth grade students. *Physical Education and Sport Pedagogy*, 20(3), 314–328.
- Leriche, J., Desbiens, J. F., Amade-Escot, C., & Tinning, R. (2016). Compatibility and complementarity of classroom ecology and didactic research perspectives in physical education. *Quest*, 68(4), 497-520.
- Lyle, J. (2002). *Sports coaching concepts: A framework for coaches’ behaviour*. London: Routledge.
- Metzler, M.W. (2005). *Instructional models for physical education*. Michigan: Holcomb Hathaway Publishers.
- Pereira, F., Mesquita, I., & Graça, A. (2009). Accountability systems and instructional approaches in youth volleyball training. *Journal of Sports Science & Medicine*, 8(3), 366.
- Romar, J. E. (1995). *Case studies of Finnish physical education teachers: Espoused and enacted theories of action*. Åbo, Finland: Åbo Akademi University Press.
- Romar, J-E., Ranta-Aho, M., & Williams, E. (in review). Exploring the coach’s and athletes’ behaviour in martial arts: A case study. *Kinesiology*.
- Rylander, P. (2015). Coaches’ bases of power: Developing some initial knowledge of athletes’ compliance with coaches in team sports. *Journal of Applied Sport Psychology*, 27(1), 110-121.
- Siedentop, D., Douthett, P., Tsangaridou, N., Ward, P., & Rauschenbach, J. (1994). Don’t sweat gym: An analysis of curriculum and instruction. *Journal of Teaching in Physical Education*, 13, 375-394.
- Smith, M. & Cushion, C. (2006). An investigation of the in-game behaviours of professional, top-level youth soccer coaches. *Journal of Sports Sciences*, 24(4), 355-366
- Smith, R. C., Ward, P., Rodrigues-Neto, M., & Zhang, P. (2009). Practice behaviors of youth soccer players. *Physical Educator*, 66(1), 2.

Tannehill, D., Van der Mars, H., MacPhail, A. (2015). *Building effective physical education programs*. Burlington; Jones & Bartlett Learning.

Turnnidge, J., Côté, J., Hollenstein, T., & Deakin, J. (2014). A direct observation of the dynamic content and structure of coach-athlete interactions in a model sport program. *Journal of Applied Sport Psychology*, 26(2), 225-240.

van der Mars, H. 1989. Observer reliability: Issues and procedures. In P. W. Darst, D. B. Zakrajsek, & V. H. Mancini (Eds.), *Analyzing physical education and sport instruction* (2nd ed.) (pp. 53–80). Champaign, IL: Human Kinetics.