

**EXPLORING CO-REGULATORY SCAFFOLDING BETWEEN A COACH AND
FIGURE SKATER IN PRACTICE: A CASE STUDY**

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Abstract

Self-regulated learning (SRL) processes are frequently used by elite athletes and are thought to be an important factor in the development of expertise (McCardle, Young, & Baker, 2017). Before learners become self-regulated, they must first be co-regulated by a more experienced other (Glaser, 1996), such as an instructor. Scaffolding, a form of co-regulation, has three conceptual characteristics: contingency, fading, and transfer of responsibility (van de Pol & Elbers, 2013). Of the little research done on scaffolding, most studies have been in the education domain with few looking at it in a naturalistic setting. This thesis represented a seminal investigation on the nature of scaffolding in a coach-athlete dyad. It aimed to explore scaffolding using a naturalistic, instrumental case study with an experienced female coach (aged 53, national level) and her competitive male figure skater (aged 15, provincial level) using a concurrent mixed methods design (Creswell, 2003). Data were collected through a) an athlete self-report survey on SRL at the beginning and end of data collection; b) participant observation, field notes, and audio recordings of coach-skater dialogue at 16 practices spread across 5 months of the season; and c) three separate interviews at mid-, late-, and post-season with the coach and skater. Study 1 presents results informed by the skater's survey and quantitative analyses of audio transcripts. The skater's self-report of the SRL-SP (Bartulovic, Young, & Baker, 2017) was higher at time two (post-season) compared to time one (mid-season), indicating an increase in SRL. Due to very poor reliability uncovered in pilot work, planned analyses to determine changes in the directionality of coach- and skater-initiated discussion and contingency at various points across the season could not be performed. Study 2 presents the results of thematic analysis (Braun & Clarke, 2006) on the interview data and audio transcript excerpts. Deductive analyses showed it was difficult to identify and describe aspects of the three scaffolding characteristics

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separately due to their overlapping conceptual definitions, and their interplay during practice. Inductive analyses revealed nuances of scaffolding in sport, including micro- and macro-level co-regulation. Micro-level co-regulation emerged as an important “interface” illustrated by mature coach-skater interactions surrounding practice trials. The interface involved shared and individual expectations for the coach and skater, roles, and described transitory processes relating the co-regulatory interface to the skater’s SRL. Fading in sport differed from the linear model in education with a cyclical pattern of engagement by the coach, returning to refine the skater’s elements if they were incorrect. After integrating and interpreting all the data, the findings suggested scaffolding manifests in unique ways in a sport dyad, with SRL representing a process goal of the interface.

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Chapter 1: Introduction

In order to maximally benefit from practice activities during the development of sport expertise, it appears crucial that an athlete develops self-regulated learning competencies and psychological processes (McCardle, Young, & Baker, 2017). Becoming an agent of one's own learning is associated with optimal practice conditions (Bartulovic, Young, & Baker, 2017; Glaser, 1996). Self-regulated learning involves “strategic and metacognitive behaviour, motivation, and cognition aimed toward a specific goal” during practice (Hadwin & Oshige, 2011) and is often defined as having six facets: planning, self-monitoring, evaluation, reflection, effort, and self-efficacy (Bartulovic et al., 2017). Recent work has suggested that self-regulated learning skills and competencies serve to enhance sport practice levels, and more specifically are thought to be associated with deliberate practice (McCardle, et al., 2017). In terms of expertise development, this is important because the accumulation of deliberate practice (DP) is associated with elite performance and differences in expertise can be explained by discrepancies in cumulative DP (Ericsson, Krampe, & Tesch-Römer, 1993). In research that has assessed self-regulated learning with elite and non-elite athletes in sport, findings show that greater amounts of self-regulated learning (SRL) associate with greater likelihood of a person being at a more elite level (Bartulovic et al., 2017; Toering, Elferink-Gemser, Jordet, and Visscher, 2009). Therefore, due to the synergies between SRL and DP, any processes that encourage the development of SRL are likely important early factors in the development of expertise.

In order to develop self-regulated competencies and psychological processes, one first needs to be exposed to conditions wherein they are regulated by others (Glaser, 1996; Karasavvidis, Pieters, & Plomp, 2000; Vygotsky, 1987). Moreover, literature suggests that an integral portal to self-regulation is via processes and conditions associated with *co-regulation*

(Hadwin, Järvelä, & Miller, 2011), however it has yet to be assessed with a coach and athlete in sport practice (McCardle et al., 2017). A conceptualization of co-regulation is scaffolding (Hadwin & Oshige, 2011) that has been found to have three recurring conceptual characteristics across various studies: contingency, fading, and transfer of responsibility (van de Pol, Volman, & Beishuizen, 2010). Scaffolding has been assessed in naturalistic settings in education, however it has yet to be assessed in sport.

Sport requires both cognitive and physical abilities, therefore it is important to look at both the education and motor learning domains. The concept of fading has been assessed in the motor learning domain, supporting the notion from scaffolding where feedback (or knowledge of results; KR) can be beneficial if it is provided relatively frequently when someone is first learning a skill and then gradually faded over time with the occurrence of skill acquisition (Winstein & Schmidt, 1990). However, this research in the motor learning domain occurs in laboratory settings and may not translate to a naturalistic setting. Scaffolding has been theorized in the sport and coaching literature, with Jones and Thomas (2015) believing that fading does not occur within sport, but coaches will leave behind a ‘ghost framework’ to revisit if a practicing athlete is struggling with a skill. Therefore, it is important to assess if and how scaffolding occurs within sport.

This study aims to explore the nature of co-regulation and scaffolding in a sport practice context. Results from the current investigation may give insight on if and how scaffolding occurs within sport, and if it may lead to an athlete becoming more self-regulated in their learning.

Chapter 2: Review of Literature

Co-regulation

Co-regulation is the temporary act of an other indirectly regulating the cognitions, behaviours, metacognitions, and motivations of a learner through active *scaffolding*, which is expected to result in increased self-regulatory abilities in a learner (Hadwin, Wozney, & Pontin, 2005; Puntambekar & Hübscher, 2005; Zimmerman & Schunk, 2001). An instructor or coach is conceived to be a critical agent in this translational process of co-regulation (McCaslin & Burross, 2011; Young & Medic, 2008). Unfortunately, to our knowledge, the impact of the coach on co-regulation as it relates to the development of SRL has yet to be empirically assessed. Bartulovic et al. (2017), for example, had participants report various forms of practice (either with or without a coach) and their relations with SRL competencies, but the authors did not specifically consider the role of co-regulation on the athletes. While there has been consideration of co-regulation between coach and athletes in relation to self-regulation of competitive curling performance (Collins & Durand-Bush, 2014), there have been very limited empirical studies assessing co-regulation between an athlete and a coach in a sport practice context (McCardle, et al., 2017). The concept of co-regulation has been assessed in the education domain through teacher-student relationships; however, understandings of processes of how co-regulatory influences facilitate SRL development in academia may not be pertinent in the sport domain. Thus, it is important to assess how athletes learn to self-regulate via their interactions with a coach and the co-regulatory influence of a coach.

Scaffolding

Scaffolding is a particular conceptualization of co-regulation (Hadwin & Oshige, 2011). The term scaffolding was first used by Wood, Bruner and Ross (1976) to explain the support that

a tutor gives a learner in order for them to achieve a goal, carry out a task, or solve a problem that was initially beyond their capacity. It is a metaphor taken from the field of construction where a temporary support is used to help build a structure and then taken down when the structure is complete (van de Pol et al., 2010). Metaphorically, for an athlete this means that the coach will provide them with a lot of support when they first start to learn a task or skill (e.g., give the athlete specific instructions, monitor the athlete, and provide feedback) until the athlete starts to show progress, in which the coach will decrease their explicit and verbal responses until the athlete is able to complete the skill or task on their own.

The premise of scaffolding is based on Vygotsky's (1978) socio-cultural theory, more specifically his notion of the Zone of Proximal Development (ZPD). ZPD is when a more knowledgeable other helps a student achieve a goal that they would not have been able to do on their own, bringing the student from their actual developmental level to their potential developmental level (Vygotsky, 1978). This is further emphasized by Vygotsky's general genetic law of cultural development: "every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first *between* people (interpsychological), and then *inside* the child (intrapsychological)" (p.57, emphasis in the original). This law suggests that it is important to study the initial manifestation of a skill between two or more people and how it later becomes internalized within an individual (Karasavvidis et al., 2000).

Conceptually, the framework on scaffolding specifies three characteristics, or instrumental mechanisms, that can be studied to understand conditions of co-regulation. While looking at a decade of literature, van de Pol et al. (2010) found that, across multiple studies, scaffolding has three recurring characteristics: *contingency*, *fading*, and *transfer of responsibility*.

Contingency refers to the teacher's initial evaluation of the student and how the support or control from the teacher is adjusted based upon the student's success or failure to progress in a task (Radford, Bosanquet, Webster, Blatchford, & Rubie-Davies, 2014; van de Pol & Elbers, 2013). For example, if a learner has difficulties reproducing a correct response, the instructor provides a strategy to help the learner recall the information (i.e., adding control) instead of waiting for him/her to fail. If a learner executes a response correctly, the instructor responds by prompting the learner to provide more information or continuing on if the learner's response is sufficient. *Fading* is when the teacher gradually withdraws their control/support over time, reducing the frequency of their control/support, thereby providing the learner with increasing latitude to self-regulate (Puntambekar & Hübscher, 2005). For example, the more correct answers a student provides on a topic, the less support a teacher will provide to help the student. *Transfer of responsibility* is closely related to fading such that if a teacher is fading their support to a student, it is conceptually posited that the learner is internalizing the processes they used, and that the learner is taking control of their responsibility for learning (Puntambekar & Hübscher, 2005). In principle, scaffolding helps optimize practice conditions, turning the responsibility over to the learner, but only if the instructor is utilizing the concept of fading. Without fading, the support that the instructor gives a learner would be distributed intelligence (the coach and athlete share the knowledge surrounding a task but the athlete does not learn to do it on their own; Pea, 1993; 2004) rather than scaffolding itself. Very few studies have examined fading and transfer of responsibility in a naturalistic setting (how things occur naturally in the environment without any manipulation), thus, it is imperative to see whether and how these concepts materialize in practice.

Scaffolding and optimal learning in education. Nearly all studies on co-regulation/scaffolding have been in an education context. Amongst these studies, only a few have examined it within a naturalistic setting. Hadwin et al. (2005) examined the transition of SRL control from instructor to student through naturalistic interactions over the course of a school year. Participants were 10 females who were randomly selected from a year-long graduate research methods and analysis course. As part of the course, participants had to create a research portfolio with assignments that demonstrated growth and competence in the course, as well as attend four individual conferences based on their portfolio. The conferences were videotaped and later analyzed and coded by researchers. Coded data for a conference at the beginning and end of the year were used to contrast facets of SRL. Teacher-student dialogue was also assessed four weeks post assignment of a complex task, and four weeks prior to when the assignment was to be submitted. The investigators made several hypotheses related to conceptual aspects of co-regulatory scaffolding, and systematically tested them in different analytic stages using discourse analyses of content and frequencies of interactions. Specifically, they hypothesized that a) teacher fading would occur in the teacher-student dialogue; b) teachers' (fading of) support would be based on phases of the self-regulatory process at a specific time; and c) the techniques used for scaffolding would be focused on specific phases and facets of the self-regulatory cycle (Hadwin et al., 2005).

Hadwin et al. (2005) advocated that teacher-student dialogue should be understood in terms of its directionality. Specifically, they examined the frequencies with which a teacher or student actively directed dialogue, and also interactions that were "indirect" in nature. Hadwin et al. explicitly contended that both teacher-indirect and student-indirect dialogue could be treated together where "co-regulation comprised all instances of either teacher-indirect or student-

indirect regulation” (p. 430). Since co-regulation is the interaction between the teacher and learner, it was believed that the two indirect categories of self-regulatory ownership would accurately represent co-regulation.

Hadwin et al.’s (2005) results supported the notion that SRL is transitioned from the teacher to the student as the teacher-directed dialogue (teacher initiation and control of regulatory work) decreased over the year while the student-directed dialogue (student initiation and control of regulatory work) increased, indicating that the teacher used the concept of fading. The teacher was able to transition the students towards self-regulation through the use of scaffolding (first explicitly controlling the self-regulatory work, then relinquishing that control to the student while fading their support over time). This study was limited in that only two out of three student-teacher meetings (one at the beginning and end of the academic year) were looked at, so the true evolution of scaffolding conditions could not be studied.

Radford et al. (2014) also used dialogue analyses to examine how teaching assistants (TAs) supported students through the use of heuristic scaffolding (where the TA develops their students’ awareness of relevant problem-solving techniques; Holton & Clarke, 2006). Notably, this study used conversation analysis to assess the interactions that TAs had with mathematics and literacy students in a naturalistic classroom setting. Their analyses allowed for an examination of whether the TA adjusted their control over the conversation and whether the discussions helped the students. The conversation analyses demonstrated how a TA uses contingency to adjust their support for a student based on the accuracy of responses and how much help the student would need to get to the right answer. For example, if the student were close to a correct answer, the TA would prompt the student, but if the student were having difficulties finding an approach to solve the problem and asking the TA for support, the TA

would model a strategy for the student, while using questions and prompts to decrease their support, allowing the student to generate the answer. Using excerpts from dialogues, Radford et al. (2014) provided examples of heuristic modeling within a naturalistic setting. Their analyses of these excerpts implied that scaffolding was assisting student learning. Although they provided excerpts from poignant TA-student interactions, these interactions were infrequent as a majority of the observed lessons bore few examples of heuristics. The study was further limited because it was not longitudinal and therefore could not properly assess the notion of fading. Thus, there is a need to examine the frequency of scaffolded interactions naturalistically (and not just using investigator-selected excerpts for illustrative purposes) and across time.

A study by van de Pol and Elbers (2013) assessed patterns of contingency support in scaffolding in naturalistic teacher-student interactions in social sciences classes. Notably, the investigators employed novel analyses of three-turn sequences in dialogue. A three-turn sequence is when there is a back and forth between two speakers where in van de Pol and Elbers' study it consisted of "a teacher turn (T1), a student turn (S1) and a teacher turn (T2; p. 35)". Results showed that teachers would either increase, decrease, or retain the same level of support to a student based on the extent to which a student successfully responded to a question. There was a significant association between contingency used by the teacher and subsequent student understanding. The benefits of contingency control were most pronounced when students' initial understanding was particularly poor. A methodological strength of this study was that three-turn sequence analyses effectively illustrated how the teacher adjusted their support to the student immediately following the student's response, hinting at the notion of fading. In the current investigation, we were interested in naturalistically observing and interpreting back-and-forth sequences such as the three-turn sequence to understand contingency control relating to an

athlete's success/understanding of tasks and strategies during practice. van de Pol and Elbers' study was limited however in that only one lesson was used to analyse the interactions between a teacher and student and could not assess how scaffolding progressed over time. The current study aimed to assess dyadic interactions longitudinally to interpret how learners internalize their coach's knowledge and use it on their own in practice situations.

Sport in the Motoric Domain

Fading in the motor learning literature. Although fading has yet to be empirically examined in terms of coach-athlete exchanges in a naturalistic practice setting, we can glean important information about its nature from the motor learning (laboratory-based) literature. One of the most important variables that affect motor skill learning is the feedback a learner receives during practice (Bilodeau & Bilodeau, 1961; Newell, 1976; Schmidt, 1988). This feedback, termed knowledge of results (KR), can be seen as either beneficial or detrimental on performance or learning (Winstein & Schmidt, 1990). KR can be detrimental if a learner receives it after every trial, where they begin to use it as a crutch and become reliant on the feedback (Winstein & Schmidt, 1990; Salmoni, Schmidt, & Walter, 1984) to the extent that if a later task does not provide KR, their performance suffers because the feedback became part of the task (Proteau, 1987 as cited in Winstein & Schmidt, 1990). KR can be beneficial and improve learning if feedback is given relatively frequently at the beginning of skill acquisition and then gradually reduced or faded over time, compared to giving feedback on every trial (Winstein & Schmidt, 1990). This literature of faded scheduling of KR during skill acquisition in motor learning reiterates the concept of fading within scaffolding. However, it has only been looked at in relatively controlled laboratory settings and not in a naturalistic setting involving an athlete and a coach. Nor has it been examined through the lens of co-regulatory scaffolding.

Scaffolding in sport coaching. While scaffolding has been assessed in education, it has largely remained absent from the sport and coaching literature. A notable exception is Jones and Thomas' (2015) proposition that scaffolding in the context of sport is a highly pertinent and worthy area of study, yet its mechanics may be different in nature compared to scaffolding in education. More specifically, they contended that the concept of fading was largely under-developed in sport. Jones and Thomas suggested that when coaches fade their scaffolds, they leave behind a "ghost" framework in their athletes which can be revisited if the coach believes the athlete needs to go "back to basics" (p. 70). Thus, they did not fully support the notion of fading in sport, instead claiming that coaches need to return athletes to fundamentals or foundations upon which their skills are based upon (Jones & Thomas, 2015). This strategy by which coaches may cycle their athletes back to relearn, rebuild, and refine, may serve to confound the expected patterns of fading predicted from the field of education. Therefore, they argue that scaffolding may differ between sports and education, and their proposition is contrary to the motor learning literature that states faded feedback requires one's independent functioning from external support to achieve good long-term performance as it (Vickers, Livingston, Umeris-Bohnert, & Holden, 1999). Notably, Jones and Thomas had not collected any data in support of their claims; their article was an insight piece on coaching science. Consequently, this thesis sought to naturalistically assess scaffolding, and especially fading, to ascertain if this concept is present during coach-athletes interactions in sport practice in a fashion that aligns with conceptualizations from education.

Chapter 3: Overview of the Studies

Research Questions

Due to the lack of naturalistic research on co-regulatory scaffolding in sport, the purpose of this research was to: 1) explore if and how the three conceptual characteristics of scaffolding occur between a coach and athlete over time; 2) understand the role of the coach and athlete together and separately and how they relate to co-regulation; 3) uncover evidence of SRL in practice and how it relates to co-regulation in sport; and 4) evaluate whether and how the coach uses contingency control in practice and how it relates to the athlete's SRL over time.

Implications and Significance of the Research

The concept of co-regulation has been insufficiently addressed in the sport literature and therefore there was a need to draw from other bodies of literature. The current thesis importantly studied the social aspect of self-regulation (i.e., how it is attained through another, and specifically with the coach) because co-regulation could be an antecedent to expertise development in sport. Therefore, this thesis was based on the premise that exploring whether and how co-regulation is a portal to self-regulation might help expand the knowledge and literature on this topic.

Methods

Participants. Prior to recruitment, all planned procedures were approved by the University of Ottawa Research and Ethics Board (see Appendix K). The thesis investigated the nature of co-regulatory interactions between an athlete and a coach during practice. There were several inclusion criteria for the sport practice context, the chosen athlete and coach, that needed to be considered in order to provide a rich setting for the study of key interactions. The sport needed to be an individual sport where the season unfolds over the course of approximately 4-6

months to ensure an evolution of interactions in the athlete-coach dyad. The sport needed to be challenging where the athlete was learning new and complex skills/routines and was working towards a specific event or competition. With respect to the practice environment, the athlete would need to rely on their coach during practice, there had to be familiarity between the athlete and coach where discussion or verbal interaction was welcome, and all training needed to be done at one venue where practice conditions could be observed (e.g., cross-country distance running was not suitable as there is an assumed independence within the athlete and practice can take place across a wide range of square mileage). Ultimately, the chosen sport was competitive singles figure skating. Figure skating was chosen because practice is typically 1.5-2 hours and is separated into dedicated ice time where the coach and skater work on skills and routines together intensively for approximately 15-20 minutes, with the remaining dedicated ice time affording the skater opportunity to work on skills and routines on his/her own. This practice structure allows for observation while the skater is working with his/her coach, as well as on their own, lending itself to co-regulation and self-regulation observations.

The athlete needed to be between 13-18 years of age, was participating at a competitive level, and had prospective growth in the sport. The athlete had to be competing to achieve expertise and not just for enjoyment. The athlete needed to already understand the fundamentals in their sport, but had to be at a stage of development where they were still learning and substantially progressing in their area as research suggests that scaffolding benefits are less pronounced when instructors interact with students with already high levels of understanding or mastery (Van de Pol & Elbers, 2013). Ultimately, the chosen athlete was a 15-year-old male figure skater who met these criteria. The skater competed at singles figure skating provincial competitions and was between the Learn to Compete and Train to Compete stages of Skate

Canada's Long-term Athlete Development Model (Skate Canada, 2014), demonstrating that he was competing for expertise development with previous knowledge in the sport. Thus, he was a suitable candidate for understanding co-regulation and self-regulated learning for the purpose of skill acquisition and development of competencies on the trajectory of sport expertise development.

The coach needed to be a certified high-performance coach with substantial experience in their sport. The coach needed to be hands-on and vocal during practice in order to assess the dialogue between the athlete and coach, and sufficiently vocal to instigate discussion with an athlete during practice that could be recorded and treated as data. The coach also had to have experience allowing their athletes to practice on their own, as imposing this element for the purpose of this study would change the nature of the dialogue between the athlete and coach. Ultimately, we recruited a female coach who met these criteria and who was suitably matched with the aforementioned teenaged skater.

Design of study. This investigation used a mixed-methods approach from the middle of a sport season to post-season, for a duration of approximately 5 months. Data collection methods included an athlete self-report survey, audio transcription of verbal practice exchanges, observational field notes from practices, and three separate semi-structured interviews with the athlete and coach. The study took place across 5 months of the skating season and included intensive data collection focused on 16 regularly scheduled practice sessions where the athlete was learning and practicing his routine/skills for a culminating event/competition.

More specifically, this study used a *concurrent transformative strategy* (Creswell, 2003) of mixed methods. According to Creswell (2003), a concurrent approach is guided by a conceptual or theoretical framework, in this case scaffolding, which is coherently applied

throughout the study to inform the purpose, research questions, methodology, and analyses. The concurrent approach dictated that quantitative and qualitative data were collected at the same time with an intended equal priority for informing results, with the integration of the mixed-methods data occurring during the interpretation phase (Creswell, 2003). By subscribing to these key characteristics of the concurrent strategy, it was hoped this would allow for a more rounded understanding of the concept of scaffolding derived from various information from different sources, and an approach to the research questions informed by different perspectives.

Athlete's self-report survey for SRL. At the beginning of data collection after the first practice, the athlete was asked to complete the Self-Regulated Learning-Self Report Scale for Sport Practice (SRL-SP; Bartulovic et al., 2017), which provided a baseline measure (i.e., pre-survey) of the athlete's levels of SRL. The SRL-SP assessed six facets for the frequency with which the athlete believed they use personal self-regulatory processes on tasks in a sport training context. It specifically assessed planning, self-monitoring, evaluation, reflection, effort, and self-efficacy processes (see Appendix L), which were scored separately and as a composite score. The athlete completed this survey again (i.e., post-survey) at the end of the 16th practice to assess any changes in the way the athlete actively participated in their own learning. The SRL-SP also gave the study a contextual outline where changes in SRL were assessed from the middle to post-season.

Audio recording of practices and coding of skater-coach verbal exchanges. Throughout the 5 months of observation, 16 practices were audio recorded. Analyses looked at the verbal communication/interaction between the skater and coach. We aimed to do an analysis of directionality because it would be important for making inferences on co-regulation. Directionality refers to who is initiating an utterance or conversation and if it is direct (when they

make a statement) or indirect (when they prompt another person or ask a question). The interpretations of directionality used for coding purposes were informed by Hadwin et al. (2005) and Karasavvidis et al. (2003), and considered in relation to sport practice.

Contingency control is when a coach assesses an athlete's level of cognitive understanding of a task or assesses an athlete's level of successful motoric execution and then decides if they need to give more or less support to the athlete. In order to code audio transcripts for contingency control in this thesis, it was necessary to locate "anchors" stated by the athlete in the transcripts and then look at what/if the coach said anything preceding, or subsequent, to each anchor. An anchor was any comment from the athlete that mentions an evaluation of relative success (or failure) on performance of a skill, strategy, or task. Locating "anchors" was an important methodological step because a coach's contingency control is defined in response to a practicing athlete's level of cognitive or motoric success of execution of a skill, strategy, or task.

Four analytic categories were used to code for the nature of contingency control from the transcripts: i) the athlete makes an individual mention of relative success/understanding or relative failure/misunderstanding (i.e., the anchor segmentation) by itself (e.g., "I think I over-rotated on that turn") with no preceding or subsequently affiliated coach comment in the sequence; ii) the athlete states an anchor that is affiliated with an immediately preceding comment/prompt from the coach (e.g., "Why do you think you fell?"); iii) the athlete states an anchor that is affiliated with an immediately subsequent comment from the coach (e.g., "Okay, try that turn one more time"); and iv) the athlete states an anchor that is affiliated with preceding and subsequent comments from the coach. SRL could be inferred from category i when a skater stated an anchor without a prompt or preceding comment from their coach. Co-regulation could be inferred from categories ii and iv as the coach prompted the skater for a response, which was

then followed up with a coach comment for category iv. Athlete-initiated evaluation could be inferred from category iii, and can be further inferred as a portal to SRL because the athlete initiated it without prior prompting from the coach.

Semi-structured interviews. Three semi-structured interviews were conducted around the same time with the coach and skater separately, in order to get corroboration between both members of the dyad. The first interview took place around the beginning of practice observation, which ensured that the skater and coach were sufficiently immersed into their season to have established a rapport, preliminary routines, and a regular schedule. The second interview took place near the end of practice observation, which allowed the skater and coach time to work on a new routine/skills during the post-season, but also allowed the investigator to observe and code more practices afterwards. The third interview took place one week after the final observed practice, which allowed the investigator to follow up on any remaining concepts or ideas that were still unclear.

Coach's semi-structured interviews. The three coach semi-structured interviews took place after practices 4 and 12, and one week after the final observed practice. The first semi-structured interview began with questions related to the coach and skater's practice together. Then, the interview was guided by the three characteristics of scaffolding (see Appendix M for the interview guide). The first coach interview was piloted with five individuals in the academic community who had previous coaching experience in various sports to make sure that the characteristics of scaffolding were being probed reliably. In the second semi-structured interview, questions were informed by the coach's answers from the previous interview and were supplemented by the observational field notes taken during prior practices in order to discuss key interactions within practice (see Appendix N). The third semi-structured interview was shorter

than the first two. It was important as it followed up on answers that were still unclear from the coach, focused mainly on interactions that occurred between the coach and skater during skill development, and was used to corroborate between the coach and skater (see Appendix O).

Skater's semi-structured interviews. Of the 16 practices observed, a semi-structured interview with the skater took place after the 5th and 15th practice, with the last one taking place one week after the final practice was observed. The guide for the first skater semi-structured interview was submitted to substantial pilot work to ensure that questions adequately probed the three concepts of scaffolding without leading the skater in any way, that they were suitable to the age of the skater, and suitable to convention of the sport of figure skating. The skater's first semi-structured interview (see Appendix P) began with background information about the skater's career and coach history. It then asked questions about fading, contingency control, and transfer of responsibility, with each question ending with 'Can you give me an example?'. Following certain questions, there were additional questions that would be asked based on if the athlete identified themselves or their coach as directing initiation or attention (such as who usually identified if there was a mistake made, if a skill was executed successfully, or identified expectations during practice). After all of the questions in either the left or right column were asked (see Appendix P), the athlete would be prompted with a question opposite of who they identified previously where if the athlete did not speak on the matter, the interview continued on sequentially. The second semi-structured interview (see Appendix Q) was similar to the second coach interview where the questions were informed by the skater's answers from the previous interview, and were supplemented by observational field notes. The third interview took place one week after the final practice was observed. This interview was shorter in length and was used to follow up on any concepts that were unclear from the previous interviews, informed by

observational field notes from prior practices, and was used to corroborate information between the coach and skater (see Appendix R).

Data Analysis

Self-report of SRL. The plan was to compare the scores for the skater's SRL from the middle of the season (pre-survey) to his scores during post-season approximately five months later (post-survey). It was hypothesized that there would be an increase in SRL scores.

Quantitative analyses of dialogue data. The plan was to perform several analyses after the transcript data had been analyzed and enumerated according to the four analytic categories (i, ii, iii, iv). Descriptive statistics would be used to assess trends over the course of the 16 practices. For each of the coding categories, the plan was to conduct separate paired-samples *t*-tests to compare the number of coded frequencies in each category from the first eight practices with the last eight practices. This planned analysis would assess if there was a difference between the former and latter half of the total observations. Additionally, for each quartile block of four practices (i.e., practices 1-4 collapsed, practices 5-8 collapsed, 9-12, 13-16), we planned to use separate chi-squared tests to assess the relative differences in frequency between the four analytic categories, across time. Chi-squared tests were to be run collapsed across each block of four practices to ensure sufficient counts in each cell.

Based on the conceptualization of scaffolding, if one were to expect the conceptual principles to be manifested in the naturalistic setting over time, it was possible to make specific hypotheses for fading, contingency control, and transfer of responsibility. For the paired samples *t*-test, it was predicted there would be more segments of coach-directed regulation (analytic categories ii and iv) in the first eight practices (first half of practices) compared to the last eight practices (second half of practices). For the chi-square tests, it was hypothesized that quantitative

analyses of coded interactions would show evidence of fading and transfer of responsibility; specifically, it was posited that there would be a decrease in frequency of anchors with an immediate preceding segment from the coach over the course of the 8 weeks. It was also posited that there would be an increase in frequency of anchors with or without an immediate subsequent segment from the coach over the course of the eight weeks. A significant increase in this regard was expected to indicate increasing evidence of an athlete's propensity for SRL, since they were not prompted to make a comment by their coach.

Qualitative analyses. Each interview was transcribed individually. The semi-structured interviews were deductively analyzed using a six-phase thematic analysis process (Braun & Clarke, 2006). The transcripts were first read and re-read in order to become familiar with the data. Then, first order themes were coded based on the three main concepts of scaffolding (contingency control, fading, and transfer of responsibilities). The transcripts were then inductively analyzed to derive initial themes, followed by interpretations to group these initial themes into higher-order themes to explain any nuances in a coach-athlete dyad not effectively captured by the deductive categories (see Appendix I).

Integration and Interpretation of Concurrent Methods

I used both quantitative and qualitative data in order to make reliable and confident statements on the use of scaffolding in a naturalistic sport setting. In terms of transfer of responsibility, I planned to use the SRL-SP as an index for how the skater saw his SRL usage changing from the middle- to post- season. I planned to use these data to help identify any noticeable changes (from the skater's perspective) that could be taken as evidence of increased responsibility. I planned to merge any findings from the coach and skater interview data with interpretations from the skater's pre- to-post SRL survey data to make interpretations about the

notion of transfer of responsibility in sport. Based on the reviewed literature that contends that co-regulation is the portal to increasing SRL, I would be able to use such changes to assume that co-regulated conditions observed across the course of the 16 practices may have facilitated this transfer of responsibility. Thus, I planned to use changes in the survey data to couch my interpretations of co-regulation from my other methods.

In terms of fading, I planned to rely on significant changes in trends from the audio transcripts of practice as evidence of fading from the middle to post-season. I planned to merge these trends with descriptions of whether and how fading occurred from the interviews conducted with the coach and the skater. Further corroborative evidence for fading was expected to be derived from the deductive analyses of the interviews, along with novel interpretations that would possibly emerge from data submitted to inductive analyses. Based on the reviewed literature stating that fading and transfer of responsibility are closely related, I believed that I could infer that one concept was present if there was evidence of the other.

In terms of contingency control, I planned to rely on quantitative analyses of the audio transcripts of practice dialogue to interpret evidence in a sport practice setting. In particular, I planned to analyze changes in directionality of conversation around anchor comments made by the skater during practice, to explore how the nature of this commentary changed from early to later, and at various points (quartiles) across the season. I planned to merge any interpretations from these quantitative analyses across the season with descriptions from the coach and skater in the semi-structured interviews. Responses from the skater and coach during the semi-structured interviews, particularly surrounding questions about feedback in practice, would allow me to infer contingency control, as well as highlight the conditions in which contingency control occurred.

Changes found across the 16 practice transcripts (of coach-athlete dialogue) and across the three semi-structured interviews (with each of the coach and athlete), combined with the athlete's changes on the SRL-SP, would overall allow me to interpret the use of co-regulation in a sport practice setting. Assessing co-regulation and scaffolding in a naturalistic sport setting is novel, and therefore it was important to use a concurrent transformative mixed-methods approach to confidently comment on the nature of co-regulation and scaffolding in sport.

Outline of Presentation of Results

The mixed methods were applied concurrently in this thesis project. My intention throughout was to equitably treat quantitatively- and qualitatively-derived data in answering my research questions. For reasons that will become apparent in the evolution of this thesis, however, this equitable balance could not be achieved. Research question 4 (refer to p. 11, this thesis) was addressed quantitatively and articulated in Chapter 4 (Study 1), while research questions 1-3 were answered in Study 2, presented in manuscript format in Chapter 5. Chapter 6 follows as the general discussion with an overview of the study, implications, and future research.

Chapter 4: The Struggle with Coding Naturalistic Sport Practice Dialogue is Real

Co-regulation is when a more experienced other regulates the cognitions, behaviours, metacognitions, and motivations of a learner that should result in increased self-regulatory abilities in a learner (Hadwin, Wozney, & Pontin, 2005; Puntambekar & Hübscher, 2005; Zimmerman & Schunk, 2001). A concept that is highly related to co-regulation and is sometimes used interchangeably is scaffolding. There are three main scaffolding conceptual characteristics that can be seen in the literature: contingency, fading, and transfer of responsibility (van de Pol, Volman, & Beishuizen, 2010). Contingency control is a key aspect of scaffolding; it entails when a more experienced other evaluates a learner and adjusts their support or control based on the learner's success or failure to progress in a task (Radford, Bosanquet, Webster, Blatchford, & Rubie-Davies, 2014; van de Pol & Elbers, 2013). Transfer of responsibility is closely related such that if the more experienced other is fading their contingency control, the learner is internalizing the processes used and taking more control of their responsibility for learning (Puntambekar & Hübscher, 2005). The purpose of the current chapter was to specifically explore the nature of contingency control and transfer of directionality over time using quantitative analyses of dialogue between a coach and figure skater derived from a naturalistic sport setting.

Little research has been done on co-regulation and scaffolding, with most of the research from the education domain, and with only a select few done in a naturalistic education setting. A study done by Radford et al. (2014) looked at teaching assistants' (TAs) use of heuristic scaffolding (how students can learn through discovery with the help from a teacher) with their elementary- and middle-school English and math students. This study used dialectic transcripts from a naturalistic classroom setting in order to look at the back-and-forth negotiations related to heuristic scaffolding. Conversation analyses demonstrated how a TA uses contingency to adjust

their support to the student based on the accuracy of the responses and what was needed in order to help the student come to the correct answer. However, the results only provided transcript excerpts (akin to conversational vignettes) as examples of contingency control. Data were collected cross-sectionally with no tracking of changes in the nature of back-and-forth conversations over time. Results were inconclusive with the naturalistic setting yielding very few examples of heuristic scaffolding. In light of this limitation, the back-and-forth negotiations found in the dialectic transcripts was important for understanding what kind of methodology is needed in co-regulation scaffolding research.

One naturalistic study done by Hadwin et al. (2005) examined the transition of self-regulated learning (SRL) control from university teacher to graduate students through the use of scaffolding in naturalistic teacher-student conferences (meetings) over the course of a school year. Ten female graduate students from a year-long research methods course were randomly selected to participate in the study. Data were collected mid-October during a conference four weeks after an assignment was given, and in March during a conference four weeks prior to the assignment was due. Hadwin et al. recorded and then examined the frequencies of self-regulatory “ownership” with direct-regulation (when the teacher or student initiated and directed the dialogue) and indirect-regulation (when the teacher prompted the student to engage in SRL or the student asked for assistance or information from the teacher). Frequencies for the teacher and student indirect dialogue were combined and considered together as co-regulation because of the back and forth that occurred with the teacher and student. Importantly, when analyses compared the nature of coded frequencies from a meeting in mid-October with those from a March meeting, results supported the notion of SRL transitioning from teacher to student. That is, there was evidence of a transfer of directionality, illustrated by a decrease in teacher-directed

regulation and an increase in student-directed regulation. However, this study only assessed two out of three teacher-student meetings during the school year, therefore the true evolution of scaffolding conditions could not be assessed. Scaffolding needs to be assessed longitudinally at multiple time points in order to assess the change in the nature of the dialogue more conclusively and infer a transfer of regulation from co-regulation to SRL.

In a cross-sectional study, van de Pol and Elbers (2013) used something they termed a “three-turn sequence” (p. 35) to assess contingency control in naturalistic teacher-student dialogue with a sample of 22 social science teachers (ten of whom had been trained on scaffolding, including principles of contingency control) and their middle school students during the last of five planned lessons. Conversation analyses were collected and analyzed. The analyses involved isolating and dissecting three-turn sequences, which each consisted of a teacher turn, a student turn, then a teacher turn to contribute to dialogue. Excerpts from the dialogue were coded as three-turn sequences if one or more of the teacher-turns was an intervention strategy (such as prompting or asking the student a question), and were considered contingent when either a) the teacher increased control when the student’s understanding was poor or partial; or b) the teacher decreased control when the student’s understanding was good; or c) the teacher retained the same level of control when the student demonstrated partial understanding. Results indicated that teachers would adjust or retain the same level of support to a student based on their success in responding to a question, with the benefits of contingency control most pronounced when a student’s initial understanding was poor. Thus, these results confirmed a key principle of contingency control, that is, that an instructor is expected to respond when they diagnose erroneous/poor understanding from a student, and respond less (less application of teacher-direction, or teacher application of information) as a student’s response

becomes less erroneous or clearer. Moreover, this empirical approach underscored the premise that analyses of contingency control depend partly on *locating and isolating dialogue attesting to a student's error or lack of understanding*, and then examining a teacher's response to such an instance. However, this study only looked at one time point and therefore was unable to assess the extent to which contingency control would change based on the student's progression in a task. In light of this, there was a need for research that tracks these changing dialogues over the course of a season, for example, examining how they change in coach-athlete dyads. The current study planned to do multiple analyses to this end to assess how contingency control changes from mid-, to late-, to post-season in a coach-athlete dyad.

A change in directionality of who initiates an evaluation of practice success or failure (and the frequency of such changes) is potentially indicative of a shift from co-regulation towards SRL. If an athlete is initiating most of the dialogue, it could be taken as evidence of SRL as they are taking control of their learning during practice. If a coach initiates most of the dialogue, it could be taken as evidence of co-regulation as they are prompting the athlete to provide information and become aware of what is occurring during practice. If a coach responds to an athlete's acknowledgment of an error, it is an indication of co-regulatory interaction.

The purpose of this study was to analyze naturalistic coach-athlete dyadic verbal interactions to 1) develop a sense of the nature of contingency control and the directionality of commentary around acknowledgements of successes and failure (whether it is more coach or athlete initiated) in practice performance; and 2) understand how the nature of back-and-forth interactions within a coach-athlete dyad varies at different parts over the season, to assess whether identifiable changes occur over time in directionality.

Methods

Participants

A coach (female, aged 53) and a competitive figure skater (male, aged 15) participated in the current quantitative analyses. The coach was a National Level (3) figure skating coach with over 30+ years of experience coaching recreational and competitive figure skaters in both singles and pairs. The coach was a Technical Specialist judge at competitions, and was a Star 1-4 competition judge. The skater had competed in figure skating for 6 years and had spent his whole skating career with the coach in this study. At the start of data collection the skater was ranked 17th out of 49 males at the pre-novice level, and then advanced to the novice level before the end of data collection. The skater was preparing for Sectionals (akin to Provincial championships) during the season. He had practice for a total of 10 hours per week with four on-ice practices. Approximately 2.5 hours of the total 10 hours were spent one-on-one with the participating coach on the ice, and the rest of the ice time was spent with other coaches or on solo ice time.

Data Collection

Data collection involved the skater completing the Self-Regulated Learning-Self Report Scale for Sport Practice (SRL-SP; Bartulovic, Young, & Baker, 2017) at the end of the first and last practice during data collection, which book-ended the audio-recording of 16 practices from the middle (October 2018) to the end of competition season (December 2018), and continued post-competition until the start of the off-season (March 2019). The SRL-SP assesses six facets (planning, self-monitoring, evaluation, reflection, effort, and self-efficacy) that can be scored separately or as a composite score. The goal of assessing the skater on SRL-SP competencies at the beginning (i.e., pre survey) and end of the season (i.e., post survey) was to gain an indication of whether the skater increased in their self-reported SRL abilities throughout the season.

The principal investigator (PI) observed the 16 practice sessions, took field notes, and audio-recorded all coach-skater dialogue. Field notes contained short descriptions of non-verbal communication between coach and skater, when and where the dyad was communicating with one another, and detailed notations about the skater's level of success on various performance elements (e.g., if he landed on two feet instead of one, if he fell), and other initial observations. Figure skating practice is segmented where there are designated times for the coach and skater to interact, and for the skater to work on their own. The designated coach-skater time in practice was on average approximately 20 minutes (with dedicated coach-skater time at one practice amounting to 40 minutes) and was recorded through a microphone on the coach's lapel. The recorded practices were then transcribed verbatim, with field notes added into the transcripts in order to give a more holistic representation of the dedicated coach-skater periods at practice, which amounted to 340 minutes of audio-recordings and more than 117 single-spaced pages of text.

Analyses and Results

SRL-SP

Our planned analysis was to conduct a within-subject dependent *t*-test with the six subscales of the SRL-SP. Our hypothesis was that there would be an increase in each of the subscales as well as the composite score from the pre- to post-test. The data collected during the pre- and post-test would be used in concert with the data collected from the quantitative analyses of conversation interactions (outlined below) from various intermediary points across the season in order to understand the changes and perhaps merge interpretations of co-regulation to SRL.

The within-subjects dependent *t*-test was run with the six constituent subscales at time 1 compared to the same six constituent subscales at time 2. The results were significant, indicating

that all six subscales at time 2 (that is the composite score for SRL; $M = 6.82$, $SD = .19$) were higher than all six subscales at time 1 (that is the composite score for SRL; $M = 5.77$, $SD = .51$), $t(5) = -5.84$, $p = .002$. The output of the within-subject dependent t -test with the six constituent subscales proved to be significant, with differences implicating that the time 2 composite score (in the post-season period of training) was significantly higher than time 1 (early in the season). Thus, the skater reported increased SRL over the season, which is notable, considering the possible ceiling effects attributed to the seven-point Likert scale. As indicated in Table 1, our descriptive analyses showed the skater reported increases in each constituent SRL subscale over the season.

Locating and Coding around Contingency Control Anchors

In order to assess contingency control, “anchors” first needed to be located and isolated in each of the practice transcripts. An *anchor* was any comment or utterance from the skater that

Table 1

Skater's Mean Scores for Each SRL Variable and Composite Scores in Pre and Post Survey

	Pre-Survey	Post-Survey
Planning	5.63	6.50
Self-monitoring	5.50	6.75
Evaluation	6.50	7.00
Reflection	6.00	7.00
Effort	6.00	6.88
Self-efficacy	5.00	6.80
Composite Score	5.77	6.82

mentioned an evaluation for relative success on performance or execution of a skill or task. An anchor was coded only on what the coach and skater were working on in that instance at that practice, and not coded when the skater was reflecting their comments for example on what had occurred in the past (e.g., reflecting on the competition that happened over the weekend).

Examples of anchors included comments such as: “What am I supposed to do after that turn again?”; “I nailed that last run through”; or “I can’t land any of my jumps today”.

Acknowledgment, via an utterance, by the skater was considered an anchor. For example, acknowledging “yeah” or “I know”, was considered an anchor if it was preceded by information from a coach suggesting an assessment of relative failure or success. The skater could verify “yeah” to the preceding comment “you bailed on that jump” (which would be an anchor), but “yeah” in response to “take a straighter line to the jump” would not be an anchor because it is a verification of a procedure or strategy.

Once anchors were located indicating an instance of judged success/failure, it was then important to analyze each transcript to derive the agent who initiated or directed the dialogue. This was based on Hadwin et al.’s (2005) coding categories of self-regulatory ownership and van de Pol and Elber’s (2013) three-turn sequence. To this end, four analytic categories were used to code for the nature of contingency control in and around each transcript anchor:

- i) the skater makes an individual mention of relative success/understanding or relative failure/misunderstanding (i.e., the anchor segmentation) by itself;
- ii) the skater states an anchor that is only affiliated with an immediately preceding segment from the coach;
- iii) the skater states an anchor that is only affiliated with an immediately subsequent segment from the coach;

- iv) the skater states an anchor that is affiliated with both preceding and subsequent comments from the coach.

There were certain assumptions attached to each of these analytic categories. For example, a score in category i could be inferred as SRL as the skater made a statement about their relative success or failure without prompting or follow-up from the coach. A score in category ii could be inferred as coach-directed co-regulation as the coach prompted a response from the skater. A score in category iii could be inferred as athlete-initiated evaluation, which can be further inferred as a portal to SRL. A score in category iv could be inferred as co-regulation with the use of contingency control as the coach initiated a response from the skater, and then provided the skater with further insight.

Planned analyses. Our planned analyses were to do separate paired-samples *t*-tests for each of the coding categories in order to compare the number of segments from the first eight practices with the last eight practices. The practices would then be sectioned into seasonal quartiles with four practices in each (i.e., Q1 had practices 1-4, Q2 had practices 5-8, Q3 had practices 9-12, and Q4 had practices 13-16) where separate chi-squared tests would be used to assess the relative differences in frequency between all of the analytic categories. In line with expectations for transfer of directionality, our hypotheses were that there would be a decrease in the number of anchors with an immediate preceding segment from the coach over the 16 practices, and that there would be an increase in the number of anchors with or without an immediate subsequent segment from the coach over the 16 practices. Prior to these planned analyses, however, it was important to first diligently ensure that anchors could be reliably located and isolated, and ensure the reliability of coding of directionality around the anchors.

Establishing reliability for locating and coding of anchors. In order to code for anchors it was important for the PI and a critical friend (her research supervisor) to go over the first three transcripts in order to have agreement, which was discussed to be at least a kappa of .70 as was seen in previous research (Karasavvidis, Pieters, & Plomp, 2000). The PI and critical friend located anchors in the first practice transcript separately, and then came together to discuss their results. These reliability analyses on the first practice transcript only assessed if there was an anchor or not and did not look at the different analytic designations attached to the anchors. Initially, the two reviewers determined that the definition for anchors was insufficient and was updated (as previously described) to include utterances on the part of the athlete including when an utterance indicated relative success or motoric performance weakness. For example, the reviewers consulted and agreed that an utterance could represent an anchor if it followed information shared by the coach that was evaluative in nature, and the utterance (e.g., “uh-huh”) acknowledged the evaluative information. However, the reviewers agreed that an utterance did not represent an anchor if it followed a prescriptive training comment by the coach (e.g., “you need to skate wider on the entry”, which is not an evaluative comment).

The PI and critical friend then attempted to locate anchors independently in the second and third practice transcripts, and reanalyzed for anchors in the first transcript. Using the aforementioned updated definition for an anchor, they proceeded to code the first three practice transcripts for the four analytic categories. They then met to discuss challenges and consensus. Again, they determined that they needed to update the definition for an anchor. Specifically, the definition needed to focus on what the coach and skater were working on in that instance at practice and were not talking about evaluations of success or failure during the recent competition over the previous weekend. These latter evaluations, which were often evident in the

transcript, were more macro level evaluations that did not relate to in situ assessments of current dyadic activities.

Inter-rater reliability values. Cohen's kappa (κ) was run to determine if there was agreement between the PI and the critical friend on locating anchors in the practice transcripts, and the four analytic categories. I decided to first run kappa statistics on the location of anchors because I believed it would be easier to achieve consensus on identifying anchors by themselves. Agreeing on the identification of anchors was difficult between the PI and the critical friend, therefore I wanted to see if we found agreement on the four analytic categories using just the anchors we both agreed on. The kappa statistics were run on many variations and combinations of the anchors and analytic categories to try to achieve a kappa of .70 that was seen in previous research; however, all calculations fell short. Analyses of practice transcripts 1 through 3 collapsed together indicated $\kappa = -.348, p = .010$ for the consensual location of an anchor (practice 1 $\kappa = -.267, p = .20$; practice 2 $\kappa = -.212, p = .128$; practice 3 $\kappa = -.250, p = .285$). Table 2 presents the pertinent data derived from data for practice transcripts 1 through 3 for location of an anchor, irrespective of coded categories. With the final updated/clarified definition for an anchor, the PI and critical friend then coded for location of anchors for practices 4-6 to make sure that their newest definition for anchors would be sufficient for consensual location and could come to an agreement of $\kappa \geq .70$. Unfortunately, consensual location of anchors for practice transcripts 4-6 collapsed together was $\kappa = -.377, p = .017$ (practice 5 $\kappa = -.455, p = .091$; practice 6 $\kappa = -.750, p = .047$). Kappa statistics could not be computed for practice 4 alone as the PI did not have anchors that the critical had not already located, making the critical friend's data constant and therefore unable to calculate. Table 3 shows the pertinent data for these analyses.

Table 2

Consensus for Location of Identified Anchors in Practice Transcripts One to Three

Case	Practice 1		Practice 2		Practice 3	
	PI	CF	PI	CF	PI	CF
1	1	1	1	0	1	0
2	1	1	1	0	1	1
3	1	0	1	0	0	1
4	0	1	1	0	1	1
5	1	1	1	1	0	1
6	1	1	1	1	1	1
7	1	1	1	1	0	1
8	0	1	0	1	0	1
9	1	1	1	1		
10	1	0	1	0		
11	1	1	1	0		
12	0	1	1	1		
13	1	1	1	1		
14	1	1	1	0		
15	1	1	1	1		
16	1	0	1	1		
17	0	1	1	1		
18	0	1	1	1		
19	0	1	1	1		
20			1	1		
21			1	1		
22			1	0		
23			0	1		
24			1	0		
25			1	0		
26			0	1		
27			1	0		
κ	-.267		-.212		-.250	
P	.20		.128		.285	

$\kappa = -.348, p = .010$

Note. A case represents an instance where one of the reviewers located an anchor. 1 is coded as anchor present, 0 is coded as anchor absent. For example, in the two columns below Practice 1 anywhere coders PI (principal investigator) and CF (critical friend) code 1 would be counted as an agreement. However, for example in case 3 in practice 1, the CF code was absent and represented with a code 0, indicating non-agreement between the PI and CF.

Table 3

Consensus for Location of Identified Anchors in Practice Transcripts Four to Six

Case	Practice 4		Practice 5		Practice 6	
	PI	CF	PI	CF	PI	CF
1	0	1	0	1	0	1
2	0	1	1	0	1	0
3	1	1	1	1	0	1
4	1	1	1	1	0	1
5	1	1	1	0	1	0
6	1	1	1	0	1	1
7	0	1	1	1	1	0
8	1	1	1	1		
9	1	1	0	1		
10	0	1	0	1		
11	0	1	0	1		
12			0	1		
κ	a		-.455		-.750	
P	a		.091		.047	

$\kappa = -.377, p = .017$

Note. A case represents an instance where one of the reviewers located an anchor. 1 is coded as anchor present, 0 is coded as anchor absent.

^aKappa and subsequent statistics could not be calculated with practice 4 by itself as the critical friend's data was constant.

Despite the very poor inter-rater reliability for anchor locations, analyses were still conducted for extent of agreement with respect to the analytic categories. Category agreement for practice transcripts 1 through 3 (irrespective of whether there was inter-rater agreement on location of anchor) was $\kappa = -.027, p = .768$. Table 4 shows the pertinent data for these analyses. Analyses were also performed on transcripts 1 through 3 collapsed using *only anchors for which the PI and the critical friend completely agreed*, $\kappa = .444, p = .001$. This means that two different coders looking at the same independent data were agreeing approximately 44% of the time, taking into consideration chance agreement. Finally, analyses for the analytic categories for practice transcripts 4 through 6 collapsed (irrespective of whether there was agreement on

Table 4

Location of Identified Analytic Categories for Anchors in Practice Transcripts One to Three

Case	Practice 1		Practice 2		Practice 3	
	PI	CF	PI	CF	PI	CF
1	4	4	3	0	4	0
2	4	4	4	0	4	4
3	3	0	2	0	0	4
4	0	4	4	0	4	4
5	4	4	4	4	0	4
6	4	4	4	4	4	4
7	4	3	4	4	0	2
8	0	4	0	4	0	4
9	4	4	4	4		
10	4	0	2	0		
11	4	4	3	0		
12	0	4	4	4		
13	2	2	2	4		
14	2	4	3	0		
15	2	4	4	4		
16	3	0	4	4		
17	0	4	3	3		
18	0	4	4	4		
19	0	4	4	4		
20			4	4		
21			4	4		
22			4	0		
23			0	4		
24			4	0		
25			4	0		
26			0	4		
27			4	0		
κ	-.009		.073		-.111	
P	.946		.514		.611	

 $\kappa = -.027, p = .768$

Note. A case represents an instance where one of the reviewers located an anchor. 0 is coded as anchor absent, 2 is coded as anchor with preceding coach comment, 3 is coded as anchor with subsequent coach comment, 4 is coded as anchor with preceding and subsequent coach comment. There were no instances of category 1.

Table 5

Location of Identified Analytic Categories for Anchors in Practice Transcripts Four to Six

Case	Practice 4		Practice 5		Practice 6	
	PI	CF	PI	CF	PI	CF
1	0	4	0	2	0	4
2	0	4	4	0	3	0
3	4	4	4	4	0	4
4	4	4	3	3	0	4
5	4	2	4	0	4	0
6	4	4	4	0	4	4
7	0	2	3	3	4	0
8	4	4	4	4		
9	3	3	0	4		
10	0	4	0	4		
11	0	4	0	4		
12			0	2		
κ	.175		.040		-.500	
p	.122		.818		.099	

$\kappa = -.019, p = .868$

Note. A case represents an instance where one of the reviewers located an anchor. 0 is coded as anchor absent, 2 is coded as anchor with preceding coach comment, 3 is coded as anchor with subsequent coach comment, 4 is coded as anchor with preceding and subsequent coach comment. There were no instances of category 1.

location of anchor) disappointingly indicated $\kappa = -.019, p = .868$. Table 5 shows pertinent data relating to this final analysis.

Coding for Directionality

In order to assess directionality and to test the aforementioned hypotheses regarding the analytic categories, it was essential to have confidence in the process of identifying and isolating anchors. This reliability had not been obtained and the subsequent discussion section will therefore be used to advance possible explanations. With poor agreement on anchors, however, we did not think it was wise to move forward with the planned analyses contrasting the first eight with the last eight practices, or the analyses of directional frequencies by season quartile.

Discussion

The purpose of this study was to explore the use of co-regulation scaffolding through coach-skater practice dialogue analysis. There was a significant difference between the pre- and post-survey of the SRL-SP indicating an increase in SRL for the skater, which suggests that the skater increased their self-regulatory abilities (possibly with help from their coach). The survey data combined with the other quantitative results would allow me to assume that observed co-regulated conditions over the 16 practices may have facilitated a transfer of responsibility from the coach to the skater.

Analyses of co-regulatory interactions however were impeded by poor reliability for coding athlete-coach dialogue. Acceptable agreement for the planned analyses for contingency control (i.e., which depended on the reliable locating of anchors) could not be reached between the PI and her supervisor for six out of 16 practices. It may be that “anchors” within sport may be more difficult to locate than in a classroom setting. This could be related to speech patterns in a coach-athlete dyad, different conversational format, and the formality of the dyadic relationship. In a classroom setting, the teacher presents in the front of a classroom with the students sitting at their desks where they can raise their hand if they have a question as it pertains to the lesson. Thus, commentary representing an error or misunderstanding is more explicit. In a sport practice setting, the coach explains to the skater what they will be working on face-to-face with more reciprocity in their dialogue. The teacher and coach are both knowledgeable in their area, however the coach appears to rely on the skater for input and discussion in ways the teacher does not (e.g., cognitive and kinesthetic information in the interface). This complexity of information sharing, coupled with the back and forth nature of interactions and constant exchanging of information between the coach and skater, means that comments representing judgments of error

or misunderstanding appear less formally and less explicitly in a classroom. I learned that this “informal” communication can lead to overlapping discourse such as the skater attempting to finish the coach’s sentence while she was talking, which does not appear to be as prevalent in an education setting and was not seen in previous research that influenced this thesis (e.g., Karasavvidis et al., 2000; Radford et al., 2014).

There were additional challenges I observed in coding for anchors in the sporting practice transcripts. One of the challenges was with the participants staying on topic. There were times when the coach would mention two different things in one sentence (e.g., commenting on the execution of a skill and stating she likes the song playing in the background) and then the skater would respond by saying “yeah”, making it unclear if the skater was agreeing with the opinion on the element’s execution or that he likes the song as well. The skater would also interrupt or try to finish the coach’s sentence, making it difficult to tease out discrete sections of text when the conversations are subjected to quantitative analyses. It was unclear if it would be a proper back and forth three-turn sequence (de Pol & Elber, 2013) if it was the same sentence but interrupted a few times by the skater stating “yeah”. This could be due to shared cognition between the coach and the skater. For example, if one person started sharing an idea, the other would often pick up on the idea and continue on with it, not allowing the first person to finish their thought as they are both on the same wavelength. Time is also limited in a figure skating practice. A coach will see multiple skaters during practice, with each skater having around 20 minutes alone to focus and work intensively with their coach. This means that the coach and skater try to make the most of their ice time, where there might not be as frequent anchors articulated from the voice of the skater because the coach is under pressure to use the time, wants

to get straight to the corrections, meaning the coach has less patience to wait for athlete-initiated evaluations.

A procedural challenge in this study was that only the coach wore a microphone on their lapel. There were some parts in the transcript where it sounded like the skater made a comment on his performance or it seemed like he did based on the coach's response, but it was not picked up by the microphone because the skater was either too far away from the coach or the coach was not directly facing the skater. This led to some anchors being missed from the transcripts as we could only code verbal data. There were also times when the coach saw an error and physically showed with her body the correct way for the skater to perform the movement. This information was lost as this study only coded verbal communication and not non-verbal corrections. Future research should look at both verbal and non-verbal data as sport involves the sharing of dialectic and kinesthetic information.

Refinements were also not coded in this study. The coach would tell the skater how to correct a mistake, the skater would perform the element again, and then the coach would make a refinement. The skater would then acknowledge the coach's comment and try to perform the element again. This would not be coded as an anchor because they were not talking about the execution of a skill but a procedural refinement to further correct the initial mistake. Future research may wish to consider coding for procedural refinements by the coach, but also through the co-regulatory categories, to determine whether procedural refinements can be reliably located and, if so, whether subsequent analyses of the nature of interactions show trends over time.

The margin of error is very influential in figure skating. As a skater progresses into the higher levels of an element, there is less room for error, and the slightest change in degree could be the difference between landing or falling on an element. During the interviews, the coach and

skater talked about how even when all of the technical components of an element are correct, it still needs to look aesthetically pleasing to the judges. This means that there is always something to correct in this sport. There is also a difference between evaluation and prescription. The coach can evaluate the success of a skater's performance, but may not explicitly state to the skater everything she thought about the element. The coach may give a brief outline of what she saw, and then prescribe what she thinks will help correct the element. What comes out of the coach's mouth is just the tip of the iceberg. The current coding procedures were not suited to quantifying either evaluative comments (anchors) from the coach, nor did they account at all for prescriptive comments (procedural refinements) from the coach. These are limitations that I became aware of during this study that could be the target of new approaches in future research.

Future Research

It appears that contingency control occurred within the intensive interactions between the coach and athlete during practice, even if there was no significant agreement on locating anchors within the transcripts. Looking for anchors with a more articulate athlete and their coach might help to understand a basic pattern that can be assessed more thoroughly later on. Future research should also understand or control for the fact that there might be interruptions in a single dialogue segment, and that too microscopic a focus on phrases and utterances (e.g., the athlete saying "yeah" every time he agrees with the coach within one sentence) may sometimes miss the broader whole idea. Future research may wish to take a broader perspective, and perhaps a mixed-methods perspective, on interpreting whole sequences of text of the dialectic interactions between athlete and coach. In other words, there could be more efforts "to see the forest, rather than the trees", especially considering the difficulties in quantitatively coding the "trees".

In the current study, there were no codes recorded for the analytic category i (i.e., the skater makes an individual mention of relative success/understanding or relative failure/misunderstanding by itself). This could be because people do not talk to themselves aloud, or if the skater did talk to himself, it was not picked up because the skater did not wear a microphone. Future research should consider putting a microphone on the athlete and using a think-aloud protocol (Ericsson & Simon, 1980) to get a better understanding of the processes they are using.

The coding for anchors was based on contingency control that relied on the skater's failure to achieve their performance goal (knowledge of results; KR) and did not include information about the skater's kinetic characteristics that lead to his performance outcome (knowledge of performance; KP; Sharma, Chevidikunnan, Khan, & Gaowgzeh, 2016). Future research could code for both types of evaluative information, trying to understand directionality around the various ways the coach and athlete discussed what led (i.e., KP) to that performance outcome. This coding could highlight the use of contingency control, as well as the different ways the coach and athlete may be responsible for certain information regarding performance remediation. Finally, the overlapping discourse between athlete and coach could also be looked at in the future and coded as "shared cognition" (Cannon-Bowers & Salas, 2001) to emphasize the role that overlapping communication has in a sport setting.

Chapter 5: Study 2

Manuscript: Co-regulatory scaffolding in a mature coach-athlete figure skating dyad: A naturalistic case study

Co-regulatory scaffolding in a mature coach-athlete figure skating dyad: A naturalistic case study

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Abstract

Self-regulated learning (SRL) processes are used frequently by elite athletes and are important for optimizing practice efforts during talent development (McCardle, Young, & Baker, 2017). Before someone becomes self-regulated, they are co-regulated by a more experienced other (e.g., a coach; Glaser, 1996). Scaffolding, a form of co-regulation, has three conceptual characteristics: contingency control; fading; transfer of responsibility (van de Pol & Elbers, 2010). While popular in education, no studies have assessed scaffolding in sport. We explored scaffolding in a naturalistic, instrumental case study with an experienced female coach (aged 53, national level) and her competitive male figure skater (aged 15, provincial level) using a) participant observation, field notes, and recording and analysis of dialogue at 16 practices; and b) three separate interviews with the coach and skater at mid-, late-, and post-season. Data were thematically analyzed (Braun & Clarke, 2006). Guided by scaffolding characteristics, deductive interpretations proved difficult due to overlap of conceptual constructs. Inductive analysis revealed complex, sport-specific nuances. Co-regulation occurred at both micro- and macro-levels. Micro-level co-regulation was illustrated by a “co-regulatory interface” – a pivotal interaction zone described by contributing roles and expectations for each actor, shared roles, and embodied transitory process related to the skater’s SRL. A mature, enriched interface was predicated on prerequisite conditions for coach and athlete. Fading differed from education because of non-linear aspects when the coach would return to refine an element if it was incorrect. Findings suggest scaffolding manifests in sport, with self-regulation married to co-regulation, and more specifically, the interface.

Keywords: Co-regulation, scaffolding, dyad

Co-regulatory scaffolding in a mature coach-athlete figure skating dyad: A naturalistic case study

It appears crucial for an athlete to develop self-regulated learning competencies and psychological processes to maximally benefit from practice activities during the development of sport expertise (McCardle, Young, & Baker, 2017). Becoming an agent of one's own learning, or a self-regulated learner, is associated with optimal sport practice conditions (Bartulovic, Young, & Baker, 2017; Glaser, 1996). Self-regulated learning is when one controls their thoughts, feelings, and behaviours aimed towards a specific goal (Hadwin & Oshige, 2011) during practice and is often defined by meta-cognitive (e.g., planning, self-monitoring, evaluation, reflection) and motivational facets (e.g., effort, self-efficacy; Bartulovic et al., 2017). Findings in previous research that assessed self-regulated learning (SRL) with elite and non-elite athletes in sport show that there is a greater likelihood of an athlete with greater amounts of SRL competency acquiring a more elite level (McCardle, Young, & Baker, 2017). It is important for an athlete to be self-regulated in order to actively engage with their coach during practice and understand what they are doing/feeling in order for them to effectively practice on their own. On the reverse, what the athlete practices on their own can inform their practicing with a coach, possibly enhancing skills acquisition and optimizing time with their coach. Therefore, becoming a self-regulated learner is important with respect to quality practice and expert development in sport.

Co-regulation

In order to become a self-regulated learner, it is important for a person to initially be in situations where they are regulated by a more experienced other, such as an instructor or coach (Glaser, 1996; Karasavvidis, Pieters, & Plomp, 2000; Vygotsky, 1987). Co-regulation is the temporary act of an other indirectly regulating the cognitions, behaviours, metacognitions, and motivations of a learner through active *scaffolding*, which is expected to result in increased self-

regulatory abilities in a learner (Hadwin, Wozney, & Pontin, 2005; Puntambekar & Hübscher, 2005; Zimmerman & Schunk, 2001). Although co-regulation consists of temporary instances of dyadic interaction, more macroscopically, repeated instances between co-actors over time embody a developmental relationship, with significant learnings for both co-actors. Based on investigations of teacher-student relationships in the education domain, co-regulation has been conceived as a portal to self-regulation (Hadwin, Järvelä, & Miller, 2011). There have however been very limited empirical studies assessing co-regulation between a coach and athlete in a sport practice context (McCardle et al., 2017), and the impact of the coach on co-regulation as it relates to the development of SRL has yet to be empirically assessed. Thus, the current study sought to examine the nature of co-regulatory interactions between a coach and an athlete, and how the athlete's SRL relates to the coach's co-regulatory influence.

Scaffolding

Scaffolding is highly related to co-regulation and, specifically, is important to understanding transitory processes through which co-regulation becomes SRL. It has been useful for framing investigations of teachers and students. Wood, Bruner, and Ross (1976) used scaffolding to explain the support a tutor gives a learner in order for them to achieve a goal, carry out a task, or solve a problem initially beyond their capacity, while also progressively decreasing the reliance of the learner on the tutor. Reviewing a decade of literature, van de Pol, Volman, and Beishuizen (2010) found that scaffolding had three recurring characteristics: *contingency*, *fading*, and *transfer of responsibility*. *Contingency* refers to the teacher's initial evaluation of the student and how the support or control from the teacher is adjusted based upon the student's success or failure to progress in a task (Radford, Bosanquet, Webster, Blatchford, & Rubie-Davies, 2014; van de Pol & Elbers, 2013). *Fading* is when the teacher gradually withdraws their

control/support over time, reducing the frequency of their control/support, providing the learner with increasing latitude to self-regulate their attempts at the task (Puntambekar & Hübscher, 2005). *Transfer of responsibility* is closely related such that if a teacher is fading their support, the learner is internalizing the processes they used, and commensurately taking on increasing control of their responsibility for learning (Puntambekar & Hübscher, 2005).

There have been a number of key studies in education wherein investigators scrutinized facets of teacher-student relationships in a naturalistic setting and framed findings according to scaffolding, with co-regulation-to-SRL interpretations (Hadwin et al., 2005; Radford et al., 2014; van de Pol and Elbers, 2013). Hadwin et al. (2005), in a study of how teaching instructors and teaching assistants (TAs) interacted with graduate students showed, from pre to post periods in an academic year, that the nature of teacher-directed dialogue faded. Specifically, there was a decrease in teacher-directed regulation and an increase in student-directed regulation, indicating that responsibility of regulation transitioned from the teacher to the student. Radford et al. (2014), with a focus on dialectic transcripts from recorded lessons between English and math TAs and their middle- and elementary-school students, were interested in the back and forth negotiations related to heuristic scaffolding (how students can learn by discovering things themselves with the help from a teacher). The results were inconclusive as the naturalistic recordings of lessons yielded very few examples of heuristic scaffolding, and therefore only provided examples of how a teacher could help students discover the correct answer. Finally, van de Pol and Elbers (2013) assessed how a sample of 22 social science teachers (half of which were trained in a professional development programme on scaffolding) interacted with middle school students during the last of five planned lessons with regards to contingency control using a three-turn sequence. Their results showed the teachers would adjust or retain the same level of

support to a student based on how successfully they responded to a question, with the benefits of contingency control being most pronounced when a student's initial understanding was poor.

Despite the presence of these naturalistic studies in education, similar studies dedicating scaffolding to the coach-athlete relationships are absent in the sport coaching research.

The Sport Practice Setting

In principle, the three processes of scaffolding turn the responsibility over to the learner and set the stage for more optimally self-managed practice conditions. Education researchers have suggested this transition from co-regulation essentially relies on the instructor utilizing the concept of fading. The criticality of fading was, however, seemingly disputed by Jones and Thomas (2015) in an insight piece on scaffolding and sport coaching. These authors suggested that instead of completely fading their scaffolds, coaches leave behind a “ghost” framework in the minds of their athletes that can be revisited if the coach believes the athlete needs to go “back to basics” or work on their fundamentals or foundations of a skill. This suggestion was contrary to what would be expected of fading from the field of education, however Jones and Thomas only speculated this idea and did not collect data to support their claims. It is reasonable to speculate that interactions in a teacher-student dyad (in a verbal-cognitive domain) and a coach-athlete dyad (in a motor learning domain) will differ. For example, athletes require verbal-cognitive transactions as well as technical, kinesthetic learning in their unique practice setting.

With no studies dedicated to scaffolding in the naturalistic sport setting, there is merit in considering findings from traditional laboratory-based motor learning literature. For example, a key topic known as feedback scheduling (i.e., the frequency with which a learner receives feedback across progressive trials during practice; e.g., Schmidt, 1988) has implications that support the notion of fading. Specifically, feedback delivered to the learner (termed knowledge

of results, or KR) after practice trials is typically found to be beneficial and helps improve learning if it is given relatively frequently at the beginning of skill acquisition trials and then gradually reduced or “faded” over time. That is, motoric learning improves when post-trial feedback is delivered to the learner at increasingly intermittent schedules over time, compared to giving feedback after practice effort on the earliest trials (Winstein & Schmidt, 1990). According to a coaching manual based on this literature (Vickers, Livingston, Umeris-Bohnert, & Holden, 1999), faded feedback across practice trials is needed for an athlete to achieve good long-term performance because it facilitates their independent functioning from external support and encourages them to attend to their own kinesthetic sensations when external information is withheld.

Considering Jones and Thomas’ (2015) commentary juxtaposed with support for fading in a highly-controlled, non-naturalistic, motor learning domain, it is important to explore the nature of fading in naturalistic coach-athlete dyads. There is a need to better understand whether fading processes are somewhat linear in sport, as espoused by perspectives in education and the classic motor learning literature. Because of assumed differences in the sporting domain, one cannot assume that processes associated with contingency control, fading, and transfer of responsibility in teacher-student dyads, manifest equally or similarly for coach-athlete relations, and that the progression from co-regulation to the development of SRL in academia applies similarly in the sport domain.

Research Purposes

The purposes of this research were to: 1) explore whether the characteristics of scaffolding occur within a relationship between one coach and athlete over time; 2) understand the role of the coach and athlete in the dyad, their independent roles, and also how their roles

relate to co-regulation; 3) explore how co-regulatory interactions occur and are implemented within dedicated times during skill acquisition at practice; and 4) uncover evidence of SRL in practice and to describe how facets of SRL relate to coach-athlete interactions and co-regulation over time. Collectively, these four purposes underpinned the broader aim of better describing the nuances and complexities of scaffolding in sport and whether they can be described as important to co-regulation-to-SRL transitions.

Method

Participants

The current instrumental case study (Stake, 2005) examined interactions between a coach and an athlete in the figure skating practice context. Figure skating was purposefully selected because it is an individual sport where the season unfolds over the course of about four months, affording the possibility of evolving key dyadic interactions. The athlete is challenged with learning new, complex skills/routine and working towards a specific event or competition. The skater interacts intensively with a coach during dedicated times at practice, and there is familiarity between the skater and coach where discussion or verbal interaction is apparent. Outside of these dedicated times with the coach, skaters can train with other specialists (e.g., jump specialists, figure coaches), and importantly, often practice on their own.

Recruitment proceeded with the dyad in mind; specifically, we aimed to recruit a coach with a matching skater, who together met inclusion criteria. Recruitment occurred via skating club representatives and then in-person at local skating clubs in a mid-size city in Eastern Canada. The coach had to be a certified high-performance coach with substantial experience within the sport (minimum 5 years). The skater had to be between 13-18 years of age, have prospective growth in their sport, had been with their coach for a few years, and participating at a

competitive level while learning a new short program. Once a coach consented to participate, she completed a screening sheet to provide data pertaining to inclusion criteria. We also presented ourselves to parents of this coach's skaters to inform them of the study and receive parental assent. Following parental assent, we further obtained informed consent from two skaters and asked them to complete a screening survey. Based on each skater's responses, we contacted the skater that best fit the inclusion criteria, who agreed to participate. All procedures were approved by the research ethics board at the host university.

The participating coach was a 53-year-old female, a National Level (3) figure skating coach, who had over 30+ years of coaching experience in recreational and competitive skating. She had coached both singles and pairs, with singles competitive skaters up to the Novice and Gold level. She was also a singles Technical Specialist who sits on a panel with judges at competitions, and is a Star 1-4 competition judge. The skater was a 15-year-old male who had skated competitively for 6 years. He was ranked 27th out of 49 males at the pre-novice level when data collection started, and advanced to novice level by the end of data collection. At pre-novice, a skater must be 15 years old or younger, must have passed specific assessments, and perform in his competitive programs elements by themselves (e.g., sit spin with one foot change, double loop jump) as well as jump and spin combinations. He competes in singles and doubles competitions and was preparing for Sectionals (akin to Provincial championships) as a singles skater during the season. He practiced on the ice four times per week for a total of 10 hours, with approximately 2.5 hours one-on-one on the ice with the participating coach. The skater first started figure skating lessons with the participating coach at age 9 and has been with her since. They had spent six years together rising through the skating development system, which allowed for a mature perspective that informed the exploration of the phenomenon in the current season.

Data Collection

Data collection involved semi-structured interviews with the coach and skater, audio-recordings of coach-skater dialogue at practices, and observational field notes. Data collection occurred from the middle (October 2018) to the end of competition season (December 2018), and continued post-competition until the start of the off-season (March 2019). Thus, data collection tracked the build-up to the season-ending Sectionals competitive peak and also the intensive time of technical preparation and refinement for skaters, which commonly occurs in the months immediately after competitive peak.

Field notes and audio transcripts. The principal investigator (PI) attended 16 practice sessions spread out across the season, where she observed the session, took field notes, and audio-recorded all coach-skater dialogue. Observational notes pertained to non-verbal communication between the coach and skater, logs for time stamps for pertinent dyadic communications, descriptions of the skater's trials on various performance elements (and notations on whether they were successful), and initial observations. These notes were instrumental for understanding figure skating in more depth (i.e., the context of dialogue, and informing interpretation of the interview transcripts to provide a more holistic picture of the sequences of interaction within practice). At each of these practice sessions, dialogue was recorded by microphones attached to the coach's lapel. The PI transcribed these audio recordings verbatim, amounting to more than 117 single-spaced pages of text illustrating the dialogue between coach and skater during dedicated periods (approximately 20 minutes) at each practice. These audio-recordings were essential for understanding dyadic relations in a naturalistic setting to provide better insight for the interviews, and to provide evidence of dialectic interactions.

Semi-structured interviews. The PI conducted three semi-structured interviews with the skater and coach separately. The first set of interviews occurred after practices 4 (December 5) and 5 (December 6) with the coach (38 minutes duration) and skater (24 minutes), respectively. The first set of interviews asked open-ended questions about their practices, for example asking the coach “Can you tell me a little bit about your philosophy on giving feedback to your athletes?” and the skater, “Is there a lot of interaction between you and your coach during practice?”. The interview was guided by the characteristics of scaffolding, for example, by asking the skater specific questions relating to contingency control (e.g., “What does your coach do when you do something wrong in practice?”), fading (“Does your coach interact with you after every time you perform an element?”), and transfer of responsibility (“Is it important for you to practice on your own without a coach?”), with further probing for situational examples.

Pilot interviews were conducted for the first coach interview to make sure the key concepts were being reliably probed. Coach pilot interviews were performed with five individuals in the academic community (i.e., master’s students, post-doctorates, professors) who had previous coaching experience with various sports (e.g., soccer, hockey, Nordic skiing). After each interview, the PI and her supervisor discussed what questions had been answered and necessary refinements to the wording of questions. Pilot work was conducted on the first athlete interview to confirm the concepts of scaffolding were being assessed by the semi-structured probes, and to make sure that wording was appropriate for a young adolescent athlete. Pilot interviews with a 24-year-old collegiate athlete, followed by six athletes between 10-14 years-old (5 competitive, 1 semi-competitive athlete) helped to refine question phrasing.

The second set of interviews occurred after practices 12 (February 5) and 15 (February 19) with the coach (44 minutes long) and skater (34 minutes), respectively. Questions were

informed by answers from the first interview and intervening field notes about key interactions and occurrences. They prompted the skater and coach to talk about previously noted ideas further, and to corroborate information between the skater and coach. The PI probed the coach with queries such as, “Last interview, you mentioned the progression from teaching to correcting. Why is it important for the skater for you to switch from teaching to correcting?” and asked the skater, “Are you expected to be an independent skater and what does that mean to you?”.

The third interviews occurred a week after the final observed practice. These interviews were shorter (20 minutes for coach; 17 minutes for skater) and followed up on concepts that were still unclear, to corroborate between the skater and coach, and were informed by intervening observational field notes. Questions focused on the nature of their interactions as the skater progressed in an element (e.g., the progression from the single, to the double, to the triple version of the same jump element). Probes asked the coach to address interactions and the skater’s maturity, for example, asking “Do you strategically try to facilitate greater maturity in the skater as a skater in practice?”.

Qualitative Data Analysis

Interview data were audio-recorded, transcribed verbatim, and then imported into QSR NVivo12 software. Data were first deductively analyzed using a six-phase thematic analysis process (Braun & Clarke, 2006). The interview transcripts were read and re-read in order to become familiar with the data. Then, notes were written in the margins to start generating ideas. After that, first order themes were coded based on contingency, fading, and transfer of responsibility. The three coach transcripts were deductively analysed first, followed by the three skater transcripts. Initial interpretations were made from the deductive analysis. Efforts were

made to group and regroup coded segments to fit into higher order themes. However, it became evident there was crossover in the three categories. At this point, the best-coded segments that were illustrative of the strict deductive definitions were kept in their respective categories. Furthermore, transcripts were inductively analysed in chronological order, alternating between coach and skater at each time point. Altogether, analyses resulted in approximately 65 single spaced pages of coding, with 30% of the coded pages derived from the deductive analysis.

Rigour

Critical friend. The PI used her supervisor as a critical friend during analysis, meeting on a bi-weekly basis. After reading the PI's notations on all interview transcripts, he provided his own notations. They then met to discuss, wherein he advanced ideas the PI had not considered, or served as a sounding board to resolve questions about regrouping of themes. The critical friend helped affirm the PI's interpretations of the collected data, refine the definitions for each theme, and vet supporting quotes.

Credibility. The PI observed over 16 hours of on-ice training between the coach and skater. Observing the coach-skater dyad within practice aided in the PI learning more about the sport, and poignant situations, to more credibly and comprehensively discuss specific instances within the interviews. Field notes informed rich and targeted probing within the interviews and enhance credibility of interpretations from the interview data. Transcribing practice audio data and reading and familiarization of the extensive audio dialogue transcripts made interviewing the participants more reliable. Similarly, the coding of interview data was more reliable because the context was well informed from the observations, field notes, and audio transcription.

The PI observed another 16 hours with the same coach and one of her less mature skaters (age 11, 3 years skating, less skilled), to have a contrasting dyadic case. This contrasting case

was important to understand how interactions between the skater and coach differ based on experience within the sport (e.g., how a skater with less maturity responded differently to the same coach). Participant observation, field notes, audio transcription were also taken during sessions for the contrasting case.

Results and Discussion from Deductive Analysis

Based on the strict definitions of the three conceptual characteristics of scaffolding, it was evident that scaffolding occurs within a sport practice context. Commonly, the coach would watch the skater perform an element on the rink, and when the skater would return to the sideboards, she would offer commentary that served as *contingency control*. The skater described how the coach would apply new corrective information when she observed faults in the just-performed element, noting: “[the coach is] like ‘ok, so you need to like pull out’, or she just uses hand gestures, showing how I just need to be a little tighter”. The skater would apply this information to the next practice trial, saying “ok, then I’ll go around and do it again”. The coach would commonly give the skater informational support on how to fix this element and then would give him time to perform that element again with the corrections.

Transfer of responsibility occurred when the skater took on more responsibility for correcting their mistakes on an element over time and making sure that it was competition ready. When the skater was asked about how his exchanges with the coach later in the season had changed compared to the beginning, he described a shift when working on an element:

Something right now is the doubles [jumps]. That stuff is mostly easy now, so it’s like I can do that on my own because there’s not much, like all that, to me, if something’s going wrong, I shouldn’t rely on my coach to fix it because I’ve done that a million gagillion times so, I should know what that feels like.

Fading was apparent when the coach gradually reduced her frequency of control/support over time. She decreased the amount of time rehearsing an element with the skater in practice but

would still expect the skater to perform it at the same level at which she last saw it at a prior practice. Thus, fading occurred across a series of practices. It also occurred within the same practice session. For example, the coach described how her communication with the skater shifted as he was progressing on a technical aspect in practice:

We were doing the edges in today's lesson. When we started off, [I was saying], 'ok, you really need to hit the edges going in and out', and then I was able to say, well, 'you know, that's nice and sharp and crisp, and that was still skidding'. And then it [my interactions] just becomes a head nod 'yes', or 'no that one didn't work', and 'let's press more into the edge', 'let's rotate more with your shoulders'.

In this example, the coach saw that the skater was progressing on his technique and faded from verbal to non-verbal feedback. After switching to non-verbal feedback, the coach provided the skater with specific cues or reminders, and then switched from focusing on very specific parts of the blade to feedback that focused on the skater overall (i.e., rotating of the shoulders).

Due to the dangerous nature of figure skating, the concept of fading for some elements (e.g., jumps) was predicated on safety, where the coach would reduce their support only after the skater showed the ability to perform the element safely, and then would withdraw their support based on the accuracy of the element.

Problematizing Exclusive Definitions of Fading and Transfer of Responsibility

The coding of strict deductive interpretations for fading and transfer was not easy. The conceptual definitions overlap making them indistinguishable at certain circumstances. Specifically, definitions for both fading and transfer (see Puntambekar and Hübscher, 2005) intertwined agency afforded to the coach and agency afforded to the skater. This was problematic when the skater would commonly switch between "I" and "we" to describe exchanges or would omit pronouns altogether during his interviews. For example, when the skater was asked how he knew he had to work on a weaker skill element, he stated:

Umm, probably, [the element] is not very good, from what I've heard. So like, if the program's disastrous then, I know that [laughter]. Or it's like, if I'm just skating in general it's like, those lines don't look so nice, and it's like ok *we're* gonna work on that now.

It was unclear who was stating the skater's lines do not look nice, and which person decided to work on that element, as the skater disguised such information by using the pronoun "we". This made it difficult to identify the decision-making agent (skater or coach) who took a more active role in situations. Based on the strict definitions, it was often unclear who decided when they should move on to another element during practice, or which person was predominantly controlling situations.

Moreover, when the skater talked about learning a new technical element (e.g., jump), it appeared that when the coach was fading her support, it went hand in hand with the skater taking on more responsibility on the skill:

At the start, *we'll* be really focusing on getting that perfect take off, and not so much the landing or the rotation, just getting that really nice take off, so everything's able and nice. Then, progressively, we'll start less worrying about that, that'll be *more on my thing*. Then we'll start focusing on the rotation and we'll start working on the landing. So then that happens, and then [those aspects also] slowly go *onto more my thing*.

This process was reiterated by the coach when she was talking about a skater first learning how to perform a jump:

When he's first starting, like when [he] first starts doing his triple lutz off the [safety] harness, then I'll probably try and be more, in his face, right away – 'you gotta fix this'. As he gets a little more comfortable and I get more confident that he's over his skate [successfully], then I'll step back a bit more.

The coach and skater both seemed to combine the concepts of fading and transfer.

Inextricably, when fading was occurring, so was transfer, and they were therefore difficult to separate deductively. In sum, this is the first time that all three concepts of scaffolding were within the same study, resulting in our finding that we could not separate fading and transfer of

responsibility completely as the terminology given by the skater and coach made it difficult to distinguish between the two concepts.

Under-Representation of Fading

Fading was found to be under-represented during the interviews for a couple of reasons. Mainly, the coach and skater often appeared unaware if there was a change in frequency of dialogue that occurred over the course of the season. Instead of explicitly acknowledging a strategy to decrease the amount of dialogue that occurred between her and the skater, the coach instead spoke more about a change in the *nature* of feedback and information exchange rather than a change from more to less. Secondly, it is possible that fading may have potentially been underrepresented because the interview questions in the current study might not have been able to pick up on the micro cycles of fading (i.e., fading leading up to a competition) and were framed around the macro cycles of fading as conceptualized in previous studies (e.g., over the course of the season).

Deductive Analysis was Insufficient

While we were able to find evidence for scaffolding in sport based on the education domain definitions, it was clear there was a lot yet to be explained. Overall, the deductive definitions were constraining in that they prevented us from interpreting the nuances and richness of co-regulation in the coach-skater dyad. Co-regulation in sport has elements from the education and motor learning domains, and therefore it seemed inefficient to only look at it through the education lens. There were a lot of rich data that did not conform to the strict definitions of scaffolding, and therefore inductive analysis was required to examine the nature, complexity, and highly particular aspects of co-regulation.

Results from Inductive Analysis

Twenty-one inductive themes were initially created, which were initially sorted into three higher-order themes (Braun & Clarke, 2006). From there, seven of the 21 themes (which became second-order themes) were broken down into third-order themes (see Appendix S). The three higher-order themes included: 1) the interface, or the zone of micro-level co-regulation; 2) macro-level co-regulation; and 3) independent roles and attributes for practice. The micro-level interface and macro-level co-regulation themes demonstrate how the coach and skater use scaffolding in various ways, whereas the roles and attributes of the coach and skater themes highlight what each person is more independently responsible for in relation to practice. Quotes from the coach and skater interviews were used to illustrate themes, with excerpts from practice transcripts embedded within the text to provide dialectic examples of the themes in practice.

The Interface

The interface represents the micro-level integration of the coach and skater's knowledge and perspective about a skill/element that the skater performed during a practice, and this understanding in the repeated dyadic interactions oriented towards skill acquisition on practice tasks. It is referred to as micro-level, because it happens in a somewhat defined zone, physically, and temporally, in a dedicated period of intensive interaction between coach and skater. During a typical practice session, the interface will take place along the boards at the side of the rink, when the skater approaches the coach at the boards after having performed one or more repetitions of a skill. The interface can also occur if the coach skates out to the skater on the ice so that the skater can promptly perform the element again with corrections and refinements. In both cases, the coach and skater will "mix" their perspectives and evaluations in the interface and it will occur immediately after the skater performs an element or skill. There is a negotiation or

back and forth between the coach and skater that includes testing one another's perspectives on appraisals and solutions through questions, commentaries, and also using strategies to gauge one another's understanding and to inform their knowledge on the element. Figure 1 represents the interface and portrays what the coach and skater provide to the post-practice trial discussion. The interface will occur when the skater first learns a skill until the coach believes that the element has been executed sufficiently and does not need to be further discussed together. A skill can be re-examined within the interface if the grade of execution declines.

The interface is a critical zone for skill acquisition and refinement that epitomizes co-regulation. The coach and skater take turns initiating the dialogue and are actively engaged in the discussion of practice trials. Both members of the dyad initiated strategies, which could be considered as questions, prompts, and statements about their interpretations on the execution and possible solutions of the just performed element. Through the interface, the coach also used techniques to encourage participation and motivate the skater.

Coach-initiated strategies. The coach was expected to provide the skater with feedback based on his performance of a skill. This feedback varied in terms of timing and mode of communication depending on the information the skater provided to the interface. The coach said "I try and give it [feedback] as quickly as possible" and "as instantly as possible" [CI-1], that way the skater still physically and cognitively remembers what they had just performed and can correct their mistakes with her feedback. This was seen, for example, after the skater had just attempted two trials of a triple toe jump. Having fallen on the first and second trial, *the coach initiated the conversation* promptly with an appraisal as the skater approached the boards:

C – That was a *much smoother pattern* [on trial two].

S – Good thing my hip healed because that would have hurt like heck. [Both laugh]
 Woah, ok. [Calming himself down so that he can talk with the coach]

C – Yes, um, so the first one [the repetition of the triple toe jump] you did, you hooked just as you went to [toe] pick.

S – Yeah.

C – [Which is what] you wanted, [so] keep it [in the pattern as you are entering the jump]. The second one [repetition of the triple toe jump], you kept yourself really under control and came right through.

S – Yeah, [I] just need to control the landing a little bit more.

C – So the more you set your pattern up consistently, the easier it will be for you to get that take off to work.

S – Yep yep.

C – So. Visualize it.

[Skater does a run-through where he visualizes what he has to do to perform the triple toe jump for about four seconds]

C – OK, now go do it [the triple toe jump].

[Excerpt, Practice 9]

Here, she provided the skater with an appraisal soon as he completed his second practice trial. It effectively prompted him to think about how he felt during the performance, but it did not allow the skater to volunteer this information or personally reflect on the element he just performed.

There were also times after a practice trial when the coach initiated the interface conversation with an appraisal, then strategically used questioning for clarification:

C – [From the boards while the skater is returning to her] So, *it's better* [the skater's performance of a rocker turn], but it was still a bit of a skid though.

S – [Back at the boards with the coach] I fell a little bit back on my skate.

C – *So, you're too far back, maybe when you're going faster, you're further back?*

S – Yeah.

C – So, try and rock forward, just before the turn.

[Skater performs it by the coach at the boards]

C – That was nice and clean. That was really clean. So, whatever you're doing there, try and do that, but it's going to be more difficult when you're going faster –

S – Yeah.

C – that's the whole point, right? Like, we give you more marks, when you're doing something faster because we realize it's harder. [Skater laughs] So, try again.

[Excerpt, Practice 12]

After the skater stated his performance appraisal, she acknowledged this appraisal and in turn asked a question to further her understanding so she could provide further support. This back and forth illustrates the prerequisite nature of information integration between the coach and skater.

The coach would sometimes provide the skater with a counter appraisal if she believed the skater's own initial appraisal of an element was insufficient. This was the case when the skater made an appraisal that she believed was not entirely correct:

C – That [triple salchow jump] was *much better in the air*. There was still a little bit of over rotation. But you were able to correct it. *Right*, when we're working to get the quadruple [salchow] we [have] got to fix that.

S – Fix it, yeah.

C – *Right?* Because, [there's] lots of room for error in a double [salchow]. Not so much room for error in a triple [salchow]. No room for error in a quadruple [salchow]. It's got to be bang on, pretty much like your double [salchow] that you did earlier, [you had] perfect position in the air. Well, there is no perfect [position in the air], but, as close to perfect as you can get for you.

S – Yeah. Um, *to correct over rotations should I just, lay off of the...? Like, not...?*

C – *No, I liked how quick it was.*

S – Ok.

C – I would more try and control –

S – Just at the end. [trying to finish the coach's sentence]

C – ...the ending of the jump –

S – Alright.

C – ...and get more over top of that right side, do that little in-turn of your big toe to tighten up through here [gesturing to the skater] and pull your hips back, which makes it easier for you to get your shoulders back in position *right?*

[Excerpt, Practice 13]

Here, the skater tried to actively participate in the dialogue by quizzically forming a solution and trailing off his sentence; this in turn prompted the coach to respond and give her counter appraisal. The skater then tried to complete the coach's sentence, displaying that he understood the corrective content the coach tried to convey. This dialogue sequence then finished with the coach presenting another appraisal and a solution to correct the mistake.

Notably, the coach often used the word "right" in strategic ways. She often used "right?" as a rhetorical question to finish her sentence, continuing on with her feedback and not waiting for him to respond. The coach also used "right?" to prompt the athlete to engage, asking for a confirmation from the skater or for his elaboration on an appraisal or a solution.

Exiting the interface: Coach gives positive and sustaining feedback. The coach often used a “sandwich approach” when providing feedback. As evidenced in the prior excerpts, the coach commonly initiated the interface with a positive appraisal, then delivered critical appraisal. Importantly, she commonly provided sustaining feedback on the exit from the interface. For example, after the skater performed a double axel erroneously (e.g., where his shoulders were ahead of his body and his hip was coming out), the coach still acknowledged improvements in this practice trial over the last attempt, gave the skater her technical directions to correct his mistake, and ended the dialogue sequence with “Yes, keep your right shoulder back. You did that just now on this walk through [intonation up]. So focus on that when you do two double axels” [Excerpt, Practice 14]. The coach wants the athlete to stay motivated and not to feel discouraged while she is providing him with technical feedback to correct his errors.

Skater-initiated strategies. In the interview, when the coach was asked who commonly initiated conversation when the skater approached the boards after a practice repetition, she said, “it doesn’t matter to me” [CI-3], as long as the conversation and the “mixing” of information between the skater and coach took place. Thus, there appeared to be much credibility to the back and forth within the interface dialogue, even when it was initiated by the skater. The skater was expected to provide the coach with his kinesthetic analysis based on his performance of a skill or element. He would sometimes initiate the conversation in the interface and provide the coach with his appraisal. Although the skater expected to appraise his own performance following practice trials, he acknowledged that “sometimes, [I] just kind of black out [when performing an element] because a jump or a spin is very quick” [SI-2]. As a result, he described that it was important to have the coach give a second perspective and to give her appraisal. He specifically relied on the benefits of the coach’s visual analysis of his performed element. The coach echoed

this statement when she described the insufficiency of the skater's own kinesthetic feedback in the interface conversation. Referring to her own role in the interface when the skater approaches her after having made a mistake in practice, she stated:

When he's doing [an element] himself, he can't always tell [what's happening]. Sometimes he can. But, sometimes he's just like, why isn't this [element] working. Like with his head on the flip [element], he's asking 'why isn't my flip working?'. Because he can't feel it, and the motion is 'this much'...[gesturing to show a very slim margin of error]...it's like 5-10 degrees, that's all. But it can throw the flip right off. And two degrees will throw off his triple. [CI-2]

With her undivided attention on his performance, the skater was often able to internalize the solutions offered by the coach for consideration when he later practiced these skills by himself.

The skater also initiated the conversation by stating his appraisal of a just-performed element to prompt the coach for insight on what he did incorrectly and how to correct it. This is illustrated by dialogue [Excerpt, Practice 9] about an axel jump:

<u>Dialogue</u>	<u>Strategy</u>
S – Over-rotated, but...[commenting on his performed axel jump]	Skater appraisal
C – A little bit, a little bit in your upper body, but actually not much.	Coach elaborates on skater's appraisal
S – No?	Skater questions the coach seeking more information
C – No, you're much more aware of it [your body during the rotation].	Coach counters skater's initial appraisal
S – Good. [laughs]	Skater acknowledges coach's appraisal
C – So, you were not happy with that landing, but, it was good. You know, four months ago that would have been an awesome landing. [skater laughs] <i>Right?</i> So, now our expectations are higher for you, you're getting stronger and stronger. Alright, do you want to do the axel again?	Coach uses positive and sustaining feedback
S – Yes. [chuckle]	

This interaction demonstrates the mixing of information and the idea that the skater would test his appraisal, and have it validated or countered by his coach. The skater initiated the

conversation by appraising his jump and trailing off his sentence so that the coach could provide commentary on the jump. The coach then reassured the skater that his appraisal is partially correct, followed by the skater asking a question so that the coach could expand on her appraisal.

Sometimes, the skater would initiate the interface with an utterance that insinuated a self-initiated appraisal. The coach would then try to gauge the skater's understanding so that she could adjust her informational support to the skater. The following dialogue [Excerpt, Practice 9] demonstrates such a back and forth after he fell while attempting a triple toe jump:

<u>Dialogue</u>	<u>Strategy</u>
S – <i>Oh my.</i> [Uneasy laugh]	Skater appraisal
C – Yeah, what happened? [Both laugh] I can tell you physically what happened, I want to know mentally what happened as you were going into it?	Coach questions the skater to seek their understanding
S – I think, even though I'm trying not to, [it may be] even a force of habit or something, I'm just trying to get it over with, and getting it finished. [I thought] just something is amiss, and something [didn't] quite go as right, and so, [I was] trying to [figure out] exactly what's happening in the jump and what's going wrong, and my nerves and everything [were distracting me].	Skater elaborates on self-appraisal but is uncertain
C – And, trying to fix it on the fly, right?	Coach questions for confirmation
S – Yeah.	Skater confirms coach's question
C – So, physically what happened was, as you went to pick, you arched.	Coach appraisal
S – OK.	Skater acknowledges coach's appraisal
C – So, you want to keep yourself in that nice line coming through. Do a couple more of those walk-throughs [performing the skill at a micro level where the body barely moves while you are going through it in your head] like you did.	Coach provides solution

Hearing the skater's emotional reaction to his fall, the coach acknowledged something happened during the trial, but asked the skater to explain his point of view before giving her appraisal. The skater validated the coach's clarification question, which prompted her to explain her visual

analysis and provide the skater with a solution. This sequence of dialogue illustrated the typical “mixing” of the coach’s visual analysis and the skater’s kinesthetic analysis within the interface.

Resolving incongruent perspectives. They sometimes had incongruent perspectives and needed to discuss to understand the other person’s point-of-view. This could be seen when they were discussing his height in the air after performing two trials of a double axel jump:

C – Um, [the] second [double axel] *was much better*, [the] first one you went outside [of] the circle a little bit, *right?* So that’s, as a result of that hip coming out –

S – Yeah.

C – or this shoulder going down. *Right?* But the second [double axel][intonation up], you fixed it. You pulled yourself together, and you were much more over your skate. You kind of bounced out of the landing [intonation up]. There wasn’t quite the same check and core control on the landing of the second [double axel], I think because you went ‘ooooooo’ [admiring the jump] that one was really nice in the air, [but] you still need that strength.

S – [makes unsure noise]

C – You didn’t feel the second [double axel] was nice in the air?

S – It’s more like, get [as] high as possible and [as] quick as possible, so it kind of [was] just everywhere in my mind, like, ‘oh, this is messy and I have no idea how I’m going to end [the jump]’. [laughs]

C – No, your second [double axel] was much tidier than the first [double axel].

S – Oh good.

C – Yep. So. Alright, so let’s try this again, ok.

[Excerpt, Practice 14]

This dialogue shows the benefits of the skater being actively engaged in the interface. After prompting from the coach, the skater explained his appraisal of the double axel jump, and the coach was then able to help recalibrate the skater’s appraisal by reassuring him that it was not as bad as he had thought. It was important that both the coach and skater gave their point of view so that they could make the appropriate corrections to the element.

Prerequisites for a rich interface. A productive interface only occurred if the coach and skater met certain prerequisites (see Figure 1). Interface prerequisites referred to what the coach and skater expected to draw upon in terms of capabilities and responsibilities that serve to enhance interactions in the interface. These expectations also included responsibilities and

competencies that they expected to further refine and act upon to enhance future interactions in the interface (i.e., prerequisites for future micro-level interactions).

Shared prerequisites. The coach and skater each expected to be able to effectively communicate in a shared language using proper technical and sport-specific conventions within the interface. The skater expected, and was expected, to self-analyze and organize points that he could verbalize within the interface. The capability of the skater to match this expectation depended on the amount of time he had spent either with his coach and/or in the sport. The coach noted the importance of shared language for having rich interface dialogue:

[Skaters] need to grow more accustomed to skating, and the terms in skating because, it's a different language. So, they need to become accustomed to the language we use, the terms, the 'balance point', the 'sweet spot on the blade', your 'free leg' as opposed to your 'skating leg'. But with a young skater, or newer students, it takes a little bit of adjusting and learning to get that, and I realized it by teaching a skater who was a few years older that I need to explain to them [the younger skaters]. And the older skater gets it right away, but the younger skater only starts to realize it, 'ok, [coach] that's what you mean by it [a skating term]', over the course of time. [CI-2]

The coach and skater also expected each other to bring the same level of engagement to the interface. The skater was expected to actively engage with the coach with the appropriate element-specific arousal level and effort. Discussing affairs during a practice when the skater has "low energy", the coach highlighted the importance of him putting in effort:

As long as he's trying, putting the effort in, I know it sounds kind of rainbow-bright kind of thinking but it's true. If he's putting the effort into it, then, I'm not going to be a grouch that [an element] wasn't necessarily successful. It's the not putting the effort in, then I'm going to get hard on him. [CI-2]

When describing his responsibilities with respect to intensive segments of practice on-ice, he similarly stated, "Putting my full effort into everything, try and not like slack off, which, I don't [laughter]. Yeah, just trying to put 100%, umm, 110% into every session, to like, try to come out with something accomplished" [SI-1]. Therefore, the skater was aware that the integrity of the

interface, and the benefits he received from it, depended on his concerted effort and his being held to account for effort.

The coach expected to have to strategically respond to the skater's arousal level and effort by pushing and motivating the skater to improve. When asked if her interactions change with the skater based on his successes or errors, she stated:

I don't think so. Again it's more the effort. It's easy [for the skater] to put the effort in when everything's working. It's hard to put the effort [in] when it's not. So, it's more me being a cheerleader, me pushing. He won't see it as cheerleading. I say 'cheerleader' because I'm, like, that 'breathe', or 'push stronger', 'skate more', or whatever. But, so he'll see it [as] me nagging [laughter]. [CI-2]

Here, the coach described how she expects to provide encouraging verbal cues to help sustain the skater's motivation through a difficult practice, especially when his energy level was flagging.

Coach's expectation for input. The coach was expected to provide the skater with feedback on their practice trials. She was expected to capably observe the skater performing an element and translate this visual acuity into verbal information about performance accuracy. In describing his needs, the skater underscored the important prerequisite of the coach's visual diagnostics, stating "She sees something. 'Cause as I'm doing it [the practice element], I can't quite see it from that angle, so having that angle just helps so much" [SI-1]. The skater expected the coach to have had the visual angle to pick up information that she could share to direct what his work on subsequent practice trials. Talking about how the skater will learn exactly what went on, or what went wrong, in a just completed practice trial, the coach commented "It's hard [for him] to figure it out. He could feel, can feel the result. He can't always feel what caused the result. *And that's why [he] needs me focusing just on him and watching just him, to see*" [CI-2]. The visual information, or a second pair of eyes, the coach provides to the skater is critical for enriching the interface, especially for integration with the skater's kinesthetic analysis.

The coach also expected to modify or adjust her support based on the skater's knowledge and progression in a skill. The coach seemed to consider degrees of cheerleading versus tough-love technical correction that she would bring to the interface. When the coach was asked about her philosophy on giving feedback, she stated:

I like *to try* and give it in a positive way. But, we are trying to correct technical skills, so often times, you know, I have to tell [him] what [his] position was and what was incorrect for [him] to realize how to correct it. [CI-1]

This quote helps to nuance the sandwich approach that was seen in practice excerpts above, where the coach would provide the skater with positive feedback, provide a critical appraisal or a technical correction, and then exit the interface with sustaining feedback.

In terms of support, the coach expected to provide solutions and remedial tasks either verbally and/or through demonstration. The coach would often demonstrate footwork or body position to the skater within the interface, or verbally communicated what the skater had to do. Referring to different communication styles, the coach stated:

When he was younger I could [actually take his shoulders and rotate them] because he was almost the same height as me. I could actually say, 'ok, this is how you rotate your shoulders', but it's less about technique teaching now. It's more refining the technique he already knows. [CI-2]

Together, the coach and skater had developed an understanding between one another where less verbal communication was needed to convey an appraisal or solution. The coach stated that she would sometimes strategically delay her input to the interface dialogue to "wait and see if they [the skater] can recognize it [what went wrong in an element] and say it on their own" [CI-2].

Skater's expectation for input. The skater was expected to provide his kinesthetic information in the interface, which included translating kinesthetic sensations into articulated observations (i.e., sharing his cognitive analysis on how he felt while performing the element);

reflections (i.e., his metacognitive analysis on how he thought the element felt after the fact); and generating possible testable solutions for remedying a performance mistake.

After a practice trial, the skater often immediately thought about what he needed to analyze to bring back to the coach in the interface. When asked what typically goes through his head after he lands a double axel jump, he said, “Well, I’m more thinking of, what are the things that went right and what are the things that went wrong, what can I fix, um, [it’s] mainly element focused” [SI-2]. The skater expected his kinesthetic information and the coach’s visual analysis would be combined in the interface, and this integration would service solutions and remedial tasks. This was illustrated when he was asked if it was more important for the coach to state an appraisal and correct an error or when he tells her his appraisal:

Both are pretty much great, because I know I’m at least on that step forward. I know what I’m doing wrong so then at least I know how to correct it myself without the second help [from the coach]. Though, again, with them helping, like, ok, I know kind of how I’m feeling, so next time I know what that feeling is when it goes wrong so I can fix that myself. [SI-2]

Here, the skater described how the expectation for him to provide input to the interface also enabled him to learn how to appraise an element and correct it on his own.

SRL expectations and competencies. The coach and skater believed that engaging in interface exchanges would result in the skater developing an SRL skill set. Talking about taking on more responsibility on an element as the season progressed and how the exchanges between the coach and himself reflect that, he stated:

And again, for the interactions, at the start I won’t yell [what I thought/felt about the just completed element] so much, because I don’t really know what’s going on. But when the time comes [and I learn how to correct my own mistakes] I’m like, ‘ok, I don’t need to go back to [the coach] first, um, I’m just going to try and fix it again.’ [SI-2]

The skater thus learned to develop error detection and correction mechanisms, and the motivation to try to correct his own mistakes, both evidence of increased ownership of his

training. He came to understand, as part of his maturing relationship with his coach, that after engaging with the coach during his practice session, he was expected to be able to take information from the interface to work on elements on his own. He understood that he needed to benefit from the interface interactions to later enrich his own self-regulated practice efforts.

The skater also commented on his cognitive engagement and personal appraisals outside the interface that implicated his personal agency in his own practice. Outside of the dedicated interface zone, he explained how he would work hard, try to remember the correct way to perform an element, and would try to perform the element again in the same way using his SRL skill set. This can be seen when the skater stated:

Every time I first nail [an element] and it hasn't been going right in a week, I usually take a step back and then visualize every single step I've done going into the jump, how the air position felt, how the entry felt, how the landing felt. I remember all that, and then go back and do it again. [SI-1]

Here, the skater was monitoring how the element felt when he performed it correctly, evaluated that it was how it should have felt, reflecting on how each part of the jump felt, and then planned on performing the element again at the same capacity. SRL expectations and consequences are married to the interface where the skater will bring what they worked on by himself back into the interface and work on it with the coach.

Macro-Level Co-Regulation

While the interface occurs on a micro-level (i.e., a defined zone of mixing for skill acquisition), it is housed within co-regulation that occurs over time on a macro-level. Macro co-regulation is when the coach and skater come together (metaphorically and physically), highlighted by exchanges related to co-planning and co-assessment of practice activities, and interactions where the skater and coach share responsibilities for optimizing on-ice activity. Macro-level co-regulation was used to discuss what needs to be worked on based on the previous

session or competition, and to decide a course of action for long term goals. It was important for the coach and skater to have this over-arching conversation in order to create a shared mentality going into training, for the coach to provide feedback, to co-plan what will happen during training, and for the skater to feel they have a voice within the co-regulatory process.

Shared mentality. The coach and skater worked closely together over a long period of time, allowing them to develop a shared mentality. The skater stated that “our kind of motto for sessions is quality over quantity”, highlighting that this is a motto they share together. He also stated that the coach recites a quote in practice that he has adopted, reading “no session is good enough if I don’t accomplish something” [SI-2]. He identified with this motto, using it when he has setbacks or errors. This shared mentality was epitomized when he used the pronoun “we”. For instance, when talking about their dialogue when he was having a lethargic day, he stated:

I try to push on. Sometimes that doesn’t work and, like, our mentality, *we* say this a lot is, ‘if you can do it tired then you can do it well when you’re not’. So, *we* kind of focus around that mentality, so like when I’m tired, *we* work really hard on things. Sometimes I don’t like it [chuckle] but, I will still try my hardest on whatever we’re doing. [SI-3]

Here, the skater co-opted the coach’s motto stated in quotations and applied it to his training. They both noted the importance of sharing the same mentality, otherwise they risked disagreements that could result in wasted practice time.

Feedback from the coach. On one hand, there appeared to be a change over time in how the coach communicated positive reinforcement during the co-regulation process. She explained how different technical elements at different levels do not require the same amount of effort from the skater. To keep him motivated, she would therefore try to emphasize her reinforcement of the skater does when he successfully performed a harder element that demanded much effort, or emphasize her reinforcement of the skater when he performed an element that was the culmination of many efforts. She stated, “Yeah, because their elements become harder, so when

they do achieve that new jump, it's a big deal. If I don't make a big deal of it, [the skater will be] kind of like, well, what did I do all that work for?" [CI-1].

On the other hand, the coach was not always aware of the nature of her feedback. When asked to consider how often she gives feedback and if it changes across practices in a season, she stated "I have no idea [laughter]." [CI-1]. She did not appear aware of how her frequency of feedback changes on a macro level, but instead was aware that she changes her feedback based on how the athlete is progressing in an element/skill over time. When asked if her philosophy for giving feedback after successes is the same as it is for when the skater is less successful she said, "I'd like to think so, but it's probably not" [CI-1]. This highlights that she knew that she would like to provide the skater with specific feedback after successes and less successful performances equally but was not consciously aware if she did so in practice.

Planning. The coach and skater made efforts to create a shared plan based on what they needed to work on during a session. A practice is generally 1.5-2 hours long with approximately 15 minutes spent with the coach, which predominantly involved time cycling in and out of the interface. Typically at the start of practice, they would discuss the plan for the entire session, with the skater querying, "what do you [the coach] want to focus on [during our session]?" [SI-2]. The skater was purposefully gauging his plans in order to make the most of the session. Taking the coach's answer under advisement (e.g., work on flexibility), he would often make decisions to use his allocation of ice time to help him obtain "equal timing" [SI-2] for what he needs to work on across the entire period. For example, he would warm up his jumps and then "save the flexibility for later". The skater would use his preliminary on-ice practice time unsupervised by the coach to improve elements or to warm up elements that he knows he will be working on later with his coach, until his one-on-one (interface) practice time with the coach,

thereby optimizing his interface practice time. When they came together at that point in practice, the coach would probe the skater about what he had been practicing on his own. For example, to see what the skater would like to work on, she stated, “you’ve been on your own for ½ hour, what would you like to work on? Would you like to work on something you were having trouble with, or are you good, do we just move on to something totally new?” [CI-1]. Here, the coach was giving him options to see if he needed help, but also was acknowledging the skater’s expectation to divulge information to improve their co-regulated planning and at the same reinforcing the skater’s SRL responsibilities.

They also negotiated what they wanted to work on depending on the time of the season.

The skater described this aspect of planning as a negotiation:

So, um, since we both have different views on what we want to accomplish, or like, a competition’s coming up, what do we really want to work on. So it’s like, ‘ok, I feel like this [element] needs a little bit more work’, and then, the coach mentions, ‘this [other element] also needs a little bit more work’, so how do we manage that time. [SI-3]

This quote demonstrates the nuance of co-regulation, where the skater had a voice in what work needs to be done. The coach and skater co-planned what they needed to work on and discussed which elements needed improvement, especially during practices leading up to a competition.

Skater’s voice in the co-regulatory process. At a macro-level, it was essential for the skater to find his voice and actively participate in his learning with his coach. He would always let her know how he was feeling that day. He also described how he had a chance to broach what he wanted to do in practice, stating, “Like, ok, I’m sore today, let’s maybe work on stretching, or, my competition program didn’t really go well, I practically fell everywhere, I really want to fix this, I’m going to work on that tonight” [SI-1]. The skater understood how his body was feeling and what he was capable of in that state, so he would communicate with his coach in order to make that practice worthwhile. When she was asked if he ever negotiated what he

wanted to work on at practice, she stated “Sometimes, but, again it’s usually in a good way. Like the other day he was saying ‘oh I’ve been playing with this [phone application] to help with my flexibility so I’d like to work on the spins” [CI-3].

The artistic nature of figure skating is a unique feature that implicated co-regulatory considerations. The mature relationship between the skater and coach, along with the skater being a composer, allowed him to have a say artistically, by trying out new elements and talking to the coach about putting them into his choreography for his program. He also had a say in his performance music. The coach stated, “normally, we would listen to music and go ‘this is what I would like you to skate to’. With him, it’s more [that he says], ‘I really like the sound of this and the beat here, and the flavour’. So he’s going to try and come up with that [and compose a song for his long program]” [CI-1]. The coach tried to facilitate greater autonomy in the skater by allowing “him more choices in the music, more maturity, for the music, but still to suit his personality and style. Um, just because he’s more mature doesn’t mean he can’t have fun with it right? He can still have his jazzy, quirky numbers” [CI-3]. She liked to guide the skater where to go and facilitated his creativity within sport.

Independent Roles and Attributes for Practice

The coach and skater had important roles that informed interactions within the dyad but did not pertain to co-regulation. These roles and personal attributes ascribed to each actor were essential in enhancing practice and skill acquisition.

Roles and attributes of the coach. The coach believed her role was to communicate demands to the skater, in keeping with his progression to higher levels of figure skating. She stated that, “[she’ll] become more strict and demand more from [him]” [CI-1], and these

“demands” were important for keeping him on task and making him a better skater. For example, she stated:

I’m trying to reinforce that he needs to work on his flexibility and stretch everyday, and trying to get him to take ownership on it. [He’s a] teenage boy, it’s not happening, so, you know, flexibility is the last thing on his mind, right? But, that’s the biggest thing he needs to work on because [it will help his camel] spin, which is worth the same value as a triple jump. [CI-2]

The coach assumed a role for pushing the skater to be better, with the aim of helping the skater take ownership for that upon which he needs to work.

The coach had important decision-making roles related to when to keep working and when to stop and work on an element at another time. For example, if the skater was exceptionally tired during practice, she would say, “he can leave 10 or 15 minutes early” [CI-3], that way he could still practice but could also rest and be ready to work hard the next day. She would also tell the skater, “you know what, for the last 10 minutes just work on your footwork slowly, focusing on the quality of the edges. Don’t do any more jumps, don’t do any more spins or anything like that” [CI-3]. Thus, the coach took decisions without consulting or negotiating in the interface so the skater could still make the most of his practice without being in the position of hurting himself. However, another decision-making role was to step in and let the skater know when it was time to execute and be held to account. For example, she decided that he needed to keep working and improving on an element with a competition fast approaching:

When [he’s] struggling and [he’s] falling, maybe it’s a bad day and we move on to something else. But over the long term it’s like, ‘we can’t keep moving on to something else, we have to get this jump. Your competition’s in a week, I’m not trying to stress you out, but I want to make sure you’re prepared.’ And you know, again, try and be honest with them but be positive. [CI-1]

The coach made those decisions to strike the right balance between working and taking a break.

The coach had a role in keeping the skater on task and focused while he was performing an element. He acknowledged he struggles with multi-tasking and thinking of one thing and one thing only. The coach knew this and helped by prompting him with cue words while he was skating. He described how “she yells [comments] like ‘posture’ and ‘breathe’, and it gets me off focusing only on the next jump, or only on the previous jump, or the element or whatever it is I’m thinking of. So it’s like, that stuff [the coach yelling cues] really relieves that” [SI-2]. The coach understood the skater’s needs and provided this support while he was performing, with benefits to his focus, further allowing him to correct his mistakes on the go.

The skater found that the coach’s experience was very helpful and considered her a necessity to progress in the sport. Both conceived her previous experience as a competitive skater as an asset. He found that it was much easier for the coach to, “tell [her] perspective and lead him better because [competing and performing these elements are] fresh in [her] mind, [she has] personal experiences, so that really helps” [SI-1]. The skater acknowledged that she did a better job since she could empathize and understand what he was going through.

Progressing from teaching to correcting. The coach expanded on how she would switch from a teaching to correcting role as the skater improved on elements. She would teach the skater the basics of an element by breaking it down into manageable parts (e.g., focusing on the entry of a jump), and as the skater progressed in the element she would then correct or refine the technique to make it competition ready (e.g., refining to get more tightness on a quadruple jump). This usually occurred over a couple of years, depending on how the skater was progressing on an element or skill, but was evident as the skater was learning a new element (e.g., a single axel jump), and progressed through different levels of that element (double axel

jump, triple axel jump, etc.) within a season. In explaining the changing nature of dialogue from teaching to correcting, the coach said:

It's a gradual process, right? And teaching the technique is usually when they're younger, so [I'm] changing not only what [I'm] saying to him, right, from technique, to refining and positions, like 'I want it to look nicer. Now you've got your balance, now you know what to do, now I want to change how you're doing it, a little bit'. [CI-2]

Once he had the basics down for an element, her feedback became corrections or refinements.

This would include aesthetic corrections for the element, but also adjusting the timing. As he progressed from a single to a triple or a quad for a jump, for example, they were performing the same element at a faster pace in order to get in multiple rotations. She explained:

[The skater] knows [his] basics. I think I said to you before, if [I'm] teaching the technique on a single jump, it's pretty much the same on a double, but you have to refine it that little bit more. There's less room for error. And then on a triple there's even less room for error. You have to really refine the positions and then the tension held through the body, but, it kind of has to be a relaxed tension. And then a quad is even more so, basically there's no room for error on a quad. So right now we're trying to get all of [his] triples, so, trying to refine the positions rather than teach new technique. [CI-2]

Therefore, a key aspect of refining as the skater progressed was adjusting the timing for an element. The coach applied teaching to correcting transitions to every element within skating.

Although going from teaching to correcting seems straight forward, she did not explain it as a straight path: "It's back and forth and you know, it will sometimes be two steps forward one step back. Sometimes one step forward, two steps back, and then three steps forward. There's no exact science, it's an art" [CI-2]. Her descriptions indicated that as much as a skater progressed within an element, she could always take him "back to basics" and work on elements that he had already "mastered" if it was not going well or if the skater kept falling or failing.

When asked why it was important to switch from teaching to correcting, she stated, "as the skaters get more mature, you want them to be more self-directed" [CI-2]. She added, "so they'll feel more ownership on things and know that, 'ok I'm stronger, I understand the

technique...I'm closer to the goal'" [CI-2]. The coach believed that her role in transitioning from teaching to correcting helped marshal the skater to higher skill levels, while also allowing him to understand what was going on and be able to work on it by himself.

Roles and attributes of the skater. The skater believed that it was important for him to practice on his own. This expectation pertained to on-ice time when he did not have a coaching session. He related to taking on more responsibility for a salchow jump as the season progressed:

So [at the beginning of the season when I was first learning the jump] I don't know the feeling [yet], so again, as the time progresses, as the feeling um gets to me, it starts, not quite clicking but it's like, 'ok I know what I can do on my own because I've felt it before.' So, I can start working alone where I won't have to be worried about the injuries or anything about that. So I'd have a lot more like wiggle room, I guess, without my coach being around. [SI-2]

The skater needed to learn the feeling of what the jump should be like with the coach present, which was partly a consequence of the interface, and once he had that feeling he felt confident enough to practice the jump on his own. The skater valued practicing on his own, noting his perfectionist tendencies, "if something doesn't go right, [I] try and do it again, or try and make the next thing better, and try to fix whatever mistake so I don't leave that mistake on my mind" [SI-1]. He had a personal expectation to self-correct, illustrated when he said, "I know that feeling [of how it should feel when I correctly land an element], so then next time I know what that feeling is when it goes wrong so I can fix that myself" [SI-2]. This mimics the coach's sentiments of the end goal for the skater being enhanced self-direction.

The skater valued hard work and his independence. She noted his ethic: "he's very eager and he's willing to do what you ask him to do to improve" [CI-2]. He valued opportunities to exercise his independence to experiment to try to resolve challenges in technical execution of elements on his own. Describing how his coach sometimes lets him work out mistakes/frustrations, he said:

Yeah, sometimes it's just like a trial and error thing. Like, even though I'm not quite getting this it's not like something that just comes out of the blue, it takes some practice. Even in, we'll practice it in session, but then afterwards I'll keep on working on it, even though it may not go right, just, try to get there. [SI-1]

Thus, over time, he was increasingly trying to assume agency to improve his elements and his self-correction capabilities on his own time. He stated, "I like working on my own as well because I like being my own boss" [SI-2]. When subsequently asked if he considers himself an independent skater, but liked a second set of coaching eyes, he stated, "Yes, exactly" [SI-2].

Discussion

The purpose was to explore if scaffolding occurs within sport, understand the coach-athlete dyad and its relation to co-regulation, how co-regulation is implemented in practice, and explore the nuances and complexities of scaffolding in sport. Evidence of scaffolding was found in the coach and skater interviews, along with other concepts that were nuanced for the sport of figure skating. The coach's feedback appeared to occur after almost every practice trial and in different variations. A mature, enriched interface depended on satisfaction of certain prerequisite conditions for coach and athlete. The interface demonstrated complex and nuanced aspects of co-regulation during dedicated periods of intensive dyadic practice. While the interface represented micro-level co-regulation, it was understood within the larger scope of macro-level co-regulation involving the coach and skater. Importantly, co-regulation did not appear to be a linear portal to SRL by a skater in a practice setting as theorized in the education domain, necessitating a non-linear conceptualization in this sport context.

Conceptual Implications

How the scaffolding tenets should be considered relative to each other. Evidence of the three conceptual characteristics of scaffolding (i.e., contingency, fading, transfer of responsibility) were found within the coach and skater interviews. However, in using the

operational definitions of these characteristics to interpret data, it became apparent that it was difficult to distinguish characteristics due to their interplay. Both the skater's and the coach's descriptions of transfer of responsibilities and fading were inextricably related; as the coach described efforts to fade support, the skater described taking on responsibility and internalizing the processes used by his coach (Puntambekar & Hübscher, 2005). It was especially difficult to separate fading and transfer of responsibility quotes, since the coach was speaking about them meta-cognitively and recalling what occurred during past practices. Overall, our recommendation with respect to the three scaffolding tenets is that they should be understood as interacting concepts and therefore should not be looked at separately.

How the conceptual modeling of the co-regulatory interface should be considered.

The co-regulatory interface emerged as a dedicated and pivotal zone for coach-athlete interactions that described (a) contributing roles and expectations attributed distinctly to the skater and coach, (b) shared roles, and represented (c) the embodiment of transitory processes between co-regulation and SRL. The interface is not a person-centered model, it highlights the coach and athlete as parallel actors, both having an important role to play in this dynamic model. The interface is dynamic with the coach and athlete repeatedly coming back to it in order to exchange and integrate information, work on a skill, and revisit the information, each time figuring out what is happening with the skill and figuring out ways to improve it.

Considering micro- and macro-level conceptualizations of co-regulation. Co-regulation emerged at the macro- and micro-level. At the macro-level, the coach and skater discussed the skater's needs based on previous sessions or competitions, and their course of action for long term goals. This over-arching conversation was important for the coach to lead the skater where she thinks he could go, while allowing the skater to have a voice in the pathway

and to learn how to assess and address issues going forward. At the micro-level, the skater would perform an element and skate back to the coach (usually at the boards) where they would interact in a dedicated manner within the co-regulatory interface.

Both the macro- and micro-levels appear to be integral for the implementation of co-regulation in this coach-athlete dyad. These levels occur in tandem, with the coach and athlete toggling between them. There are times where the skater will practice alone on-ice (and self-regulate his learning), but will bring it back to the interface. Although the skater may not explicitly and outright state what he had worked on, the coach would regularly ask him what he has been working on by himself and what he would like to work on, or thinks he needs to improve upon. Therefore, self-regulation seemed to be married to the concept of co-regulation in sport, where the skater would self-regulate their learning, but would bring back what he has learned and worked on into the micro- and macro-levels of co-regulation. For example, the coach and skater would work on an element together in the interface during the micro-level of co-regulation, then nearing the end of the practice session the coach would convey planning at the macro-level stating they would work on this element during the next practice to further improve it. At the end of the same practice the skater would work on the element on his own using SRL competencies, thereby fulfilling his expectations for independent practice, and would finally bring back any learnings during this self-practice period to the micro-level interface at the next supervised practice session. While research has looked at SRL at the micro- and macro-level (e.g., Gould & Chung, 2004; Zimmerman, 2008), and Jones and Thomas' (2016) insight paper contended that scaffolding has the opportunity to work at varying levels, this study was the first to see the varying levels of co-regulation within one study and how it relates to SRL.

Fading and evidence of non-linear development. Scaffolding was found to emerge differently than from the education domain. The education domain is similar to the motor learning literature where Winstein and Schmidt (1990) stated that it was most beneficial when feedback was given frequently at the beginning of skill acquisition and gradually faded over time, compared to giving feedback after every trial. The results from this study were similar where improving elements would receive less technical feedback from the coach over time. However, coaching feedback overall was found to occur after the majority of practice trials and would be communicated within the interface where if the skater achieved near perfection on an element, the coach would still provide positive feedback to the skater after the performed element. These improved elements would receive less technical feedback, or less contingency control from the coach, unless the coach deemed the element was unsatisfactory at same later point (because the skater's execution had regressed) and she began to work on it again with the skater at a more basic level (see Figure 2). This cyclical nature of learning and mastering a skill, and then returning to a more basic version of that skill when there are recurring mistakes, is similar to Jones and Thomas' (2015) "ghost" framework. Returning to the fundamentals is not discussed within the education domain and it is assumed that the learning process for a skill is done once the learner is able to perform it on their own.

Practical Implications

The findings of this study may be important for practical use by coaches. The interface (see Figure 1) was integral to the communication between this coach-athlete dyad and to maximizing skill acquisition while engaging the SRL competencies of the athlete. It may be important for coaches to consider implementing the interface in order for their athlete to become a more independent learner, as seen in this study. It is important to note that our model of the

interface was co-constructed based on the current dyad and the meanings that each member shared with respect to their interactions and roles during exchanges at practice. Although we believe that this interface could be of great practical interest to more coaches, its pertinence depends on whether other coaches also see meaning in the current interpretations, and as such, are motivated to translate it to their own craft. If a coach wants to use our portrayal of the interface, he/she could consider the importance of building a shared knowledge base and language skills so that that he/she can effectively communicate with an athlete during skill acquisition segments of practice. Once this is established, the coach could start implementing the use of the interface with their athlete. Should an athlete be new to the sport, the coach could start by asking comprehension questions and how the athlete feels kinaesthetically when they perform a task or skill. Once the skater starts to become more aware of what they are doing within the sport, they could be given more opportunities to actively engage within the interface, volunteering kinesthetic articulations, without as much prompting from the coach. With continued dialogue and prompting from the coach, the skater may develop competencies and further motivation to mix his perspectives and integrate his information from those contributed by the coach. A coach's continued and patient use of interface strategies, such as allowing for skater-initiated appraisals, seeking clarification and elaboration from a skater, allowing for counter solutions, understanding a skater's confirmation statements (i.e., acknowledgment of understanding), all appear to be important for enriching an interface. Similarly, encouraging a skater to form their own solutions and test them, permitting the negotiation of perspectives, inviting clarification questions, and granting a skater to form a counter solution in response to a coach solution, can all be enriching strategies.

The interface can be implemented during practice and appears to be most beneficial after the athlete performs a task or skill. There may be others who would interpret the dyadic interactions having an ancillary target through which a learner learns how to learn. In sports other than figure skating, the coach may ask an athlete to perform a drill or skill, recognize when their athlete makes a mistake, stop the athlete where they are to discuss the mistake and invite various interface strategies, and then motivate and sustain positive feedback for the athlete to continue on with the drill.

The cyclical nature of learning and mastering a skill is also important to keep in mind when working on tasks or skills in sports. When the coach first taught the skater a new element, they would complete multiple repetitions of that element until the coach would switch to a more correcting or refining role. Once the coach believed that she had refined what needed to be corrected, she would then expect the skater to show increasing evidence of being able to work on the element on his own. When the coach decided to reduce the frequency of the interactions on an element, it is because the coach decided to offload the work to SRL. If the skater was unable to maintain the element at the same level, the coach could bring the element back to the correcting/refining stage of the element, or break down the element and teach him a new approach to the element. It is important for the coach to consider that even after an athlete has “mastered” a skill, there can always be improvement and the coach can refine the athlete’s technique, and then allow the athlete to work on it by themselves again, as evidenced in Figure 2. Therefore, SRL is not the final goal in the progression from teaching to correcting to SRL because a skill can still cycle back to the interface. The coach does not teach a skill to an athlete and then leave it at that, they always come back and tweak the skill. This could occur as the

athlete progresses in the sport or to harder skills that are similar graduations (technically) of simpler ones.

Merits, Limitations, and Future Research

This study is beneficial to research as it is one of few that have tried to look at all three concepts of scaffolding within the same study. This has allowed me to state with better confidence that I believe scaffolding occurs within sport because I looked at each individual tenant that created scaffolding separately and as a whole, unlike prior research that has looked at the tenants individually or in smaller pairings. It has also shown me that the three concepts are interrelated and should therefore be assessed together in the future.

Methodologically, this is the first study in sport to examine this phenomenon in a naturalistic practice setting. Therefore, it has given insight as to how scaffolding occurs and some examples of how it could be analyzed. Many steps were taken to enhance the credibility of the qualitative data collection and interpretations within this study. The PI observed 16 practices spanning over five months, all the while being a participant observer, taking in-depth field notes, and recording and transcribing over six hours of dialogue in the coach-athlete interface. Observing the participating coach with a younger skater in parallel to the reported case herein allowed for a contrasting perspective from a less mature coach-skater dyad. These methodological steps enhanced the interviews with the coach and the primary skater and the resultant analyses; they allowed the PI to become familiar with the data, to ask better questions, and present a fuller story on micro and macro-level interactions associated with a more mature coach-athlete dyad.

There were some limitations in this study. The first two interviews with the coach and skater occurred during the middle and end of the season, with the last interviews occurring post-

season, where we could have missed the initial learning of elements and programs that occurred at the beginning of the season. The mature coach-skater dyad was able to show nuances of scaffolding in sport, however it may have limited what we would have seen for fading as the skater was correcting elements instead of progressing through an initially (and intuitively steeper) learning curve. In light of this, future research could assess co-regulation at both micro- and macro-levels at different stages of development of athletes. This could be assessing co-regulation when an athlete is just starting the sport, or with an athlete that has progressed to expert levels in their career. Moreover, future research could assess co-regulation at different stages of dyadic development. Questions of dyadic stability and longevity, and associated aspects of relational familiarity and maturity, are important and likely have a bearing on the nature of co-regulation, and the contributing roles and attributes of each member.

Furthermore, we have speculated about how the shared prerequisites for the interface are developed, but it might not be the case. An athlete could have spent little time in the sport and/or with their coach and still be able to effectively communicate with their coach within the interface. Finally, we note that our findings are derived from a case study of figure skating and that the contexts of other sports may limit the extent to which current interpretations may apply elsewhere. We recommend that future research also assess the interface within a sport that does not have a specific time built into practice where an athlete will work on their own. This may change the pace with which the athlete can progress within a skill as they do not necessarily have a specified time to practice on their own but have to find their own time.

References

- Bartulovic, D., Young, B. W., & Baker, J. (2017). Self-regulated learning predicts skill group differences in developing athletes. *Psychology of Sport and Exercise, 31*, 61-69. doi: 10.1016/j.psychsport.2017.04.006
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*, 77-101. doi: 10.1191/1478088706qp063oa
- Gould, D., & Chung, Y. (2004). Self-regulation skills in young, middle, and older adulthood. In M. R. Weiss (Ed.), *Developmental sport and exercise psychology: A lifespan perspective* (pp. 383-402). Morgantown, WV: Fitness Information Technology, Inc.
- Glaser, R. (1996). Changing the agency for learning: Acquiring expert performance. In K. A. Ericsson (Ed.), *The road to excellence: The acquisition of expert performance in the arts and sciences, sports and games* (pp. 303-311). Hillsdale, NJ: Erlbaum.
- Hadwin, A. F., Järvelä, S., & Miller, M. (2011). Self-regulated, co-regulated, and socially shared regulation of learning. In B. J. Zimmerman & D. Schunk (Eds.), *Handbook of self-regulation of learning and performance* (pp. 65-84). NY: Routledge.
- Hadwin, A., & Oshige, M. (2011). Self-regulation, coregulation, and socially shared regulation: Exploring perspectives of social in self-regulated learning theory. *Teachers College Record, 113*(2), 240-264.
- Hadwin, A. F., Wozney, L., & Pontin, O. (2005). Scaffolding the appropriation of self-regulatory activity: A socio-cultural analysis of changes in teacher-student discourse about a graduate research portfolio. *Instructional Science, 33*, 413-450. doi: 10.1007/s11251-005-1274-7

- Jones, R. L., & Thomas, G. L. (2015). Coaching as 'scaffolded' practice: Further insights into sport pedagogy. *Sports Coaching Review*, 4(2), 65-79. doi: 10.1080/21640629.2016.1157321
- Karasavvidis, I., Pieters, J. M., & Plomp, T. (2000). Investigating how secondary school students learn to solve correlational problems: Quantitative and qualitative disclosure approaches to the development of self-regulation. *Learning and Instruction*, 10, 267-292.
- McCardle, L., Young, B.W., & Baker, J. (2017). Self-regulated learning in sport training contexts: Current status, challenges, and future opportunities. *International Review of Sport and Exercise Psychology*, 12(1), 112-138. doi: 10.1080/1750984X.2017.1381141
- McCardle, L., Young, B. W., & Baker, J. (2018). Two-phase evaluation of the validity of a measure for self-regulated learning in sport practice. *Frontiers in Psychology*, 9, 1-17. doi: 10.3389/fpsyg.2018.02641
- Puntambekar, S., & Hübscher, R. (2005). Tools for scaffolding students in a complex learning environment: What have we gained and what have we missed? *Educational Psychologist*, 40, 1-12.
- Radford, J., Bosanquet, P., Webster, R., Blatchford, P., & Rubie-Davies, C. (2014). Fostering learner independence through heuristic scaffolding: A valuable role for teaching assistants. *International Journal of Educational Research*, 63, 116-126. doi: 10.1016/j.ijer.2013.02.010
- Schmidt, R. A. (1988). *Motor control and learning: A behavioral emphasis* (2nd ed.). Champaign, IL: Human Kinetics.
- Stake, R. E. (2005). Qualitative case studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research* (pp. 443-466). Thousand Oaks, CA: Sage.

- van de Pol, J., & Elbers, E. (2013). Scaffolding student learning: A micro-analysis of teacher-student interaction. *Learning, Culture and Social Interaction*, 2, 32-41. doi: 10.1016/j.lcsi.2012.12.001
- van de Pol, J., Volman, M., & Beishuizen, J. (2010). Scaffolding in teacher-student interaction: A decade of research. *Educational Psychology Review*, 22, 271-296. doi: 10.1007/s10648-010-9127-6
- Vickers, J. N., Livingston, L. F., Umeris-Bohnert, S., & Holden, D. (1999). Decision training: The effects of complex instruction, variable practice and reduced delayed feedback on the acquisition and transfer of a motor skill. *Journal of Sports Sciences*, 17, 357-367.
- Vygotsky, L. S. (1987). *The collected works of L.S. Vygotsky. Vol. 1: Problems of general psychology. Including the volume Thinking and speech.* In R. W. Rieber & A. S. Carton, (Eds.; N. Minick, Trans.). New York: Plenum Press.
- Winstein, C. J., & Schmidt, R. A. (1990). Reduced frequency of knowledge of results enhances motor skill learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 16(4), 677-691.
- Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 17, 89-100.
- Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal*, 45(1), 166-183.
- Zimmerman, B. J., & Schunk, D. H. (2001). *Self-regulated learning and academic achievement.* Mahwah, NJ: Lawrence Erlbaum Associates.

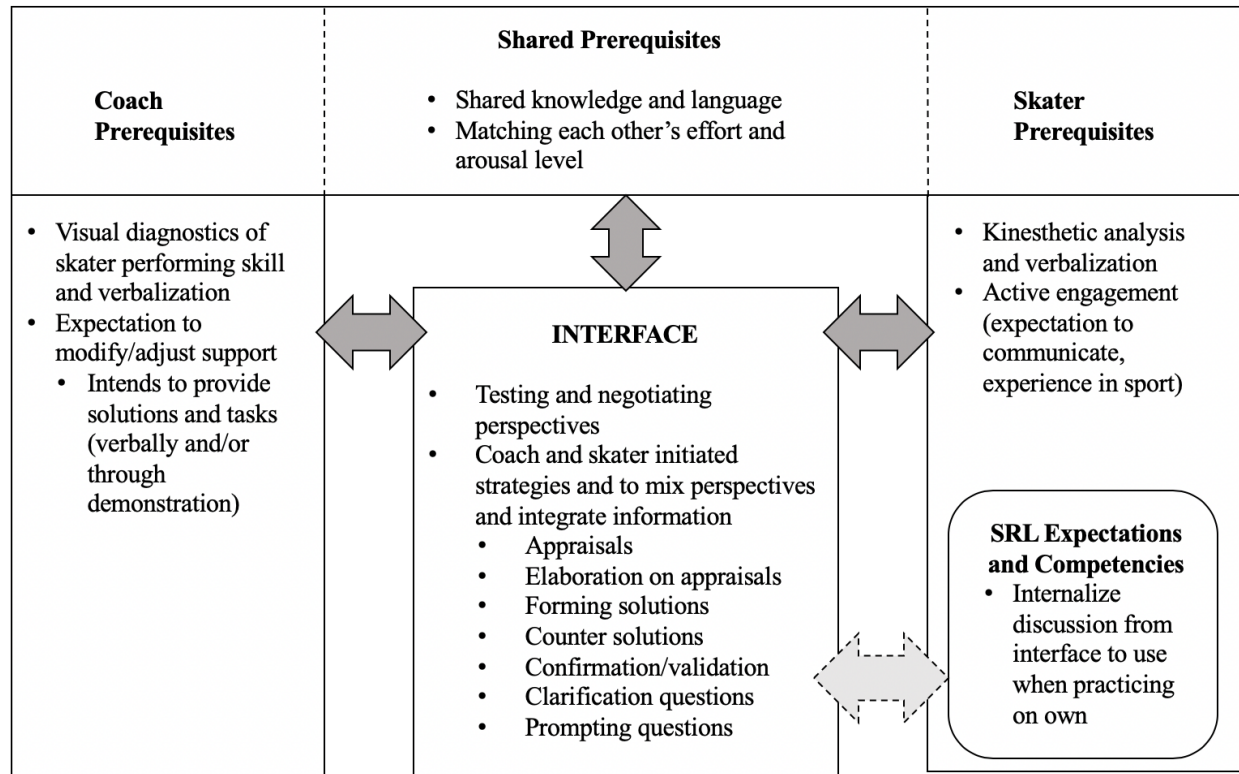


Figure 1. This figure illustrates the prerequisites of the coach and skater and the micro-level exchange of information within the interface.

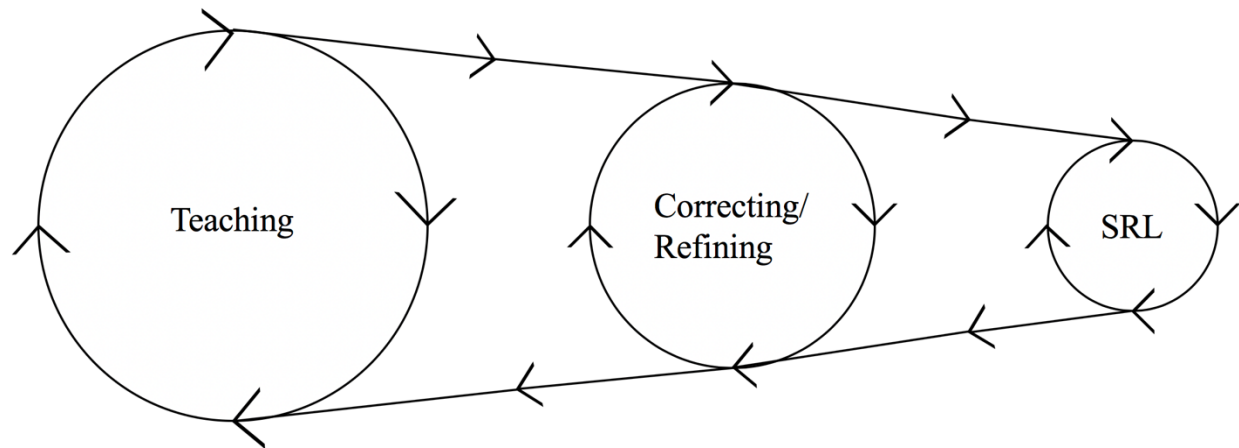


Figure 2. This figure demonstrates the cyclical nature of learning and mastering a skill through which a coach will lead the skater.

Chapter 6: General Discussion

Overall, this investigation sought to determine if and how co-regulation scaffolding occurred during skill acquisition efforts shared by a coach and athlete within a naturalistic sport practice context. Data were collected through various media, including multiple interviews with the coach and athlete and audio-recorded transcripts of dialogue exchanges, in order to attain a more holistic view of co-regulation scaffolding in sport. The following chapter summarizes the findings of the current research and attempts to merge the mixed methods analyses disseminated in Manuscript 1 and the preceding chapter in this thesis. The chapter then discusses methodological, conceptual, and practical considerations, limitations, and future research in this area. Finally, the chapter concludes with practical implications this research may have for coaches and coach training.

Summary of Studies

The first study aimed to quantitatively assess the use of co-regulation scaffolding in sport. More specifically, it aimed to assess if co-regulation could be concluded based on coach and athlete directionality dialogue analysis (based on a study by Hadwin, Wozney, and Pontin, 2005), and to assess the notion of contingency control during and across practices (based on the three-turn sequence analysis done by van de Pol and Elbers, 2013). As part of that study, self-report data were collected from the athletes using the SRL-SP (Bartulovic, Young, & Baker, 2017) to determine whether the skater may have changed their levels of self-regulated learning in relation to their practice from early to late season. The results indicated that the skater reported increased SRL capabilities from the beginning to end of data collection. However, through extensive initial analyses, we were unable to have sufficient inter-rater agreement on coding for anchors in the practice transcripts to be able to move forward with our planned quantitative

analyses of coding data from transcripts. Although the further planned analyses were not conducted, anchors were located within the first six practice transcripts, hinting that contingency control occurs within sport and more specifically within the interface.

Using the same sample as Study 1, Study 2 focused on discovering whether and how scaffolding occurred in sport. Specifically, that study aimed to understand whether and how the three conceptual characteristics of scaffolding occurred in designated coach-athlete practice time, and how else scaffolding occurred in sport compared to education. Through deductive analyses, findings showed that contingency control, fading, and transfer of responsibility manifested in sport, although they were closely related such that there were few distinct examples of each concept during the interviews. To further investigate this topic, inductive analyses revealed that there were nuances of scaffolding in sport. Nuances included the coach's transition from teaching to correcting as a cyclical model; that there are micro- and macro-levels of co-regulation, with micro-levels being particularly represented in a coach-athlete interface; and that the coach and athlete have their own prerequisites that are needed for the interface.

Integration and interpretation. This study used a mixed-methods approach in order to assess co-regulation scaffolding from various viewpoints. The interviews with the coach and skater separately suggested that transfer of responsibility occurred in sport. There was also an increase in the skater's self-reported SRL-SP scores, and the trending of this in an upwards direction was noted consistently across all aspects of SRL despite the threat of ceiling effects in the Likert scale measures. From this, we made the inference that there was an increase in (or a transfer of) responsibility for the athlete that could have been facilitated by co-regulated conditions. The coach and athlete interviews also suggested that fading occurred within sport (which is also seen in the coach's transitional cyclical model from teaching to correcting). The

results from the qualitative data (i.e., interviews and back-and-forth dialogue excerpts), combined with the SRL-SP quantitative trends, support the notion that fading and transfer of responsibility are closely related and happened in parallel (i.e., where if there is evidence of one concept the other one can be inferred to be present as well).

The interviews also suggested that contingency occurs in a coach's interactions with a figure skater within sport. In order to support interpretations from the qualitative data, practice transcripts were supposed to be anchored, coded for directionality, and quantitatively analysed across the season to show how the nature of directionality and contingency control changed over time. While it was disappointing that we could not establish reliability for this analysis to occur, there were anchors located within the first six practice transcripts supporting what was seen in the interview deductive analysis that contingency control occurs within sport. Most of the anchors that were found and were agreed upon between the PI and critical friend were a category iv (where an anchor by an athlete has preceding and subsequent dialogue from the coach), supporting that there is a back and forth dialogue between the coach and skater in the interface. The fact that there was evidence (despite limited reliability) of such back and forth dialogue during our preliminary pilot analyses of the transcript data for quantitative coding is synonymous with the tremendous back-and-forth dialogue described in the qualitative findings of Study 2.

At this point it is worth considering whether the current findings informed conceptualizations of effective co-regulation. Co-regulation appeared to be effective in this context for this coach-athlete dyad. I did not set out to assess the effectiveness of co-regulation in sport, only to explore the use of co-regulation within this sport specific domain. However, while describing the different aspects of co-regulation within their practice context, I interpret the

various processes and skills that the coach used with the skater to be effective for the skater's skill acquisition and the skater's development of expertise in figure skating.

Methodological Implications

Methodologically, this was a very important study as it was the first to assess co-regulatory scaffolding in a coach-athlete dyad in a naturalistic practice setting, over time, in the sport domain. A concurrent mixed-methods approach (Creswell, 2003) was used during data collection. This meant that the qualitative and quantitative data were collected at the same time, going back and forth between the two, and were not collected sequentially. This allowed me to make decisions about how I could use my data along the way. While going through the quantitative data analyses, I realized that I was lacking in my reliability of my interpretations of practice transcripts and that I needed to use those transcripts in another way. I decided to use excerpts from the practice transcripts to help demonstrate the themes that emerged in the inductive analysis from the interviews, based on the precedent in a study by Radford, Bosanquet, Webster, Blatchford, and Rubie-Davies (2014) who also treated excerpts as data. This allowed me to make the most of the data collected during this study; I was able to corroborate and colour what I was hearing and interpreting from the interviews with actual and explicit evidence of exchanges in the transcript excerpts. I believe this helped further my understanding of co-regulation in figure skating.

Conceptual and Practical Implications

The results in the current thesis have conceptual implications. While the portal from co-regulation to SRL was theorized by Hadwin, Järvelä, and Miller (2011) in graduate level education, findings from this thesis supports this connection between co-regulation and SRL in a sport practice setting. The increased skater self-reported SRL-SP scores from pre- to post-data

collection, combined with the various forms of co-regulation in the inductive analysis of Study 2, support the notion of co-regulation aiding in the increased SRL of an athlete. Findings also showed that SRL is *not an end-goal, but a process-goal* that enhances coach-athlete dyadic practice, with the skater bringing what he had worked on while he was self-regulating back into a co-regulated environment. Whilst the interface specifically is understood as a figure portraying various roles and interactions oriented towards skill acquisition repeatedly over time in an intensive dyadic training environment, I acknowledge that the interpretations showed that SRL becomes a process goal in the application of the interface over time. The Study 2 manuscript introduced the notion of a dyadic interface, and this process-goal is represented within the skater's prerequisite that informs the interface (see Figure 1, p. 92). The arrows between a skater's SRL expectations and competencies and the interface represent more than just a portal from the interface to SRL, but is a process that represents a mature dyad. It appears that once a skater gets to this SRL process-goal, both the coach and skater know that the skater is on their way to becoming a student of the sport, and will be able to maximize their practice time because the skater is able to efficiently work by themselves and then effectively engage with their coach in the interface.

In the inductive analyses, co-regulation was seen at the micro- and macro-level. This is an important conceptual implication as co-regulation is often discussed as a broad term and not how it might be applied in a naturalistic setting. This is useful as research will be able to see how co-regulation manifests in naturalistic sport dyads to further inform theory and research. It is also important to see the different manifestations of co-regulation in order to encourage others how to effectively co-regulate, and how it relates to SRL. There has been research conducted in the past that have looked at the varying levels of a concept relating to co-regulation in the past. Gould

and Chung (2004) discuss that SRL research in sport psychology can be divided into micro- (short-term) and macro-level (long-term) self-regulation. Zimmerman (2008) also discusses the use of microanalyses (or *in situ* perspectives) with regards to SRL processes and various sources of motivations. A review article by Jones and Thomas (2008) also discussed that scaffolding could occur at micro-, meso-, and macro-levels, and how it could occur in sport based on previous general research on scaffolding in sport and in education. While borrowing from this research, the findings found in this thesis are novel because they were able to assess varying levels of co-regulation in sport within the same study, and how both levels associated with SRL in a naturalistic sport practice setting.

Study 2 also highlighted the importance of considering the three conceptual characteristics of scaffolding together in order to assess if scaffolding occurs overall rather than looking at them separately. Previous research in education has often discussed the three conceptual characteristics and then specifically look at different variations of each of the three concepts without looking at them altogether (e.g., van de Pol & Elbers, 2013; Radford et al., 2014). In Study 2, interpretations based on the deductive analyses illustrated that the definitions of the three concepts (contingency control, fading and transfer of responsibility) are so closely related that in order to assess scaffolding they should be looked at together.

Study 2 also has practical implications. The findings from this research could inform coach curriculum, informing coaches of the different levels of co-regulation and how it can facilitate SRL development in their athletes over time. Our model of the interface was created based on the roles and interactions performed by the current dyad in practice. While we believe this interface would be very beneficial to other coaches, its pertinence is dependent on the meaning other coaches take from it and if they are motivated to incorporate it into their own

practice. Importantly, coaches could consider that the use of the interface within practice in order to discuss and enhance specific skills, in tandem with the macro-level co-regulation with the use of co-planning and co-assessment of practice activities, could enhance their coach-athlete practice time on the road to expertise development. The curriculum could discuss the various parts of the interface and how/when each of the elements (e.g., testing and negotiating perspectives, elaboration on appraisals) can be used by both the coach and athlete during dedicated practice time. The interface could also be beneficial to athletes aspiring to enhance their practice during their progress toward expertise development for understanding the importance of SRL with the interface, and their expectation to actively engage with their coach during practice as described in a manner that was meaningful to the skater in this study. Athletes could learn how to effectively engage with their coach at practice from this interface model, which might allow them to get more out of their sport.

Limitations and Future Research

There were a few limitations to this investigation. This thesis research was very sport specific and there may be slight variations in the co-regulation and scaffolding data if assessed in other individual sports. Future mixed-methods research could try to replicate our quantitative efforts using an updated anchor definition, employing the interface and macro-level co-regulation as frameworks for deductive analyses of qualitative data. We also highly recommend the use of transcript excerpts because they allow readers to see how verbal exchanges around theoretical concepts occur in a naturalistic setting. Transcript excerpts also highlight or emphasise key points/concepts that participants talk about during their interviews and demonstrate how they occur in a naturalistic setting. This study also pertained to an individual sport and the results may vary in how co-regulation is implemented in a socially-mediated

practice context, and specifically in a coached team sports setting. Future research could try to use the same concurrent mixed-methods data collection with a small-team sport (e.g., pairs tennis, canoe pairs, basketball) to see how co-regulation occurs when there is more than one athlete present.

This study only used one microphone attached to the coach's lapel and did not put a microphone on the skater as it was believed that it may interfere with their figure skating. Future research could either find a sport where an athlete microphone would not interfere as much with their practice, or could find a more discrete microphone to place on the participants. Because the coach was the only participant with a microphone, data was lost when the skater made a comment while he was far away from the coach, and was lost to interference when the coach was not directly squared up to the skater. Also, only verbal interactions were assessed in this study, while interactions in sport come in a variety of ways (i.e., physical, non-verbal, implicit). Future research could collect audio-video recordings of practices in order to code both verbal and behavioural data, and video data could be reinforced with video-stimulated recall interviews (Lyle, 2003).

Co-regulation was seen in this study, but there was no indication of SRL with this methodology when submitted to quantitative data analysis. There were times observed in practice where the skater would make an error in a jump and instead of skating back to the coach he would attempt the jump again, presumably with his own corrections. This would be a behavioural indication of the skater using SRL to correct his mistake, but we were unable to submit it to quantitative analysis as it was behavioural or non-verbal in nature. In Chapter 4 that reported the quantitative analyses, analytical category i (i.e., the skater makes an individual mention of relative success/understanding or relative failure/misunderstanding by himself)

should be the ultimate criterion for SRL, however it was not assessed in this thesis as none emerged within the data. Future research could assess category i by placing a microphone on the athlete while using a think-aloud protocol (e.g., Ericsson & Simon, 1980) where they say whatever they are thinking and the processes they are using out loud.

References

- Bakhtin, M. M. (1986). *Speech genres and other late essays*. In C. Emerson & M. Holquist (Eds.), (V. McGee, Trans.). Austin: University of Texas Press.
- Bartulovic, D., Young, B. W., & Baker, J. (2017). Self-regulated learning predicts skill group differences in developing athletes. *Psychology of Sport and Exercise*, 31, 61-69. doi: 10.1016/j.psychsport.2017.04.006
- Bilodeau, E. A., & Bilodeau, I. M. (1961). Motor-skills learning. *Annual Review of Psychology*, 12, 243-280.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77-101. doi: 10.1191/1478088706qp063oa
- Canon-Bowers, J. A., & Salas, E. (2001). Reflections on shared cognition. *Journal of Organizational Behaviour*, 22, 195-202.
- Collins, J., & Durand-Bush, N. (2014). Strategies used by an elite curling coach to nurture athletes' self-regulation: A single case study. *Journal of Applied Sport Psychology*, 26, 211-224. doi: 10.1080/10413200.2013.819823
- Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd ed.). Thousand Oaks, CA: Sage Publications, Inc.
- Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, 100, 363-406. doi: 10.1037/0033-295X.100.3.363
- Ericsson, K. A., & Simon, H. A. (1980). Verbal reports as data. *Psychological Review*, 87(3), 215-251.

- Gould, D., & Chung, Y. (2004). Self-regulation skills in young, middle, and older adulthood. In M. R. Weiss (Ed.), *Developmental sport and exercise psychology: A lifespan perspective* (pp. 383-402). Morgantown, WV: Fitness Information Technology, Inc.
- Glaser, R. (1996). Changing the agency for learning: Acquiring expert performance. In K. A. Ericsson (Ed.), *The road to excellence: The acquisition of expert performance in the arts and sciences, sports and games* (pp. 303-311). Hillsdale, NJ: Erlbaum.
- Hadwin, A. F., Järvelä, S., & Miller, M. (2011). Self-regulated, co-regulated, and socially shared regulation of learning. In B. J. Zimmerman & D. Schunk (Eds.), *Handbook of self-regulation of learning and performance*. NY: Routledge.
- Hadwin, A., & Oshige, M. (2011). Self-regulation, coregulation, and socially shared regulation: Exploring perspectives of social in self-regulated learning theory. *Teachers College Record*, 113(2), 240-264.
- Hadwin, A. F., Wozney, L., & Pontin, O. (2005). Scaffolding the appropriation of self-regulatory activity: A socio-cultural analysis of changes in teacher-student discourse about a graduate research portfolio. *Instructional Science*, 33, 413-450. doi: 10.1007/s11251-005-1274-7
- Holton, D., & Clarke, D. (2006). Scaffolding and metacognition. *International Journal of Mathematical Education in Science and Technology*, 37, 127-143.
- Hong, E., & O'Neil, H. F., Jr. (2001). Construct validation of a trait self-regulation model. *International Journal of Psychology*, 36, 186-194.
- Howard, B. C., McGee, S., Shia, R., & Hong, N. S. (2000, April 24-28). Metacognitive self-regulation and problem-solving: Expanding the theory base through factor analysis. Paper

presented at *the Annual Meeting of the American Educational Research Association*, New Orleans, LA.

Järvelä, S., & Hadwin, A. (2013). New frontiers: Regulating learning in CSCL. *Educational Psychologist*, 48(1), 25-39. doi: 10.1080/00461520.2012.748006

Järvelä, S., & Hadwin, A. (2015). Promoting and researching adaptive regulation: New frontiers for CSCL research. *Computers in Human Behaviour*, 52, 559-561.

Jones, R. L., & Thomas, G. L. (2015). Coaching as ‘scaffolded’ practice: Further insights into sport pedagogy. *Sports Coaching Review*, 4(2), 65-79. doi: 10.1080/21640629.2016.1157321

Karasavvidis, I., Pieters, J. M., & Plomp, T. (2000). Investigating how secondary school students learn to solve correlational problems: Quantitative and qualitative disclosure approaches to the development of self-regulation. *Learning and Instruction*, 10, 267-292.

Karasavvidis, I., Pieters, J. M., & Plomp, T. (2003). Exploring the mechanisms through which computers contribute to learning. *Journal of Computer Assisted Learning*, 19, 115-128.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33(1), 159-174.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.

Lyle, B. (2003). Stimulated recall: A report on its use in a naturalistic research. *British Educational Research Journal*, 29(6), 861-878.

McCardle, L., Young, B.W., & Baker, J. (2017). Self-regulated learning in sport training contexts: Current status, challenges, and future opportunities. *International Review of Sport and Exercise Psychology*, 12(1), 112-138. doi: 10.1080/1750984X.2017.1381141

- McCaslin, M. (2009). Co-regulation of student motivation and emergent identity. *Educational Psychologist, 44*(2), 137-146.
- McCaslin, M., & Burross, H. L. (2011). Research on individual differences within a sociocultural perspective: Co-regulation and adaptive learning. *Teachers College Record, 113*(2), 325-349.
- Newell, K. M. (1976). Knowledge of results and motor learning. In J. Keogh & R. S. Hutton (Eds.), *Exercise and sport sciences reviews: Vol. 4* (pp. 195-228). Santa Barbara, CA: Journal Publishing Affiliates.
- Pea, R. D. (1993). Practices of distributed intelligence and designs for education. In G. Salmon (Ed.), *Distributed cognitions* (pp.47-87). New York: Cambridge University Press.
- Pea, R. D. (2004). The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and human activity. *The Journal of the Learning Sciences, 13*(3), 423-451.
- Peltier, J. W., Hay, A., & Drago, M. (2006). Reflecting on reflection: Scale extension and a comparison of undergraduate business students in the United States and the United Kingdom. *Journal of Marketing Education, 28*, 5-16.
- Perry, N., & Drummond, L. (2002). Helping young students become self-regulated researchers and writers. *The Reading Teacher, 56*(3), 298-310.
- Proteau, L. (1987). The role of KR in learning and performance. Experimental evidence: Specificity of learning [Abstract]. *Proceedings of the Annual Meeting of the North American Society for the Psychology of Sport and Physical Activity* (NASPPSA), pp. 12-13.

- Puntambekar, S., & Hübscher, R. (2005). Tools for scaffolding students in a complex learning environment: What have we gained and what have we missed? *Educational Psychologist*, 40, 1-12.
- Radford, J., Bosanquet, P., Webster, R., Blatchford, P., & Rubie-Davies, C. (2014). Fostering learner independence through heuristic scaffolding: A valuable role for teaching assistants. *International Journal of Educational Research*, 63, 116-126. doi: 10.1016/j.ijer.2013.02.010
- Salmoni, A. W., Schmidt, R. A., & Walter, C. B. (1984). Knowledge of results and motor learning: A review and critical reappraisal. *Psychological Bulletin*, 95(3), 355-386.
- Schmidt, R. A. (1988). *Motor control and learning: A behavioral emphasis* (2nd ed.). Champaign, IL: Human Kinetics.
- Schwarzer, R., & Jerusalem, M. (1995). Generalized self-efficacy scale. In J. Weinman, S. Wright, & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35-37). Windsor, UK: NFER-NELSON.
- Searle, J. R. (1969). *Speech acts. An essay in the philosophy of language*. London: Cambridge University Press.
- Sharma, D. A., Chevidikunnan, M. F., Khan, F. R., & Gaowgzeh, R. A. (2016). Effectiveness of knowledge of result and knowledge of performance in the learning of a skilled motor activity by healthy young adults. *Journal of Physical Therapy Science*, 28, 1482–1486. doi:10.1589/jpts.28.1482
- Skate Canada (2014). In pursuit of personal excellence: Skate Canada's guide to long-term athlete development [PDF file]. Retrieved from <https://skatecanada.ca/wp-content/uploads/2014/09/Skate-Canada-LTAD-Model-EN.pdf>

- Stake, R. E. (2005). Qualitative case studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research* (pp. 443-466). Thousand Oaks, CA: Sage.
- Toering, T., Elferink-Gemser, M., Jonker, L., van Heuvelen, M., & Visscher, C. (2012). Measuring self-regulation in a learning context: Reliability and validity of the self-regulation of learning self-report scale (SRL-SRS). *International Journal of Sport & Exercise Psychology*, 10, 24-38.
- Toering, T. T., Elferink-Gemser, M. T., Jordet, G., & Visscher, C. (2009). Self-regulation and performance level of elite and non-elite youth soccer players. *Journal of Sports Sciences*, 27(14), 1509-1517. doi: 10.1080/02640410903369919
- van de Pol, J., & Elbers, E. (2013). Scaffolding student learning: A micro-analysis of teacher-student interaction. *Learning, Culture and Social Interaction*, 2, 32-41. doi: 10.1016/j.lcsi.2012.12.001
- van de Pol, J., Volman, M., & Beishuizen, J. (2010). Scaffolding in teacher-student interaction: A decade of research. *Educational Psychology Review*, 22, 271-296. doi: 10.1007/s10648-010-9127-6
- Vickers, J. N., Livingston, L. F., Umeris-Bohnert, S., & Holden, D. (1999). Decision training: The effects of complex instruction, variable practice and reduced delayed feedback on the acquisition and transfer of a motor skill. *Journal of Sports Sciences*, 17, 357-367.
- Vygotsky, L. S. (1978). In M. Cole., V. John-Steiner, S. Scribner and E. Souberman, (Eds.), *Mind in society – The development of higher psychological processes*. Cambridge: Harvard University Press.

- Vygotsky, L. S. (1987). Thinking and speech. In R. W. Rieber & A. S. Carton (Eds.), *The collected works of L.S. Vygotsky, Vol 1: Problems of general psychology* (pp. 39-285). New York: Plenum Press. (Original work published 1934).
- Winstein, C. J., & Schmidt, R. A. (1990). Reduced frequency of knowledge of results enhances motor skill learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 16(4), 677-691.
- Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 17, 89-100.
- Young, B. W., & Medic, N. (2008). The motivation to become an expert athlete: How coaches can promote long-term commitment. In Farrow, D., Baker, J., & MacMahon, C. (Eds.), *Developing elite sports performers: Lessons from theory and practice* (pp.43-59). New York: Routledge.
- Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal*, 45(1), 166-183.
- Zimmerman, B. J., & Schunk, D. H. (2001). *Self-regulated learning and academic achievement*. Mahwah, NJ: Lawrence Erlbaum Associates.

Statement of Contributions

My contributions as the primary investigator were the conceptualization of the research, recruitment of participants, the data analyses, and the writing of the manuscript and following chapters. As my thesis supervisor, Dr. Bradley Young helped challenge and refine my ideas for this thesis. He was a critical friend for the qualitative and quantitative analyses, and provided feedback and edits to the interview guides, data analyses, the manuscript, and chapters in the current document.

Appendices

Appendix A: Letter of Information to Organizational Representatives

Dear organizational representative,

I am contacting you in the hope that you will consider endorsing a research project and grant us permission to visit coaches as well as athletes and their parents at your facility, on site either before or after practice, to approach them about this study.

This study is a master's thesis project within the School of Human Kinetics at the University of Ottawa and is supervised by Dr. Bradley W. Young. The purpose of this research is to explore the nature of coach-athlete dialogue and determine how the coach and athlete work together to develop better training habits and practice routines over time. We are seeking to recruit one coach certified at the National Level and one of their athletes between the ages of 10-18 and in the "Learn to Compete" stage to participate. The study will involve audio recordings of practice blocks involving the coach and one athlete, a short survey that the athlete will be asked to complete on two occasions, two interviews that the researcher will have with the coach, and two interviews that the researcher will have with the athlete.

This is a naturalistic study that intends to observe patterns in coach-athlete dialogue in a practice setting. It is not meant to be intrusive and will not interfere with practice.

All information that participants provide will remain confidential and anonymous. Information will be securely stored in a password-protected computer in the supervising professor's office for 10 years, after which the data will be destroyed. Information gathered from the athlete and coach interviews will be kept confidential and will not be disclosed to the other participant. The names of the participants and your club will remain anonymous and will not be shared in future publications of this research.

Participation in this study is voluntary. If at any time a participant wishes to withdraw from the study, they may do so freely. Although very unlikely, there is a remote possibility of the athlete feeling some discomfort during an interview when asked to recall times in practice when they have messed up, made errors, or were frustrated. If this occurs, participants may contact the researchers to request information for appropriate resources to help with such discomfort.

This study has the potential to identify key elements of a coach's role in assisting in an athlete's development of self-regulated learning over time. This may lead to understanding one key component to achieving quality practice routines and optimizing performance in sport.



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In light of this, I would like to ask your permission (via letter to be signed below) to be on site at your facility to distribute a letter of informed consent, as well as a recruitment screening sheet to all eligible coaches from your club. These documents will provide information about the study, what the coach and what the athlete would be required to do, selection criteria for both the coach and the athlete, and an informed consent form that can be signed and returned to the principal investigator if a coach is interested in the study. Once the consent form is obtained from the coach, the researcher will ask to be on site at your facility to meet and distribute a letter of informed consent to parents of potential athlete participants who are associated with a recruited coach. At that time, parents will be asked to provide authorization for their child to participate by returning the signed parental consent form. Assent will then be obtained from potential athletes along with a recruitment screening sheet prior to their participation.

Should you feel that this study would be of interest to coaches and athletes affiliated with your club, I would ask that you indicate your consent by signing and returning the attached form. If you would like more information or have any questions about this research project, do not hesitate to contact the principal investigator, Lisa Bain.

Thank you for your time.

I, _____, have read this letter of information and understand the procedures of this research project. By signing this form, I hereby give the principal investigator permission to be on site at our facility to meet and distribute letters of informed consent to all eligible coaches at a time of convenience for my organization. Should the principal investigator gain informed consent and participation from one of our coaches, I give her permission to be on site at our facility to meet and distribute letters of informed consent to parents and athletes associated with the recruited coach.

Lisa Bain, BA – Primary Investigator
MA Candidate
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Montpetit Hall, Room 416B
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Bradley W. Young, Ph.D. – Project Supervisor
Associate Professor
School of Human Kinetics
Montpetit Hall, Room 376
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Ottawa, ON, K1N 6N5

Appendix B: Coach Recruitment Script

Good afternoon,

My name is Lisa Bain and I am a second-year graduate student from the University of Ottawa doing my master's thesis research in sport psychology on optimal training habits. For my research, I will be conducting a study to get one coach and one competitive athlete's perspectives on how they see interactions around skill acquisition at practice.

For this study, one coach and one of their athlete's will be asked to participate. The athlete will fill out a quick 15-minute questionnaire about practice routines and habits at the beginning of the study, and then again 10 weeks later. The coach will be asked to wear a microphone that will audio record the exchanges that the coach and athlete have during 12 practice sessions over the course of 10 weeks. During those 12 practice sessions, I will be on-site and writing down observational field notes to make sure that I will only be analyzing the data from the coach and athlete participating in this study. My observational field notes will not be used in any way to form judgments of coaching style or the coach or athlete's abilities, nor will they be presented in any written documents or publications stemming from this study. I will be analyzing the audio recordings in order to describe the nature of verbal interactions between a coach and an athlete over the course of a season.

The coach and athlete will also each be asked to partake in two, one-on-one, audio-recorded interviews, separately. One interview will take place early on in the season and then one a few weeks later. The interviews can last between 45 minutes to an hour and will be done on site at the skating rink in a visible public place, but also a location that allows the interviewee to respond to questions out of earshot of others. The answers that the coach and athlete share with me will not be shared with the other person participating in the study, the athlete's parents, friends, family, or anyone else.

There is a possibility that the voices of other athletes skating during the 12 audio-recorded practice sessions will be picked up on the microphone because the microphone will be attached to the lapel of the coach. Be assured the voices of other athletes are not the focus of my study. Once I have transcribed the audio-recordings of the athlete and coach who are the focus of the study, all recordings will be destroyed.

Your choice in participating in this study will in no way effect your relationship with your athletes or your club. If you are interested in participating in this study, you can fill out and return the consent forms and the screening sheet to me. Not all coaches and athletes who return their form may be selected for the study. The selection of the participants will depend on the promptness with which participants return the consent/assent forms, the practice schedule and availabilities of the coach and athlete, whether the athlete is preparing for test/competitive elements this season, and the competitive level of the athlete. After vetting the returned sheets, we will advise all those who completed the forms about selection. Once I have chosen this coach-athlete pair, the data that I have received from the other coaches, parents, and athletes will be destroyed.

If you have any questions or concerns you can ask me in person after this meeting, you can reach me on my cell phone at [phone number] or email me at [email address] Thank you so much for your time.

Appendix C: Athlete Recruitment Script

Good afternoon,

My name is Lisa Bain and I am a second-year graduate student from the University of Ottawa doing my master's thesis research in sport psychology on optimal training habits. For my research, I will be conducting a study to get one coach and one competitive athlete's perspectives on how they see interactions around skill acquisition at practice.

For this study, one coach and one of their athlete's will be asked to participate. The athlete will fill out a quick 15-minute questionnaire about practice routines and habits at the beginning of the study, and then again 10 weeks later. The coach will be asked to wear a microphone that will audio record the exchanges that the coach and athlete have during 12 practice sessions over the course of 10 weeks. During those 12 practice sessions, I will be on-site and writing down observational field notes to make sure that I will only be analyzing the data from the coach and athlete participating in this study. My observational field notes will not be used in any way to form judgments of coaching style or the coach or athlete's abilities, nor will they be presented in any written documents or publications stemming from this study. I will be analyzing the audio recordings in order to describe the nature of verbal interactions between a coach and an athlete over the course of a season.

The coach and athlete will also each be asked to partake in two, one-on-one, audio-recorded interviews, separately. One interview will take place early on in the season and then one a few weeks later. The interviews can last between 45 minutes to an hour and will be done on site at the skating rink in a visible public place, but also a location that allows the interviewee to respond to questions out of earshot of others. The answers that the coach and athlete share with me will not be shared with the other person participating in the study, the athlete's parents, friends, family, or anyone else.

There is a possibility that the voices of other athletes skating during the 12 audio-recorded practice sessions will be picked up on the microphone because the microphone will be attached to the lapel of the coach. Be assured the voices of other athletes are not the focus of my study. Once I have transcribed the audio-recordings of the athlete and coach who are the focus of the study, all recordings will be destroyed.

Your choice in participating in this study will in no way effect your relationship with your coach or your club. If you are interested in participating in this study, you can fill out and return the consent forms and the screening sheet to me. Not all parents and athletes who return their form may be selected for the study. The selection of the participants will depend on the promptness with which participants return the consent/assent forms, the practice schedule and availabilities of the coach and athlete, whether the athlete is preparing for test/competitive elements this season, and the competitive level of the athlete. After vetting the returned sheets, we will advise all those who completed the forms about selection.

Once I have chosen this coach-athlete pair, the data that I have received from the other coaches, parents, and athletes will be destroyed.

If you have any questions or concerns you can ask me in person after this meeting, you can reach me on my cell phone at [phone number], or email me at [email address]. Thank you so much for your time.

Appendix D: Coach Informed Consent Letter**uOttawa**

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Dear potential participant,

We are contacting you in order to ask you to consider participating in a master's thesis research study titled "Exploring coregulatory scaffolding dialogue between an athlete and coach in a practice setting: A case study". We are investigating the coach-athlete dyad, more specifically the role of the coach, with respect to an individual sport. This study is a master's thesis project within the School of Human Kinetics at the University of Ottawa and is supervised by Dr. Bradley W. Young. The purpose of this research is to explore the nature of coach-athlete dialogue and the role that the coach has in an athlete's learning during practice.

Your participation in this study will involve partaking in two one-on-one audio-recorded interviews with the primary investigator, one early in the season, and one ten weeks later, each lasting about 60 minutes in duration. The interviews will later be transcribed and returned to you for approval and/or minor modifications. Additionally, the researcher will attend practice over the course of approximately 10 weeks in the season and will ask you to wear a microphone that will audio record the exchanges you have with one of your athletes during 12 practice sessions. You will be asked to wear a microphone in order to capture the dialogue between you and your athlete (that way the athlete does not need to wear one and practice will not be interfered with). The researcher will document observational field notes to note when you and the chosen athlete are interacting, to ensure that only the dialogue between you and one of your athletes will be collected and transcribed. The observational field notes will not be used in any way to form judgments of your coaching style or abilities, nor will they be presented in any written documents or publications stemming from this study.

Your choice to participate in this study will have no effect on your relationship with the sports club/organization. If you agree to participate, we will invite your athletes to participate in the study. Of the athletes that stated their interest in participating in the study, one will be chosen based on the criteria listed on an athlete recruitment screening sheet. This athlete will be asked to complete a survey on their own practice routines and habits on two occasions, will have their exchanges with you audio-recorded during 12 practice sessions, and will be asked to partake in two one-on-one interviews with the researcher, over the course of approximately 10 weeks of the season. The athlete will be asked to describe what occurs during a typical practice, their responsibilities as an athlete, and how they learn from their interactions with you during practice.

Information discussed with you and your responses to questions will not be disclosed with your athlete or others, nor will the responses by your athlete be shared with you or others. All information will remain confidential, with only the principal investigator and her supervisor having access. The type of sport you coach will be revealed in future publications or presentations, however your name and the club to which you belong will remain anonymous and will not be

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presented or discussed in future research. Your information will always remain anonymous. The athlete participating in the study will know that you are also participating, and other athletes who you coach at the practice complex will know that you and the athlete are participating in a study. All collected data will be destroyed after analyses are finished for the current study. Transcripts of your data will be securely stored in a password protected computer in the supervising professor's office for 10 years, after which the data will be destroyed.

Participation in this study is voluntary. If at any time you or your athlete wishes to withdraw from the study, you may do so without penalty and will be given the option to withdraw data that has already been collected. There are two copies of this consent form, one of which you may keep for your records. A returned and completed recruitment screening sheet (that is attached to this letter) to the principal investigator indicates that you are interested in, and consent to, participating in this study. If you and one of your athletes meet the criteria for the study (e.g., have 5+ years of coaching experience at the National level, have an athlete between the ages of 10-18 that is working on a new solo routine, and wants to compete at higher levels), you will be contacted by the principal investigator.

If you would like more information or have any questions about this research project, do not hesitate to contact the principal investigator, Lisa Bain.

If you have any questions regarding the ethical conduct of this project, you can contact the Protocol Officer for Ethics in Research, University of Ottawa, 550 Cumberland Street, Room 154, Ottawa, ON, K1N 6N5, (613) 562-5387 or ethics@uottawa.ca.

Thank you for your time.

I, _____, have read this consent form and I understand the procedures of this research project. I understand that my participation is completely voluntary, and that I may withdraw from the study at any time without penalty. By signing this form, I indicate my consent to participate.

Lisa Bain, BA – Primary Investigator
MA Candidate
School of Human Kinetics
Montpetit Hall, Room 416B
University of Ottawa
Ottawa, ON, K1N 6N5

Bradley W. Young, Ph.D.
Associate Professor
School of Human Kinetics
Montpetit Hall, Room 376
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Ottawa, ON, K1N 6N5

Appendix E: Consent Form for Parents/Legal Guardians



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Title of Project: Exploring co-regulatory scaffolding dialogue between an athlete and coach in a practice setting: A case study

Principal Investigator: Lisa Bain, MA student, School of Human Kinetics, University of Ottawa

Project Supervisor: Bradley W. Young, PhD, Associate Professor, School of Human Kinetics, University of Ottawa

Purpose of the Study: The purpose of this master's thesis research is to explore the nature of coach-athlete dialogue and the role that the coach has in an athlete's learning during practice. Overall, we wish to better understand the interactions between a coach and athlete in a practice setting that allow for optimal learning conditions.

Participation: If you provide consent for your child to participate in this research project by completing and returning one of the two forms provided (so that you may keep one for your records), we will approach you and your child on site (either before or after practice) to provide information about the study, and to provide your child with an assent form and a recruitment screening sheet. Once your child reads this assent form that includes the purpose of this study, what is required of them, and a screening sheet for their eligibility, they may be contacted by the principal investigator to participate in this study. Participation in this study will include completing a short 15-minute survey on self-regulation, once at the beginning of the season and again 10 weeks later. The survey can be done at a location and time of your child's convenience. The survey is in English (because it has been validated and proven reliable in English by prior research), and therefore it is important that your child be able to read and understand English. Participation will also mean that your child's verbal exchanges with their coach will be audio recorded during 12 practice sessions (the microphone will be on the coach), and your child will be invited to participate in two one-on-one audio-recorded interviews with the principal investigator (approximately 45 minutes – 1 hour each). The interviews will later be transcribed and returned to your child for approval and/or minor modifications. Not all parents and athletes who return their form may be selected for the study. The selection of the participants will depend on the promptness with which participants return the consent/assent forms, the practice schedule and availabilities of the coach and athlete, whether the athlete is preparing for test/competitive elements this season, and the competitive level of the athlete. After vetting the returned recruitment screening sheets, we will advise all those who completed the forms about selection.

Benefits: The participation of your child in this research project will help contribute to coaching research. This study has the potential to identify patterns of coach-athlete dialogue, and to better understand how athletes respond to coaches in practice environments. This knowledge may aid coaches in optimizing their practice time with their athletes and empowering athletes for their own development over the course of the season.

Confidentiality and Anonymity: Your anonymity and the anonymity of your child will be protected. All recorded data will be destroyed after analyses are finished for the current study. Transcripts of recorded data will be securely stored in a password-protected computer and in a locked drawer in the supervising professor's office for 10 years, after which they will be destroyed. Information gathered from the athlete and coach interviews will be kept confidential and will not be disclosed to the other participant. The names of the participants and the club to which your child belongs will remain anonymous and will not be presented or discussed in future research. Your son or daughter's information will always remain anonymous. The coach participating in the study will know that your son/daughter is also participating, and other athletes who are at the practice complex will know that your son/daughter and their coach are participating in a study.

Voluntary Participation and Withdrawal: The participation of your child in this study is voluntary. If at any time your child wishes to withdraw from the study, they may do so freely and will be given the option to withdraw data that has already been collected. Your decision for your child to participate will in no way impact their access to the club where they are registered.

Risks: Although very unlikely, there is a remote possibility of the athlete feeling some discomfort when asked to recall times in practice when they have messed up, made errors, or were frustrated. If this occurs, participants may contact the researchers to request information for appropriate resources to help with such discomfort.

If you would like more information or have any questions about this research project, do not hesitate to contact the principal investigator by phone at [phone number], or by email at [email address].

If you have any questions regarding the ethical conduct of this project, you can contact the Protocol Officer for Ethics in Research, University of Ottawa, 550 Cumberland Street, Room 154, Ottawa, ON, K1N 6N5, (613) 562-5387 or ethics@uottawa.ca.

Consent:

I have read this consent form and I understand the procedures of this research project. I understand that my child's participation is completely voluntary, and they may withdraw from the study at any time without penalty. By signing this form, I indicate my consent for my child to participate. Upon receipt of this consent, the principal investigator will approach my child on-site in a non-disruptive manner, either before or after practice, to read and complete an assent form and recruitment screening sheet.

☐ I permit my child to participate in this project.

Name of Child (Please Print)

Date

Name of Parent/Guardian (Please Print)

Signature of Parent/Guardian



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Appendix F: Assent Form for Youth Athletes

Title of Project: Exploring coregulatory scaffolding dialogue between an athlete and coach in a practice setting: A case study

What is this study about?

The purpose of this research is to explore the nature of coach-athlete dialogue and the role that the coach has in your learning during practice.

What happens to me if I choose to be in this study?

If you choose to participate in this study, you will be asked to complete a survey that asks you about your practice routines and habits. You will be asked to complete this once at the beginning of the season and again about 10 weeks later. The survey takes approximately 15 minutes to complete. To complete this survey, it is important that you are able to read and understand English. As a participant, you will have your verbal exchange with your coach audio recorded during 12 practice sessions (your coach will wear the recording device) over 10 weeks of the season. You will also be asked to participate in two one-on-one interviews with myself (Lisa Bain) that will each last approximately 45 minutes – 1 hour. These interviews will ask you to describe how you learn during practice, how you feel after successes and mistakes during practice, and how you think you have developed training habits with your coach over the course of the season. These interviews will be done at your convenience, at the sport facility, either before or after practice. It is important that you answer all questions honestly. You do not have to answer any question that you do not want to answer and can decide to stop participating at any time during this study. The interviews will later be typed up and returned to you for approval and/or minor changes.

Is everyone chosen to participate in this study?

Not all athletes who return their form may be selected for the study. The selection of the participants will depend on how fast the participants return the consent/assent forms, the practice schedule and availabilities of the coach and athlete, whether the athlete is preparing for test/competitive elements this season, and the competitive level of the athlete. After vetting the returned recruitment screening sheets, we will advise all those who completed the forms about selection.

Will you tell anyone what I say in the survey or interviews?

We will not share any of your answers from the survey or your interviews with your coach, parents, friends, or anyone else. Only the primary researcher (Lisa Bain) and her supervisor have access to the information. When writing about this research, we will never use your name and will not associate the information you provide with the club to which you are registered.

What will you do with my answers?

We will find out about the role that your coach plays in your learning and training environment and how it may lead to better performance outcomes over

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time. All recorded data will be destroyed after analyses are finished for the current study. Transcripts of recorded data will be securely stored in a password-protected computer and in a locked drawer in the supervising professor's office for 10 years, after which they will be destroyed.

What else do I need to know?

Your information will always remain anonymous. The coach participating in the study will know that you are also participating, and other athletes who are at the practice complex will know that you are participating in a study. If at any time you wish to withdraw from the study, you may do so freely.

Although very

unlikely, there is a remote possibility of you feeling some discomfort when asked to recall times in practice when you have messed up, made errors, or were frustrated. If this occurs, you may contact the Kids Help Phone at 1-800-668-6868 to help with such discomfort.

Questions?

If you would like more information or have any questions about this study, you or your parent can contact me (Lisa Bain) at [phone number] or [email address], or my supervisor (Dr. Bradley Young) at [phone number] or [email address].

For any questions about this project, you can contact the Protocol Officer for Ethics in Research, University of Ottawa, 550 Cumberland Street, Room 154, Ottawa, ON, K1N 6N5, (613) 562-5387 or ethics@uottawa.ca.

Assent:

I have read this form, understand the information about this study, filled out the recruitment screening sheet, and am willing to participate in this study.

Youth name printed

Youth signature

Date

Appendix G: Coach Recruitment Screening Sheet

Name: _____

Name of Club: _____

1. What is your highest level of coaching certification you have received? (Please circle)

Regional	Provincial	National	High Performance (Designations: International, World, Olympic)
- Learn to Train	- Learn to Compete	- Train to Compete	- Learn to Win/Live to Win

2. Describe any pertinent information related to your **formal coach education** and **formal coach certification training**, including any pertinent information that would be recognized by Skate Canada.

3. When did you receive your highest level of coach certification? Year: _____
4. Are you in the process of becoming certified at another level? If so, please indicate which level. Which step of the certification process (e.g., in-training, trained, certified) are you in?

5. Please estimate the **level of the athletes you are regularly coaching** at present (please check off all that apply to you):

☐	Club
☐	Regional
☐	Provincial
☐	National
☐	High Performance

6. For **how many years** have you regularly coached athletes at this level?

_____	Club
_____	Regional
_____	Provincial
_____	National
_____	High Performance

7. How many athletes are you coaching right now at this level?

_____	Club
_____	Regional
_____	Provincial
_____	National
_____	High Performance

For each of your athletes between the ages of 10-18, we would like you to complete the following table. This information will help us recruit one of the athletes with whom you work regularly. Particularly, we are seeking an athlete between the ages of 10-18, who is working on a new solo routine for an upcoming test (competitive stream, likely pre-juvenile or juvenile, but could be higher), working towards the National level or higher, and has prospective growth in the sport where they have talent and is not in figure skating just for fun. If you think that you have an athlete that fits these criteria, please fill out the table below. We will use this information confidentially to help us for purposes of recruitment.

[illegible]

Appendix I: Athlete Recruitment Screening Sheet

Name: _____

Name of Coach: _____

Name of Club: _____

1. Date of Birth (DD/MM/YYYY): _____
2. Gender: _____
3. Please identify any performance tests and/or competitions you are preparing for this season.

Tests	Competitions

4. Are you mostly a test (STARSkate) or competitive skater? _____
5. How many years have you been in this sport? _____
6. How long have you been with your current coach? Years: _____ Months: _____
7. On average, how many practices do you have where your coach is present at the rink **each week**?
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15+
8. On average, how long do you practice on ice **in total** during the week?
Hours: _____ Minutes: _____
9. How much of the time stated in question 7 is spent directly interacting with your coach on your skating?
Hours: _____ Minutes: _____
10. What additional off-ice training do you participate in during the week?

--

11. Which test level did you last complete for free skating?

Junior Bronze Senior Bronze Junior Silver Senior Silver Gold

12. When did you compete for this? (DD/MM/YYYY) _____

13. How did you do on your last test for free skating?

Poor Fair Good Excellent

14. Did you pass your last test for free skating?

Yes No

15. Which singles category do you compete at for the Free Program Segment?

Pre-Juvenile Juvenile Pre-Novice Novice Junior Senior

16. Are you working on a solo routine for an upcoming test now? If yes, how many routines are you working on?

1 2 3

17. If yes to question 10, how many of these are **new** solo routines this season?

1 2 3

18. When is the next time you will be completing a test, roughly?

<1 month 1 month 2 months 3 months 4 months Unknown

19. In the long-term, please describe the highest level you wish to compete at in figure skating?

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l'activité physique**University of Ottawa**Faculty of Health
SciencesSchool of Human
Kinetics**Appendix J: Letter of Information for Non-Participants**

To whom it may concern,

We are contacting you in order to let you know that audio-recordings of a coach and one of their athletes will be taking place at your practice complex during training over the course of the next 10 weeks. This audio recording is part of a master's thesis research project based at the School of Human Kinetics at the University of Ottawa that is examining a case study of how a coach and athlete interact during practice. This study conforms to all requirements from the University of Ottawa Office for Research Ethics.

Although it is not the intention of our audio recordings to pick up any voices beyond the one coach and one athlete in our study, there is a possibility that other voices at the practice complex (such as your son's and/or daughter's) might be picked up on the microphone. This dialogue will not be transcribed or analyzed, and the audio-recordings of these practice sessions will be kept in a secure and safe place. Once we have audio-recorded and transcribed the recordings pertaining to the coach and the athlete in our study, all audio-recordings will be destroyed.

If you would like more information or have any questions, you can contact me (Lisa Bain) at [phone number] or [email address], or my supervisor (Dr. Bradley Young) at [phone number] or [email address].

Thank you for your time.

Sincerely,

Lisa Bain

Lisa Bain, BA
MA Candidate
School of Human Kinetics
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Bradley W. Young, Ph.D.
Associate Professor
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Appendix K: Certificate of Ethics Approval

25/09/2018

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Bureau d'éthique et d'intégrité de la recherche

University of Ottawa

Office of Research Ethics and Integrity

CERTIFICAT D'APPROBATION ÉTHIQUE | CERTIFICATE OF ETHICS APPROVAL

Numéro du dossier / Ethics File Number

H-08-18-897

Titre du projet / Project Title

Exploring co-regulatory
scaffolding dialogue between an
athlete and coach in a practice
setting: A case study

Type de projet / Project Type

Thèse de maîtrise / Master's
thesis

Statut du projet / Project Status

Approuvé / Approved

Date d'approbation (jj/mm/aaaa) / Approval Date (dd/mm/yyyy)

25/09/2018

Date d'expiration (jj/mm/aaaa) / Expiry Date (dd/mm/yyyy)

24/09/2019

Équipe de recherche / Research Team

**Chercheur /
Researcher**

Affiliation

Role

Lisa BAIN

École des sciences de l'activité physique / School of Human
Kinetics

Chercheur Principal / Principal
Investigator

Bradley YOUNG

École des sciences de l'activité physique / School of Human
Kinetics

Superviseur / Supervisor

Conditions spéciales ou commentaires / Special conditions or comments

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25/09/2018

Université d'Ottawa

Bureau d'éthique et d'intégrité de la recherche

University of Ottawa

Office of Research Ethics and Integrity

Le Comité d'éthique de la recherche (CÉR) de l'Université d'Ottawa, opérant conformément à l'*Énoncé de politique des Trois conseils* (2014) et toutes autres lois et tous règlements applicables, a examiné et approuvé la demande d'éthique du projet de recherche ci-nommé.

L'approbation est valide pour la durée indiquée plus haut et est sujette aux conditions énumérées dans la section intitulée "Conditions Spéciales ou Commentaires". Le formulaire « Renouvellement ou Fermeture de Projet » doit être complété quatre semaines avant la date d'échéance indiquée ci-haut afin de demander un renouvellement de cette approbation éthique ou afin de fermer le dossier.

Toutes modifications apportées au projet doivent être approuvées par le CÉR avant leur mise en place, sauf si le participant doit être retiré en raison d'un danger immédiat ou s'il s'agit d'un changement ayant trait à des éléments administratifs ou logistiques du projet. Les chercheurs doivent aviser le CÉR dans les plus brefs délais de tout changement pouvant augmenter le niveau de risque aux participants ou pouvant affecter considérablement le déroulement du projet, rapporter tout événement imprévu ou indésirable et soumettre toute nouvelle information pouvant nuire à la conduite du projet ou à la sécurité des participants.

The University of Ottawa Research Ethics Board, which operates in accordance with the *Tri-Council Policy Statement* (2014) and other applicable laws and regulations, has examined and approved the ethics application for the above-named research project.

Ethics approval is valid for the period indicated above and is subject to the conditions listed in the section entitled "Special Conditions or Comments". The "Renewal/Project Closure" form must be completed four weeks before the above-referenced expiry date to request a renewal of this ethics approval or closure of the file.

Any changes made to the project must be approved by the REB before being implemented, except when necessary to remove participants from immediate endangerment or when the modification(s) only pertain to administrative or logistical components of the project. Investigators must also promptly alert the REB of any changes that increase the risk to participant(s), any changes that considerably affect the conduct of the project, all unanticipated and harmful events that occur, and new information that may negatively affect the conduct of the project or the safety of the participant(s).

Riana MARCOTTE

Responsable d'éthique en recherche / Protocol Officer

Pour/For **Daniel LAGAREC** Président(e) du/ Chair of the **Comité d'éthique de la recherche en sciences sociales et humanités / Social Sciences and Humanities Research Ethics Board**

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Appendix L: Self-Regulated Learning in Sport Practice Survey

Athlete Survey for Self-Regulated Learning in Sport Practice (SRL-SP; Bartulovic, Young, & Baker, 2017)

Please read the following statements and choose the number that best describes the way you act when approaching challenges, difficulties, and/or tasks in your sport training.

Think about a challenge or difficulty you might have faced in practice during the last two weeks. Think about when you have to overcome a difficult practice task. What do you do before you start? What do you do while you work out? What do you do after difficult practice tasks? And how often you act like this when approaching practice tasks? There are no right answers -- please describe yourself as you are, not how you want to be or think you ought to be.

Almost Never	Sometimes						Almost Always				
1	2	3	4	5	6	7					
1.I determine how to approach a practice task before I begin.					1	2	3	4	5	6	7
2.I put forth my best effort when performing tasks at practice.					1	2	3	4	5	6	7
3.I check aspects of my workout while doing it.					1	2	3	4	5	6	7
4.I double-check to make sure I did practice tasks right.					1	2	3	4	5	6	7
5.I develop a plan for resolving difficulties at practice.					1	2	3	4	5	6	7
6.Even when I don’t like a task during practice, I work hard to do well.					1	2	3	4	5	6	7
7.I keep working hard even when sport training tasks become difficult.					1	2	3	4	5	6	7
8.Before practice tasks, I carefully plan my course of action.					1	2	3	4	5	6	7
9.I don’t give up at practice even if a task is hard.					1	2	3	4	5	6	7
10.While I am engaged in a practice task, I know how much of it I still have to complete.	1	2	3	4	5	6	7				
11.I am willing to do extra practice on tasks in order to acquire more skill.					1	2	3	4	5	6	7
12.I try to understand the goal of a practice task before I do it.					1	2	3	4	5	6	7
13. If I’m not really good at a task, I can compensate for this by practicing hard.					1	2	3	4	5	6	7
14.I ask myself questions about what a practice task requires me to do before I do it.					1	2	3	4	5	6	7
15.I work as hard as possible on all tasks at practice.					1	2	3	4	5	6	7
16.I check my work all the way through a practice session.					1	2	3	4	5	6	7
17. I check how well I am doing during practice tasks.					1	2	3	4	5	6	7
18. I clearly plan my course of action before starting practice tasks.					1	2	3	4	5	6	7
19.I look back and check if what I did in practice was right.					1	2	3	4	5	6	7
20.Before practice tasks, I figure out my goals and what I need to do to accomplish them.	1	2	3	4	5	6	7				

21. I work hard at practice on a task even if it is not important. 1 2 3 4 5 6 7
22. I look back to see if I did the correct procedures at practice. 1 2 3 4 5 6 7
23. Before I do a practice task, I think through the steps in my mind. 1 2 3 4 5 6 7
24. After finishing, I look back on the practice task to evaluate my performance. 1 2 3 4 5 6 7

Please indicate your agreement with each of the following statements:

Strongly Disagree 1	Disagree 2	Slightly Disagree 3	Neither Agree Or Disagree 4	Slightly Agree 5	Agree 6	Strongly Agree 7
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25. When I am confronted with a difficulty during practice, I can usually find several solutions. 1 2 3 4 5 6 7
26. When facing difficulties at practice, I can remain calm because I can rely on my coping abilities. 1 2 3 4 5 6 7
27. I often think about my past experiences at practice to gain new insights. 1 2 3 4 5 6 7
28. No matter what comes my way at practice, I am usually able to handle it. 1 2 3 4 5 6 7
29. I am confident that I can deal efficiently with unexpected events at practice. 1 2 3 4 5 6 7
30. When thinking about my training, I often reflect about my strengths and weaknesses. 1 2 3 4 5 6 7
31. I know how to handle unforeseen situations during practice, because I am resourceful. 1 2 3 4 5 6 7

SCORES:

To get a score for each subscale, average the following items:

Planning	1, 5, 8, 12, 14, 18, 20, 23
Self-monitoring	3, 10, 16, 17
Evaluation	4, 19, 22, 24
Reflection	27, 30
Effort	2, 6, 7, 9, 11, 13, 15, 21
Self-efficacy	25, 26, 28, 29, 31

Appendix M: Semi-Structured Interview Guide - Coach Interview 1

- How are you? **Chit chat**
- I am a graduate student from the University of Ottawa doing research in sport psychology on optimal training habits, so I'm just here to get your perspective and to see how a high level athlete and their coach practice together
- I think being in school you kind of get caught up in the theory of things and there's a loss of connection between the theory and what actually goes on in real life, so I'd really like to learn about the lived experiences of practitioners and hopefully find a way where research can benefit the both of us
- So again thank you for participating in this study and taking the time to sit down with me today.

Find common ground

- Recording and taking notes
- If uncomfortable, we can move on
- Not judging, not disclosing their information to anyone else (parents, athlete)
- Anonymous

1. How long have you been coaching at the (insert the chosen athlete's level here) level?
2. How long have you been coaching (insert chosen athlete's name)?
3. Can you describe a typical week for your athlete?
4. Do you have a plan each time you go into a practice?
5. How do you set up your practices?
6. How much interaction is there between you and your athlete during practice?
 - a. Is it consistent during practice? At more times than others?
 - b. What does this depend on?

[Contingency, (Support/Feedback)]

For this next set of questions, I would like you to think about what happens within any one practice session.

7. Can you tell me a little bit about your philosophy on giving feedback to your athletes? (sharing of information, conveying information to athlete at different instances in practice, could be how they are doing)
8. What types of things do you like to give feedback on?
9. How often do you give feedback?
 - a. Is there a pattern to how you give feedback during a practice?
 - b. What does this depend on?
10. How do you support your athlete when they try things in practice?
Feedback depends on degree of success, clear successes or clear failures
Does your philosophy vary based on their degree of success in practice?
11. Is your philosophy the same for giving feedback after successes as it is for when your athlete is less successful?
12. Is this something you intentionally set out to do during a practice?
 - a. Can you give me specific instances, situations, or scenarios?

[Fading]

For this next set of questions, I would like you to think about what happens across multiple practices over the course of a season.

13. You said earlier on your philosophy on giving feedback that you... What is your philosophy on whether how you give feedback should change over time? Such as types of feedback, how you give feedback, and when you give feedback?
14. Do the types of things you like to give feedback on change over time?
15. When you consider how often you give feedback to your athletes, does this change over time, across practices in a season?
 - a. Is there a pattern to how often you give feedback over the course of the season? Are the changes, more or less, in terms of the feedback and support you give?
 - b. What does this depend on?
16. When your athletes try things in practice, does your support change over time?
 - a. Does it increase or decrease?
 - b. What does this depend on?
17. You said “(Insert the answer they provided for the question “Is your philosophy the same for giving feedback after successes as it is for when your athlete is less successful?” here)”, does this change over time?
 - a. More or less?
18. Is this something you intentionally set out to do over the course of the season?
 - a. Is this something that you intentionally try to change over the course of the season? Are the changes more or less?
 - b. What does this depend on?

[Transfer of Responsibility]

19. Do you have expectations for your athletes with regards to responsibilities, roles, and duties for being a “good athlete” during practice?
 - a. What are some of those responsibilities? In what areas of practice?

Again, talking about responsibilities, roles and duties...

20. Do you have expectations for your athlete with regards to their “own development, for optimizing their learning and skill improvement”, during practice?
21. How do these roles and responsibilities get figured out?
22. a) Are there any roles or responsibilities that they learn from you? OR Do you have a role in the athlete learning these roles and responsibilities?
 - a. Can you give me a specific example?
 - b. Is this something that you set out to do?
- b) Does the athlete have a role in figuring out these roles and responsibilities?
 - c. How are they picking up good training habits to help themselves?

- d. How does the athlete figure these roles and responsibilities out?
 - e. Can you give me a specific example?
 - f. Is this something that you set out to do, that is, intentionally supporting the athletes when they are figuring out their roles and responsibilities?
23. What is your philosophy on letting athletes work on skills or mistakes on their own?
24. Is it important for you that your athlete learns to do things on their own?
- a. What sort of things?
 - b. What does this depend on?
25. Do you have a role in your athletes' learning to do things on their own?
- a. In what aspects? Can you give me an example?
 - b. Can you speak about the nature of any changes in the athletes' learning to do this over multiple practices?
 - c. Is this something you intentionally set out to do as a coach, that is, intentionally supporting the athletes so they learn how to do things on their own?
 - d. Do you think this will change over the course of the season?
26. Is there anything else you would like to add?

Again, thank you for taking the time and talking with me today. I will type up this interview and forward it to you to make sure everything is correct, and you can make slight changes if need be. I look forward to doing the second interview with you later on in the season, and I will see you at next practice.

Optional questions if they come up from discussion from the coach

- Do you talk to your athlete after every time you perform a skill?
- Can you tell when your athlete is frustrated? How?
- Does your athlete practice on their own during practice?
- Does your athlete have a say in what they want to do in practice?

Appendix N: Semi-Structured Interview Guide - Coach Interview 2

I would like to talk to you about some of the quotes from the last interview, I would like your opinion and more information on them.

The last time we talked, during the interview, you mentioned that this is the time of year where you start working with [the athlete] on skills he needs to improve on or learn how to do.

- Right now I would like you to think about skills where [the athlete] has a lot of work to do on them, where YOU are going to work with him to make improvements on those skills, so this could be triples, certain types of triple, something that you can identify for me. What are those skills you have in mind? (try to categorize them)

With those skills in mind (list them), I would like you to keep those in mind and I will come back and prompt you on them in different parts of the interview.

Last interview you mentioned that you switch from teaching the athletes new things to more of a correcting role.

- Does this happen in a season? Can this happen in a season?
- Can you give me an example of an exchange between you and [the athlete] that would occur when you are teaching? (use one of the examples given up there)
- Can you give me an example of an exchange between you and [the athlete] that would occur when you are correcting?
- Last interview you mentioned the progression from teaching to correcting. Why is it important for you to switch from teaching to correcting?
- Why is it important for the skater, for [the athlete], for you to switch from teaching to correcting?
- How do you know when to switch from teaching to correcting?
 - o Is there a specific time or marker you look for?
 - o Is there something you look for from the skater?
- You also mentioned that you get more demanding as the season progresses, what are you demanding from the athlete at the beginning of the season? What are you demanding from the athlete at the end of the season?
 - o How do the demands change?
 - o What does this look like in practice?
 - o How does your athlete respond to these demands?

I would like you to think of a time, maybe recently, when [the athlete] caught himself from falling. So he was doing a jump, didn't quite land it, but was still able to catch himself and not land on the ice. (use an example provided)

- What happens when [the athlete] skates back to the boards after performing that element or program?
 - o Do you jump in and start talking about what happened/what went wrong?
 - o Do you pause to let him talk first about what went wrong/what needs to be fixed?
 - o Do you ever ask him what happened/what went wrong?
 - o What is the ratio between all of those?
 - o Does this change over time?

- How do you determine which strategy to use?
- Do you think it's important to give the athlete feedback right away? Do you ever delay your feedback?

Last interview you mentioned that [the athlete] was an ideal student and that interactions with him are easy.

- What makes [the athlete] an ideal student? What are some characteristics that make him an ideal student?
 - What makes [the athlete] an ideal student when, for example, you interact with him around a skill, errors, challenges?
 - Does he adopt your instruction well?
 - Does he try and figure things out for himself?
 - Does he ask good questions of you?
 - Does he respond well to your questions?
 - Is this evidence that [the athlete] is taking responsibility for his training?
- You mentioned that "He's really easy to work with, and that makes the interaction easy", can you give me an example of when the interactions are easy?
- Are there times when the interactions are hard? Can you give me an example?
- Do you think hard interactions sometimes are necessary for your athlete to progress in this sport?
- (Are there any times during "hard practice" when your interactions with your athlete make it easier?)

It sounds like you tailor your sessions around what the athlete's energy is like that day.

- What are your interactions like when the athlete has low energy during a session?
 - Can you give me an example of an exchange between you and the athlete?
 - Is there a lot of interaction, a little interaction?
 - Does this change based on successes or errors made by the athlete?
- What are your interactions like when the athlete has high energy during a session?
 - Can you give me an example of an exchange between you and the athlete?
 - Is there a lot of interaction, a little interaction?
 - Does this change based on successes or errors made by the athlete?

Appendix O: Semi-Structured Interview Guide - Coach Interview 3

- Do you see [the athlete] as having a role in planning and how time is managed at practice?
- Does [the athlete] ever negotiate what he wants to work on at practice?
- When you are asking the athlete what happened or what went wrong after they perform an element, are you asking to help yourself figure out how you can help him, or to bring his awareness to it, or both?
- Does it matter who initiates the conversation after a practice rep when he approaches the boards?
 - (During practice, do you take [the athlete]'s silence or pregnant pause as a sign that you should initiate conversation?)
- Last interview you mentioned a shared language between you and [the athlete].
 - What is this shared language? How would you describe it?
 - How did he learn this?
 - Is this shared language still being developed?
- I would like you to think about a jump and the progression from the single to the double to the triple. Does the frequency of interactions change, or just the content becomes more refined/tighter depending on the higher level of the jump?
- Last interview you mentioned that you like to give feedback right away, but you sometimes like to delay the feedback. When would it be useful to delay your feedback? When would it be useful to give your feedback right away?
- Last interview when I asked “And do you ever, instead of letting him know exactly what went wrong, is there a time where you ask him what happened or what went wrong, to kind of see his response from it?” you mentioned “I have to keep reminding myself of that. I need to step back and let them drive it, guide it, and not just always correct”. How do you think you step back and let him drive it? Can you give me an example?
- In what conditions is it better to tell the athlete how to correct their mistakes versus allowing them to try to figure it out themselves?
- You mentioned that “Maybe I still teach technique as well, but it’s, more them directing me in what technique I’m teaching?”. Is there a specific example of this from [the athlete] from this past season, since I have been collecting data?
- Do you find that when an athlete gets older, so for example [the athlete]'s age, the practice is formed on the way the athlete feels performing an element and a coach's second set of eyes?
- Last interview you mentioned for the progression from teaching to correcting, that “the progression is not just about they understand the technique, they understand the language, they're more mature they understand the concepts”. When you say mature, what do you mean? What is maturity?
- Do you strategically try to facilitate greater maturity in [the athlete] as a skater in practice? What do you try and do?

Appendix P: Semi-Structured Interview Guide - Skater Interview 1

- How are you? **Chit chat**
- I am a masters student from the University of Ottawa doing research in sport psychology on optimal training habits, so I'm just here to get your perspective and to see how a high level athlete and their coach practice together
- So again thank you for participating in this study and taking the time to sit down with me today.

Find common ground

- Recording and taking notes
 - If uncomfortable, we can move on
 - Not judging, not disclosing their information to anyone else (parents, athlete)
 - Anonymous
1. Pretend like I don't know anything about figure skating and that I haven't been out to some of your practices. Can you describe to me what your average practice is like, right from when you arrive at the arena until you leave?
 2. What are your favorite parts of practice?
 3. How long have you been with your current coach?
 4. Do you think your coach makes you a better athlete during practice? How?
 - a. Are there any other ways? What is she doing exactly?
 5. Is there a lot of interaction between you and your coach during practice? When I say interaction, I mean back and forth in terms of him/her showing you things, talking with you, stuff like that. [follow up with next question if they don't understand] Do you and your coach talk a lot?
 - a. Does this happen the whole time during practice? Only at certain times? At more times than others?
 - b. When does it happen?
 - c. Where does it happen? Does it happen at a certain place?
 - d. How often does this type of interaction happen?
 - e. Is it always talking? Talking about/showing demos?
 6. Does your coach interact with you after every time you perform an element? Again, when I say interaction I mean like back and forth in terms of him/her showing you things, talking with you, stuff like that. What happens?
 - a. Is there times when the coach doesn't interact with you?
 7. Is it easy to tell when you "nail" an element or make a mistake in practice?

For these next set of questions, I would like you to think about a recent example of when you made a mistake or the grade of execution on an element was poor.

8. Can you talk about or describe the example you've chosen and what happened when your execution of an element was poor?

i. How can you tell when you've slipped up?	i. Does your coach respond in any way?
ii. When you realized this, what was going through your head?	ii. What does your coach do when you do something wrong?

iii. What did you do next? a. Can you give a specific example? b. What did that look like?	a. Can you give a specific example? iii. * Does your coach leave it to you or let you work on mistakes and frustrations on your own? * a. How do you know what to work on during that period?
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(after you go through this table, try to get a second example at least)

For these next set of questions, I would like you to think about a recent example in practice when you nailed something or performed something very well.

9. Can you talk about or describe the example you've chosen for when you nailed something or performed something very well in practice?

i. How could you tell you were successful? ii. What was going through your head? What tells you, you were successful? a. Can you give a specific example? iii. What did you do next? iv. What happens after you're successful?	i. Does your coach respond in any way? ii. What does the coach do when you are successful in a task? a. Can you give a specific example? iii. * Does your coach leave it to you or let you figure out where you are successful during practice? * a. Was there a time when you were successful and you didn't need your coach to tell you?
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10. What are your responsibilities, roles, and duties at home?

Ok, now I want you to think about this as a figure skater at practice.

11. What are your responsibilities, roles, duties for being a "good figure skater" during practice this season?

i. (Repeat back the responsibilities that they said) Do you expect yourself to be good at all of these responsibilities? a. Can you give me a specific example? b. How did you figure out these expectations? ii. What do you expect from your coach in terms of being an amazing coach in practice? a. Can you give me a specific example? iii. * Are there any times where one of your responsibilities is to go away by	i. Does your coach have expectations for you in terms of how you go about practice? a. How do you know this?
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yourself and practice on your own without the coach monitoring you? *	
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12. Do you have a goal when you practice on your own?
 - a. Can you give me an example?
13. Is it important for you to practice on your own without a coach?
14. Do you ever have a chance to talk to your coach about what you want to do in practice?
 - a. How often would you say does this happen?
 - b. Can you give me an example?
15. Does your coach ever give you choices in practice?
 - a. Can you give me an example?
16. Is there anything else you would like to add?

Appendix Q: Semi-Structured Interview Guide - Skater Interview 2

Last interview when I asked if you could describe what your average practice is like, you mentioned that you liked to set a plan at the beginning.

- Is planning important the moment you arrive?
- Who initiates ideas and planning on what needs to be worked on, fixed?
- Who sets the plan? Do coaches set the plan and then confirm it with you? Do the coaches make most of the plan and then ask if there is anything you'd like to add? Are all of you equal and plan together?
- Are you relying on what the coach says to start working? Do you sometimes? When?
- How do you set things you want to accomplish each day?

Last interview I asked if you ever have a chance to talk to your coach about what you want to do in practice, and you said "Umm, if I ever, like, ok I'm sore today, lets maybe work on stretching or ok, at competition this program really didn't go well, I practically fell everywhere, I really want to fix this, I'm going to work on that tonight."

- How do you tell her or let her know you want to work on those things, or do you ask her?

What happens when you find something you want to or have to work on?

- How do you know this element is something you have to work on?
- Does your coach ask if there's something you want to work on?
- Do you initiate the conversation, so you approach the coach to see if you can work on it?

You mentioned last interview that you can tell you did something right because it felt easy. Is there ever a time where an element felt "easy" but it was still "incorrect" or "wrong"?

- How did you know? How did you find out?
- Are you expected to be an independent skater? When I say independent I mean working things out on your own, practicing on your own, taking initiative.
- Are you an independent skater?
- So you'll go over an element a few times while the coach is there, but then it is your responsibility or you take it upon yourself to work on it by yourself when you are alone?
- (Do you think that the fact that you interact less with this is because you identify yourself as an independent worker and she expects you to do this?)
- Is the coach aware of the things you do on your own? How do you make the coach aware of what you worked on on your own?
- Can you explain what happens when you're in session right after you perform an element? What's going through your head? (maybe an example when he was successful and when he caught himself)
- What happens as you approach your coach on the boards?
 - What does she do/say?
 - Does she ever pause to let you talk first about what went wrong or what needs to be fixed?
 - Does she ever ask you what happened or what went wrong?

- When does the coach make the first comment after you perform an element, when does she take the lead?
- Does she always let you try and fix it yourself before she makes a comment?

What do you think the role of the coach is in practice?

- What makes her a good coach?
- Do you find she has more of a teaching or a correcting role? Is this the same at the beginning of the season compared to the end of the season?
- Do you need your coach to tell you in practice when something might be off?
- Does your coach need you to tell her when it might be off?
- Which is more important to you? For your improvement? (when she tells you when something is off vs. when you tell her)

Try to think about a time in practice where everything seemed to be going wrong. You get on the ice, you don't land your jumps, your spins aren't what they usually are.

- How do you try to "bounce back" from these setbacks/errors/bad program?
- What do you do to try and make it a better practice where you do land your jumps?
- Where or how did you learn that this works for you?

Last interview when I asked what was going through your head when you realized something wasn't quite right when you made a mistake or your grade of execution on an element was poor, you mentioned that you try and make the next one better and try not to leave that mistake on your mind. So, it was just a simple mistake, forget it, and continue on.

- Is this something that you learned from your coach or that you have learned to do over the years by yourself?

(How are priorities for learning and working on stuff established?)

You mentioned that through experience you know how to fix your own mistakes.

- Can you tell me about the experience by which you've learned to fix your own mistakes?
- Is there any point in your career where you suddenly took a greater role in fixing your mistakes?
- How do you notice that you have a greater role in fixing your own mistakes now? Have you asked for that?
- When did you start fixing your own mistakes?
- How was experience developed?
- Can you give an example relating to one element where it is still developing?

What is a new element that you started at the beginning of this previous season? OR I would like you to think of an element what you worked on this season or started at the beginning of the previous season. Ok, I would like you to keep this element in your mind.

Is there anything that the coach was doing with you, or the dialogue you were having with your coach over the course of things you were working on this year, where you felt more responsibility for making yourself better on that element?

- How? Can you walk me through that element?

- What's changed with how you interact with your coach?
- Has the nature of dialogue changed?

Appendix R: Semi-Structured Interview Guide - Skater Interview 3

- Last interview you mentioned negotiating with regards to who sets the plan at practice, what did you mean by negotiation? What does that look like?
- I would like you to think about a jump and the progression from the single to the double to the triple. Does the frequency of interactions change, or just the content becomes more refined/tighter depending on the higher level of the jump?
- When do you keep working on something if it isn't going right and when do you leave it until another time?
 - Is this negotiated with the coach?
 - How does she support this?
- When the coach asks what went wrong, is she asking to help her figure out how she can help you, or to bring your awareness to it, or both?
- What is the nature of dialogue when you are having a lethargic day in training vs energetic day?
 - Does this change depending on how much effort you are giving?
- When working on an element, how would the coach ever know that an element is feeling lighter, easier? If no, how do you convey this information, or do you keep it to yourself?
 - How does the coach understand what you "feel"?
- Can you tell me if how much you like an element vs elements you don't like factor in to how much you practice an element?
- Was there a time this season, since I've been collecting data, where you found a new element on your own to work on and asked the coach to work on it with you?
 - What was it?
 - How did this happen?
 - How did you feel about this?
- Do you see demands in training change over the course of a season? If so, how do you respond to those changing demands?
- Would you say you are mature with respect to training/how you learn at practice? Does your coach do anything in practice to help or increase your maturity?
- Did you seek out a sport psychologist, was she recommended, or did your coach provide you with one?

Appendix S: Inductive Analysis Themes

Co-regulation

- Shared mentality
- Shared training habit
- Feedback from the coach
 - Positive
 - No sugar coating
 - Technical
 - Change in communication
 - Over time
 - In practice
 - Energy level
 - Speed/rapidness
 - Experience in sport
- Planning
 - Plan for practice that day
 - Situational
 - Negotiation of plan
- Skater's voice in the co-regulatory process
- Skater uses contingency control
- Goal setting
- Artistic aspect of transfer of responsibility
- Work on old things

Interface

- Coach expectation to give input
 - Visual cue
 - Coach expectation to modify/adjust their support
 - Coach intends to provide solutions and tasks
 - Visual and kinesthetic information
 - Response from coach
- Skater expectation for input
 - Kinesthetic information
 - Active engagement
 - Arousal level
 - Effort
 - Expectation to communicate
 - Kinesthetic and visual information
 - Internalization of information
 - SRL skill set
- Sharing in the mixing zone
- Negotiation/back and forth

Independent roles and attributes for practice

- Role of the Coach
 - Demands
 - Decisions

- Need for a coach
- Teaching to correcting
 - Teaching and correcting
 - Progression
 - Correcting as adjusting timing
 - Refinement of position
 - Occurs over time
 - End goal is self-directed
 - No straight path
- Experience
- Role of the Skater
 - Effort
 - Works on own
 - Hard work/independence
 - Take initiative
 - Hard work
 - Fix mistakes
 - Perseverance
 - Optimize practice
 - Independence
 - Repetition
 - Responsibilities