Self-regulation of learning and the performance level of youth soccer players
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Self-regulation of practice behavior among elite youth soccer players: An exploratory observation study

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Abstract
This study aimed to measure behavioral correlates of self-regulation in elite youth soccer players. Behaviors regarded as indicative of self-regulated learning were identified by interviewing six expert youth soccer coaches. These behaviors were observed during practice of eight elite youth soccer players aged 15-17 years, and linked with self-reported self-regulated learning scores to describe behavioral correlates of self-regulation. Results indicated that self-regulated learning is reflected in taking responsibility for learning and that players’ practice environment plays a significant role. This study highlights the importance of measuring overt behavior to gain a complete impression of youth soccer players’ self-regulated learning skills.

Introduction

Self-regulation is presumed to involve processes that enable individuals to control their thoughts, feelings, and actions (Baumeister & Vohs, 2004). This includes processes that have evolved to extend the range and flexibility of human behavior, and that enable human beings to override responses which may prove counterproductive (Baumeister, 2005). Self-regulation may be important in youth sport, because these processes are supposed to help individuals learn more effectively (Zimmerman, 2006). Accordingly, athletes who self-regulate their learning well may be better able to get the maximum out of their potential. This seems particularly relevant in high-level youth soccer where players must perform well to become selected for - and must keep up their performance to stay in- a talent program (Siebelink, 2008; Stratton, Reilly, Williams, & Richardson, 2004). Youth soccer players are assumed to have a better chance of achieving the adult elite status if they are enrolled in such talent development programs, because these provide high-standard facilities such as high-quality practice and coaching. The current study aimed to identify behavioral correlates of self-regulated learning within the context of practice among elite youth soccer players.

Zimmerman (2008) pointed out that self-regulated learning refers to self-directed processes that enable learners to transform their mental abilities into performance skills. Self-regulated learners show personal initiative, perseverance, and adaptive skills, originating from favorable metacognitive strategies and motivational beliefs (e.g., Zimmerman, 2006, 2008). Self-regulation processes are thought not to produce excellence immediately, but to facilitate effective learning of individuals (Zimmerman, 2006). Several studies have shown that successful learners display greater self-regulation and stronger motivational beliefs (e.g., Boekaerts, Pintrich, & Zeidner, 2005; Pintrich & De Groot, 1990; Zimmerman, 2006).

Chen and Singer (1992) suggested that successful athletes self-monitor; they detect discrepancies between their current and potential level of achievement and self-regulate their efforts to improve performance. Additionally, it has been found that self-regulation failure harms athletic performance (e.g., Anshel & Porter, 1996; Jordet, 2009a, 2009b; Kirschenbaum, Ordman, Tomarken, & Holtzbauer, 1982). Therefore, athletes who self-regulate well could be more likely to reach the elite status than others (Anshel & Porter, 1996). Studies examining self-regulation in sport training have revealed that experts are better self-regulators than non-experts or novices (Cleary & Zimmerman, 2001; Kitsantas & Zimmerman, 2002). When practicing free throws in basketball, for instance, experts were found to use better methods to self-regulate their learning. They set more specific goals, selected more technique oriented strategies, and displayed higher levels of self-efficacy than non-experts or novices (Cleary & Zimmerman, 2001). Hence, self-regulation of learning may cause youth athletes to benefit more from practice and competition. As the time to reach the top in sports is relatively short compared to other domains, such as academia or music, effective learning is particularly important in youth sport.

Recent studies have indicated a relationship between self-regulation and performance level of youth soccer players. Elite youth soccer players reported higher self-regulation of learning scores than non-elite
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players (Toering, Elferink-Gemser, Jordet, & Visscher, 2009a), and, within a group of elite youth soccer players (all belonging to the best 1% of players in the Netherlands), international level players’ self-assessed reflection scores were higher than national level players’ scores (Toering, Elferink-Gemser, Jordet, & Visscher, 2009b). These studies support the view that players who score high on self-assessed self-regulation of learning benefit more from practice and competition, which may explain the differences in performance level.

What currently remains unclear is exactly how effectively regulated learning leads to more effective learning and better performance. To answer this question, we need to know what effective self-regulation of learning is. One way to find out how players self-regulate their learning is to observe their behavior in a learning context, that is, during practice. The American Psychological Association states that psychology is the study of mind and behavior and that the understanding of behavior is the enterprise of psychologists (APA, 2010). However, to date, only few studies have been conducted in sport psychology in which behavior was measured directly (Andersen, McCullagh, & Wilson, 2007). Although knowledge about inner processes is valuable to understand the mechanisms underpinning behavior, different scores on questionnaires will only be meaningful if they can be related to overt behavior (Andersen et al., 2007; Baumeister, Vohs, & Funder, 2007). Therefore, the present study focused on real-world behavior.

In the context of learning, self-regulation has been described by Zimmerman (1989, 2006) as the degree to which individuals are metacognitively, motivationally, and behaviorally proactive participants in their learning process. This means that self-regulated learners are able to adapt their learning strategies to the practice environment to maximize their progress. The current study focused on how the metacognitive and motivational processes of self-regulation are reflected in practice behaviors of youth soccer players. The regulatory component of the expert learner model suggested by Ertmer and Newby (1996) was used to measure the metacognitive aspects of self-regulation. According to this model, self-regulation of learning means that individuals: a. Plan how they can improve before initiating actions; b. Self-monitor their actions relative to their goal; c. Evaluate the process and outcome after task execution; and d. Reflect upon the entire process during cycles of planning, self-monitoring, and evaluation.

Self-regulated learners are thought to make use of metacognitive strategies and motivational beliefs that lead them to show personal initiative, perseverance, and adaptive skills (e.g., Zimmerman, 2006, 2008). Studies among students indicated that motivational beliefs (e.g., self-efficacy) and motivational outcome variables (e.g., effort) were positively associated with cognitive and metacognitive strategies use (e.g., Pintrich & Schunk, 2002; Schunk, 2001). Other research has suggested that to attain maximal performance levels, youth soccer players must be willing to expend maximal efforts to improve and sustain these efforts over years (Ford, Ward, Hodges, & Williams, 2009; Helsen, Starkes, & Hodges, 1998). Self-efficacy is the belief that one is able to successfully execute a required behavior to attain a certain goal (Bandura, 1997), and is a central motivational variable in Zimmerman’s theory of self-regulated learning. Thus, effort and self-efficacy were the
motivational variables investigated in the current study.

With respect to the sport psychology practice, it is relevant to mention the relationship between self-regulation of learning and intrinsic versus extrinsic motivation. Intrinsic motivation refers to performing an activity because it is meaningful in itself (Deci, 1971), while extrinsic motivation refers to engagement in an activity as a means to an end (Vallerand, 2007). It has been shown that youth soccer players’ willingness to strive toward achievement severely depends on perceptions of competence and control, which in turn are influenced by coach behaviors (e.g., Wong & Bridges, 1995). Thus, in youth soccer, the coach has great impact on players’ type of motivation and, therefore, on young athletes’ self-regulation as well.

The purpose of this study was to measure behavioral correlates of self-regulation in elite youth soccer players. To this end, the study involved two parts: First, six expert youth soccer coaches were provided conceptualizations of self-regulation of learning and they were then asked to describe activities they regarded as good or poor self-regulation behaviors during practice. As we were particularly interested in practice behaviors of high-level youth soccer players, coaches working with elite youth soccer players on a daily basis were interviewed. Based on the outcomes of these semi-structured interviews, behavioral items regarded as indicative of self-regulation of learning were defined (for a description of similar procedures, see Young & Starkes, 2006a, 2006b). Second, the identified practice behaviors perceived as indicative of self-regulation of learning by the expert coaches were observed within a group of elite youth soccer players aged 15 to 17 years using video-taped practice sessions. In an attempt to describe behavioral correlates of self-regulation during soccer practice, the behavioral items reported in the interviews were related to a self-report instrument that measured self-assessed self-regulation of learning.

Method

Participants

Coach interviews. Six male expert coaches in youth soccer aged 33 to 45 years were interviewed ($M_{\text{age}} = 37.2$ years, $SD = 5.4$). They had four to 15 years of experience as soccer coaches ($M = 10.2$ years, $SD = 5.1$), and worked with elite youth players on a daily basis. At the time this study took place, they were all coaching male youth soccer teams playing at the highest national competition level in the Netherlands, meaning that the players in these teams belonged to the best 1% of soccer players of their age.

Behavioral observation. To investigate self-regulation behavior, 13 youth male soccer players from a team playing at the highest national competitive level in the Netherlands were observed during soccer practice. The mean age of the players was 16.0 years ($SD = 0.6$), and, on average, they had 9.6 years of competitive soccer experience ($SD = 2.3$), they practiced 8.0 hours per week at their club ($SD = 0.7$), and they played 1.4 matches per week ($SD = 0.5$). Goal keepers were excluded from the analysis because of their deviating task requirements compared to those of field players.

Procedure

Coach interviews. Before coaches were contacted, the youth academy director of the soccer club they worked at was asked permission for the study to proceed. Next, the coaches were
asked (by email) to participate in this study. Appointments for the interviews were made with each coach separately. The interviews were conducted by one of the investigators, who beforehand observed youth soccer practices for two weeks to become familiar with the setting in order to improve the trustworthiness of the data (Lincoln & Guba, 1985). Prior to the interviews, the coaches were informed that they were audio-recorded for subsequent analysis and that their responses were treated anonymously. All coaches gave their consent in advance of the interviews, which each lasted approximately 60 minutes.

**Behavioral observation.** The youth academy director of a Dutch premier league soccer club was approached for participation in this study. After permission of the youth academy director, the Under 17 youth team was appointed to participate in the study. Then, the parents were asked permission for the study to proceed. The participants first completed the 46-item Self-Regulation Scale (SRS; Toering, Elferink-Gemser, Jonker, Van Heuvelen, & Visscher, in press), a questionnaire which intends to measure self-regulation of learning. Four practice sessions considered representative for a regular training week were analyzed, which were filmed over a two-week period. Each practice session filmed consisted of 30 minutes unregulated pre-practice in the absence of a coach and 90 minutes of regular practice guided by the team’s coach(es). The players were accustomed to being filmed for coaching purposes, and the researchers did not make the players aware of the objective of analysis in order to prevent them from showing social desirable behavior.

Before analyzing the four practice sessions, the two observers used one extra videotaped practice session to train their observation skills by discussing discrepancies in recordings and interpretations of behavior. Furthermore, slight adjustments were made to the list of behavioral items and their operational definitions to ensure objective and consistent recording among both observers. For instance, looking away from the coach had to continue for a few seconds in order to become defined as ‘being distracted during instruction of an exercise’. Additionally, some positive behaviors were transformed into their negative opposites, because the negative behaviors could be detected more objectively (e.g., not performing the exercise as intended). One of the four practice sessions used for final analysis was analyzed by both observers separately to determine the inter-rater reliability. The two observers scored the frequency of occurrence of the behavioral items per player. The participants who attended at least three out of four practice sessions were included in the final analysis, meaning that the behaviors of eight of the 13 players could be analyzed. All procedures were in accordance with the ethical standards of the medical faculty of the University of Groningen.

**Instruments**

**Coach interviews.** The expert coaches were interviewed and asked to describe in detail the practice behaviors of youth soccer players that reflect self-regulation of learning (see also Young & Starkes, 2006a). For the coaches’ understanding and to gather accurate data, self-regulation was described in layman terms. The following probe was read to the coaches:

*This interview focuses on a select few of your soccer players, specifically, those who self-regulate their learning. These are the players who: are good at time-management, think about*
what they need to do to perform successfully at practice and competition, seek feedback of their progress, are willing to expend effort, and are self-efficacious. They reflect upon what they have learnt and upon their strengths and weaknesses. These players’ practice behaviors are best suited to benefit from practice. However, these players are not necessarily the ones who perform best. I will ask you questions about how self-regulation of learning is reflected in practice behaviors and how this is visible during soccer practice.

In order to extend the coaches’ understanding of self-regulated learning theory, a series of open-ended questions was asked following a general-to-specific approach. First, the interviewer provided the coaches the definition of self-regulation of learning during practice (“self-regulation refers to processes by which individuals control their thoughts, feelings and actions during practice”), and coaches were requested to appoint practice behaviors that they thought reflected self-regulation of learning. Thereafter, definitions of the metacognitive and motivational components of self-regulation were given (“metacognition refers to the regulation of a player’s own thoughts during practice”, and “motivation refers to the goals players set for themselves during practice and the effort they are willing to expend to attain these goals”, respectively). Once more, the coaches were asked to describe behaviors that reflected these components of self-regulation of learning.

Assuming that the coaches had become sufficiently familiar with the concept of self-regulation of learning, and as we were particularly interested in the aspects of planning, self-monitoring, evaluation, reflection, effort, and self-efficacy, a series of open-ended questions was then posed as follows:

What practice behaviors do you look for in order to identify a soccer player who shows a lot of planning? Planning is defined as follows: The player plans how he wants to improve his performance, before initiating actions. What may a player who is good or poor at planning do? What may a player who is good or poor at planning say?

The same series of questions was posed for self-monitoring (“The player controls his progress during task performance.”), evaluation (“After task performance, the player evaluates what went right and wrong.”), reflection (“The player thinks about what he has learnt, his strengths and weaknesses, and how he can improve.”), effort (“The player is willing to expend effort in order to successfully execute a task.”), and self-efficacy (“The player believes that he can successfully perform his tasks. This is a player’s judgment of his own abilities.”). When a coach responded ambiguously to a question, he was asked to describe exactly what a player might say or do.

Lastly, the interviewer requested the coaches to describe behaviors indicative of good and poor self-regulation of learning in specific practice contexts, that is, on the pitch before the start of a practice session, during instruction of exercises, and during exercises, respectively. This information was used to check whether coaches had correctly understood the concept of self-regulation of learning.

**Self-regulation scale.** In an attempt to accurately describe behavioral correlates of self-regulation during soccer practice, the behavioral items observed during practice were related to a self-report instrument that measured self-regulation of learning. To this end, the soccer players first completed the Self-Regulation Scale,
which measures dispositional self-regulation as a metacognitive and motivational construct in learning contexts (Toering et al., in press). The 46-item SRS comprises the subscales of planning (8 items), self-monitoring (6 items), evaluation (8 items), reflection (5 items), effort (9 items), and self-efficacy (10 items). A confirmatory factor analysis among 601 adolescents aged 11 to 17 years revealed sufficient reliability and validity (i.e., CFI = .95, NNFI = .94, RMSEA = .060, SRMR = .063, Cronbach’s α = .73-.85; Toering et al., in press).

**Behavioral Observation.** In order to identify behavioral correlates of self-regulation during soccer practice, the 16 behavioral items from the interviews were operationalized into a classification scheme (Table 1). The practice sessions filmed were analyzed by two observers using Noldus Observer XT 8.0 (Noldus Information Technology, 2009). Each behavioral item was scored per player based on frequency, grading one point each time the behavior was displayed. In this way, we took into account whether or not a behavior was shown and how often it was shown. For the item of ‘on time for practice’, however, the scoring differed. The 30 minutes before practice started were divided into six and players received 1/6 of a point extra for every 5 minutes they were on the pitch before the start of practice. Players received one point for being on time plus 1/6 for every five minutes they were on the pitch before practice, meaning that a player coming to the pitch 20 minutes before practice received $1 + 4/6 = 1.67$ points. This scoring method allowed us to differentiate players who came to the pitch early from the ones who arrived relatively late, because normally players at this high level of performance all are on time for practice.

**Data Analysis**

**Coach interviews.** The interviews were transcribed verbatim. Each behavioral item mentioned was categorized into one or more of the self-regulation aspects and as either good or poor self-regulation. Two of the investigators separately analyzed the interviews. Items reflecting the same content were grouped together. Thereafter, the investigators discussed the content of the items and grouped the items they had not agreed upon accordingly. Subsequently, the number of times was counted that each practice behavior perceived by the expert coaches as an example of self-regulation was mentioned.

**Behavioral observation.** The inter-rater reliability was determined in Noldus Observer based on one practice session. In this program, the calculation of Cohen’s Kappa accounts for the kinds of behaviors that are observed and the time at which these behaviors are observed. As the usual calculation of Cohen’s Kappa only accounts for the kind of behavior observed, the computation of Cohen’s Kappa in Noldus Observer is more strict than the usual calculation procedure (Jansen, Wiertz, Meyer, & Noldus, 2003). A Cohen’s Kappa of .85 was found, which is above the criterion of .60, indicating sufficient inter-rater reliability.

Mean scores on each of the six SRS subscales were calculated as well as a total self-regulation score. Furthermore, the scores on each behavioral item were divided by the number of practice sessions each participant attended so that a mean score per player over the practice sessions could be obtained. Thereafter, Spearman correlations were computed between the mean scores of the SRS and the behavioral item scores.
Results
Coach Interviews

The responses to the questions about self-regulation of learning, metacognition, and motivation indicated that the coaches regarded self-regulation of learning as associated with behaviors such as being prepared for practice (e.g., correct outfit, being on time), practicing weak points before practice, asking questions, requesting maximum efforts of themselves and of their teammates, coaching of teammates, engaging in focused practice, and wanting to get the maximum out of those one-and-a-half practice hours. The metacognition component was perceived as the thinking part of self-regulation, while motivation was perceived as the willingness to succeed in soccer, which also influences the thinking part. Although the coaches generally regarded motivation as positive for learning, they believed that metacognition may also have a downside, in that being overly critical may lead to doubt. The part of the interviews asking about specific practice contexts revealed that the coaches seemed to have a clear understanding of the self-regulation concept, as responses were comparable to the ones given in the other parts of the interviews. The following quotes illustrate the coaches’ ideas about self-regulation of learning, metacognition, and motivation:

*Self-regulated players are the guys who want to invest in themselves, who are there, who want to know all, who are eager to practice, and who like to receive feedback. (…). At the start of an exercise he would ask whether the ball should be passed low or through the air, for instance.*

*Metacognition has two directions. A player can be occupied with the tasks of his playing position and then he absolutely has thoughts of when to do this or that, which I find absolutely positive.*

*A truly motivated player not only wants to improve himself. He also wants to help his teammates. This kind of player often tries to coach and to help at the right moment.*

<table>
<thead>
<tr>
<th>Behavioral Item: Coaches’ Perceptions of Good Self-Regulation of Learning</th>
<th>Aspect (N coaches)</th>
<th>Total N</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Verbally approaches coach during instruction</td>
<td>Planning (2) Monitoring (2) Evaluation (1) Effort (2) Self-efficacy (2)</td>
<td>9</td>
<td>The player approaches the coach during instruction (e.g., by raising his hand) and starts talking to him: 0 = no, 1 = yes.</td>
</tr>
<tr>
<td>2. Verbally approaches coach during exercise</td>
<td>Monitoring (4) Effort (2) Self-efficacy (2)</td>
<td>8</td>
<td>The player approaches the coach during an exercise and starts talking to him: 0 = no, 1 = yes.</td>
</tr>
</tbody>
</table>

*Table 1. Behavioral Items, Number of Coaches Who Mentioned the Items per Self-Regulation Aspect, Total Frequency of Occurrence, and Operational Definitions*
<table>
<thead>
<tr>
<th>Behavioral Item: Coaches’ Perceptions of Good Self-Regulation of Learning</th>
<th>Aspect (N coaches)</th>
<th>Total N</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Verbally approaches coach after exercise</td>
<td>Evaluation (4) Reflection (2) Effort (2) Self-efficacy (2)</td>
<td>6</td>
<td>The player approaches the coach after an exercise and starts talking to him: 0 = no, 1 = yes.</td>
</tr>
<tr>
<td>4. Coaching of teammates (with gesture)</td>
<td>Planning (4) Monitoring (1) Reflection (1) Effort (2) Self-efficacy (2)</td>
<td>10</td>
<td>The player coaches his teammate(s) verbally (by shouting corrections, indications or directions) AND uses a gesture: 0 = no, 1 = yes.</td>
</tr>
<tr>
<td>5. Works on improvement of his weak points during the 30 min before start of practice session</td>
<td>Evaluation (3) Reflection (2)</td>
<td>5</td>
<td>The player works on improvement of his weak points. These points are assigned by the coach and are known to the observers (e.g. passing/shooting, left foot, receive ball left foot, right foot): 0 = no, 1 = yes for each point of improvement separately.</td>
</tr>
<tr>
<td>6. Apologizes to teammate(s) for making error</td>
<td>Reflection (1) Effort (1)</td>
<td>2</td>
<td>The player makes an error during an exercise and notices it was his error. Therefore, he apologizes to his teammate(s) using a gesture: 0 = no, 1 = yes.</td>
</tr>
<tr>
<td>7. Number of minutes on pitch before practice session starts</td>
<td>Effort (2)</td>
<td>2</td>
<td>On time: 0 = no, 1 = yes. Plus score for number of minutes player is on pitch before practice session starts: 1/6 = 0-5 min, 1/3 = 5-10 min, 1/2 = 10-15 min, 2/3 = 15-20 min, 5/6 = 20-25 min, and 1 = 25-30 min.</td>
</tr>
<tr>
<td>8. Outfit</td>
<td>Effort (2)</td>
<td>2</td>
<td>Player wears the correct outfit for practice: 0 = no, 1 = yes.</td>
</tr>
<tr>
<td>9. Position in front of line at start exercise</td>
<td>Planning (1)</td>
<td>1</td>
<td>The player is among the first two players in line at the start of an exercise when the exercise allows for it: 0 = no, 1 = yes.</td>
</tr>
<tr>
<td>10. Asking for the ball</td>
<td>Self-efficacy (1)</td>
<td>1</td>
<td>The player shouts for the ball during exercises that allow for it, for instance, during small-sided games or position play: 0 = no, 1 = yes.</td>
</tr>
<tr>
<td>11. Answers questions</td>
<td>Evaluation (2)</td>
<td>2</td>
<td>The player answers questions asked by the coach: 0 = no, 1 = yes.</td>
</tr>
</tbody>
</table>

*Table 1. Behavioral Items, Number of Coaches Who Mentioned the Items per Self-Regulation Aspect, Total Frequency of Occurrence, and Operational Definitions*
The coaches described 27 behaviors when asked about the six self-regulation aspects, 16 of which were objectively visible behaviors. Only the visible behaviors were included in the observation part of this study, because the sensitivity of the microphones did not allow us to reliably obtain auditory information during video observation.

There were four single-mentioned items, that is, items mentioned by one expert coach, and 12 multiple-mentioned items. The 16 visible behavioral items are listed in Table 1, with numbers 1 to 11 as good self-regulation behaviors and numbers 12 to 16 as poor self-regulation behaviors. First, the behavioral items regarded as good self-regulation behaviors will be discussed, thereafter the behaviors perceived as indicative of poor self-regulation will be described.

The expert coaches linked several behaviors to more than one self-regulation of learning aspect. “Verbally approaching the coach during instruction”, for instance, was regarded as an example of planning, self-monitoring, evaluation, effort, and self-efficacy. “Verbally approaching the coach during and after exercises” and “coaching of teammates (with gesture)” were perceived as expressions of several self-regulation aspects.

<table>
<thead>
<tr>
<th>Behavioral Item: Coaches’ Perceptions of Poor Self-Regulation of Learning</th>
<th>Aspect (N coaches)</th>
<th>Total N</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Is distracted during instruction of an exercise</td>
<td>Planning (2)</td>
<td>5</td>
<td>The player does not pay attention to the coach during instruction. He does not look at the coach or the coach’s gestures, but looks around: 0 = no, 1 = yes.</td>
</tr>
<tr>
<td>13. Excessive behavior</td>
<td>Effort (2)</td>
<td>2</td>
<td>The player displays excessive behavior, which is defined as non-disciplinary behavior. For instance, the player kicks balls off the pitch in between exercises or frolics with teammates: 0 = no, 1 = yes.</td>
</tr>
<tr>
<td>14. Not watching teammates performing exercise while waiting for his turn</td>
<td>Planning (1)</td>
<td>1</td>
<td>During an exercise, the player is in line waiting for his turn. However, he is not watching his teammates performing the exercise: 0 = watching, 1 = not watching.</td>
</tr>
<tr>
<td>15. Not performing exercise as intended</td>
<td>Effort (3) Self-efficacy (1)</td>
<td>4</td>
<td>The player does not perform the exercise as he is supposed to do. For instance, he takes a short-cut by not going around the cones: 0 = performs as supposed to, 1 = does not perform as supposed to.</td>
</tr>
<tr>
<td>16. Makes error during exercise</td>
<td>Monitoring (1)</td>
<td>1</td>
<td>The player makes an error during an exercise, for instance, passing the ball to the wrong player: 0 = no, 1 = yes.</td>
</tr>
</tbody>
</table>

Table 1. Behavioral Items, Number of Coaches Who Mentioned the Items per Self-Regulation Aspect, Total Frequency of Occurrence, and Operational Definitions
as well. These behaviors were also the most frequently mentioned by the coaches (i.e., 9, 8, 6, and 10 times, respectively; Table 1). These results are in accordance with the coaches’ responses to the more general questions about self-regulation of learning, metacognition, and motivation, in that they frequently mentioned asking questions and coaching of teammates as indicative of these concepts. “Asking questions”, for instance, was regarded as indicative of self-regulation, because coaches thought that it is important that players find out why they do certain things wrong and try to do these things differently. Asking the coach may provide players with the information they need, and this was regarded as an important feature of several self-regulated learning aspects. The following quote illustrates the coaches’ ideas:

They ask many questions. Such as, ‘if I do this, then it may be easier’. Or ‘I often do this during a match, is it right or wrong?’. They are open to critique. They want to learn.

Coaches perceived “coaching of teammates” as a way of directing or stimulating teammates. “Coaching of teammates” was, for example, regarded as a self-efficacy aspect of self-regulation, in that players with high self-efficacy beliefs were suggested to be more confident to direct or stimulate others. One of the coaches indicated: “I believe that confident players direct their teammates in a positive way”.

The expert coaches perceived “working on improvement of weak points before practice” as an example of the evaluation and reflection aspects of self-regulation of learning. They explained that players who try to improve their weak points before practice are the ones who are able to indicate which performance aspects they must improve and which aspects they are in control of. These players were assumed to have a correct self-image and to know that they are not at an optimal performance level yet. A coach indicated that “some of my players are already well able to indicate which things they are in control of and which aspects need improvement. You see those guys working on their weak points. They want to do this for their own sake, not because the coach wants them to.” The coaches stated that they notice that these players make progress because of extra practice. As one coach pointed out: “Before practice they are occupied with the ball. These are the guys who make the biggest steps. They are not necessarily the best players, but they make the most progress.”

“Apologizing to teammates for making an error” was perceived as an example of reflection by one coach, who indicated that players displaying this behavior are aware of their actions and the effects of their actions, and take responsibility. He pointed out that it is easy to blame a teammate for a poor pass, but that players who reflect on their performance know when they make an error and take responsibility. Another coach regarded this behavioral item as an expression of effort. He stated that players who show this kind of behavior have a critical attitude towards themselves and they are tremendously motivated to improve the aspects of their performance that need improvement.

“On time for practice” and “wearing the right outfit” were regarded as expressions of effort. Both behaviors were perceived as basic expressions of the willingness to invest maximal effort in practice. “Players’ position in the front part of the line at the start of an exercise” was mentioned as an example of planning. One of the coaches thought that planning was related to taking initiative, meaning that “being in the front part of the line when an exercise starts” was supposed to be an
One coach assumed that “asking for the ball” was an expression of self-efficacy. Players who frequently ask for the ball were supposed to play with confidence, even if they make an error. They were perceived as players who always want the ball, even when playing poor. “Answering questions” was perceived by one coach as an example of evaluation. He pointed out that players who evaluate their performance answer questions by the coach in a substantive manner. Players who evaluate were supposed to not just answer questions affirmative or negative.

Several behaviors were thought to be associated with concentration, which was perceived as an expression of planning and effort. One of these behaviors was “being distracted during instruction of an exercise”. The coaches pointed out that they perceived players who listen carefully to the coach’s instructions as being focused. Thus, “being distracted during instruction” was regarded as a form of poor planning. They also indicated that players who put maximal efforts into practice are the ones who are focused and who are not easily distracted. “Being distracted during instruction of an exercise” was, therefore, perceived as indicative of investing lower levels of effort into practice as well. Additionally, “excessive behavior” was thought to be indicative of unfocused practice and, therefore, of lowered levels of effort. By excessive behavior the coaches meant behaviors such as frolicking with teammates during practice or kicking balls off the pitch in between exercises. Another coach perceived “not watching teammates performing and exercise while waiting in line” as an example of poor planning. He indicated that players good at planning are concentrated and carefully watch their teammates performing exercises: “They look carefully at an exercise. You see them thinking and checking in their minds while they wait for their turn. During a passing exercise, like “all right, the ball should go there and there.” It can be argued that the coach is speaking of observational learning, which has been investigated in relationship with self-regulation of learning in previous research (e.g., Kitsantas, Zimmerman, & Cleary, 2000).

The expert coaches appointed “not performing the exercise as intended” as an example of maladaptive motivational patterns, that is, lowered effort and self-efficacy levels. They regarded correct performance of exercises as very important in players’ learning process, which does not mean that exercises have to be performed perfectly. However, the player’s intention should be to perform exercises completely and not to take the easy way. The coaches also indicated that players should always execute exercises as intended, not just when they notice that the coach is watching. One coach mentioned this behavioral item as indicative of self-efficacy. He stated that players who do not perform the exercises as intended may make decisions that are not in accordance with their qualities. It was suggested that these players may have an unrealistic self-image, meaning that they perform actions they are not (yet) able to perform, which the following quote is intended to exemplify:

These guys have a good and realistic self-image. There are guys who, for instance during match play, try to give a cross pass while they don’t have the qualities to do so, which means losing ball possession each time. I don’t think that’s an example of a correct self-image. You must know what your qualities are and become the best at the things you are able to.
"Making errors during an exercise" was mentioned as indicative of poor self-monitoring by one coach. He stated that players who self-monitor well process directions given by the coach in an adaptive way, which means that they do not make many mistakes. Players who self-monitor poorly were thought to make more errors and more same-kind errors. The coach indicated: "I would watch how they execute exercises. And whether they try things differently when they make an error. So I would look at whether they make many same-kind errors."

In summary, the expert coaches mostly mentioned verbal approach behaviors, coaching of teammates, and behaviors referring to focused practice as expressions of self-regulation of learning. Furthermore, some behaviors were perceived to reflect several self-regulated learning aspects. We must observe the behavioral items mentioned by the coaches and link these with an instrument measuring self-regulation of learning in order to identify behavioral correlates of self-regulated learning during soccer practice. To this end, the second part of the present study examined whether the behaviors observed during practice and players’ self-assessed self-regulation of learning scores were related.

### Behavioral Item: Coaches’ Perceptions of Good Self-Regulation of Learning

<table>
<thead>
<tr>
<th>Behavioral Item</th>
<th>M (SD)</th>
<th>Range of Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Verbally approaches coach during instruction</td>
<td>0.88 (1.25)</td>
<td>0.00 – 3.00</td>
</tr>
<tr>
<td>2. Verbally approaches coach during exercise</td>
<td>0.38 (0.74)</td>
<td>0.00 – 2.00</td>
</tr>
<tr>
<td>3. Verbally approaches coach after exercise</td>
<td>0.38 (0.52)</td>
<td>0.00 – 1.00</td>
</tr>
<tr>
<td>4. Coaching of teammates (with gesture)</td>
<td>21.25 (15.77)</td>
<td>9.00 – 53.00</td>
</tr>
<tr>
<td>5. Works on improvement of his weak points during the 30 min before start of practice session</td>
<td>2.63 (0.74)</td>
<td>2.00 – 4.00</td>
</tr>
<tr>
<td>6. Apologizes to teammate(s) for making error</td>
<td>0.50 (0.53)</td>
<td>0.00 – 1.00</td>
</tr>
<tr>
<td>7. Number of minutes on pitch before practice session starts</td>
<td>1.36 (0.10)</td>
<td>1.22 – 1.50</td>
</tr>
<tr>
<td>8. Outfit</td>
<td>1.00 (0.00)</td>
<td>1.00 – 1.00</td>
</tr>
<tr>
<td>9. Position in front of line at start exercise</td>
<td>1.50 (1.20)</td>
<td>0.00 – 3.00</td>
</tr>
<tr>
<td>10. Asking for the ball</td>
<td>10.63 (0.33)</td>
<td>3.00 – 24.00</td>
</tr>
<tr>
<td>11. Answers questions</td>
<td>3.75 (2.60)</td>
<td>0.00 – 7.00</td>
</tr>
</tbody>
</table>

### Behavioral Item: Coaches’ Perceptions of Poor Self-Regulation of Learning

<table>
<thead>
<tr>
<th>Behavioral Item</th>
<th>M (SD)</th>
<th>Range of Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. Is distracted during instruction of an exercise</td>
<td>20.13 (8.36)</td>
<td>9.00 – 30.00</td>
</tr>
<tr>
<td>13. Excessive behavior</td>
<td>0.50 (0.76)</td>
<td>0.00 – 2.00</td>
</tr>
<tr>
<td>14. Not watching teammates performing exercise while waiting for his turn</td>
<td>4.00 (2.33)</td>
<td>1.00 – 7.00</td>
</tr>
<tr>
<td>15. Not performing exercise as intended</td>
<td>2.63 (5.29)</td>
<td>0.00 – 15.00</td>
</tr>
<tr>
<td>16. Makes error during exercise</td>
<td>1.75 (1.16)</td>
<td>0.00 – 4.00</td>
</tr>
</tbody>
</table>

*Table 2.* Mean Scores, Standard Deviations, and Range of Scores for each Behavioral Item per Practice Session.
Behavioral Observation

The mean scores, standard deviations, and range of scores for each behavioral item over the four practice sessions are presented in Table 2. The self-regulation practice behavior displayed the most was “coaching teammates (with gesture)”, whereas “verbally approach the coach during and after exercises” appeared the least (Table 2).

Table 3 shows the significant Spearman correlations between the questionnaire scores and the scores on the behavioral items. Results revealed that the total self-regulation score was positively associated with “verbal approach behaviors”, “coaching of teammates (with gesture)”, and “answering questions”.

<table>
<thead>
<tr>
<th></th>
<th>Planning</th>
<th>Self-Monitoring</th>
<th>Evaluation</th>
<th>Reflection</th>
<th>Effort</th>
<th>Self-Efficacy</th>
<th>Self-Regulation Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbally approaches coach during instruction</td>
<td></td>
<td></td>
<td>.87a</td>
<td></td>
<td></td>
<td></td>
<td>.67b</td>
</tr>
<tr>
<td>Verbally approaches coach during exercise</td>
<td></td>
<td></td>
<td>.74a</td>
<td></td>
<td></td>
<td></td>
<td>.73a</td>
</tr>
<tr>
<td>Coaching of teammates (with gesture)</td>
<td>.93a</td>
<td></td>
<td>.75a</td>
<td>.76a</td>
<td></td>
<td>.83a</td>
<td></td>
</tr>
<tr>
<td>Answers questions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.64b</td>
</tr>
<tr>
<td>Apologizes to teammate for making error</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asking for the ball</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.64b</td>
</tr>
<tr>
<td>Makes error during exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.66b</td>
</tr>
<tr>
<td>Not performing exercise as intended</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.83a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excessive behavior</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.72a</td>
<td>-.73a</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Significant Spearman Correlations between SRS subscales and Scores on Behavioral Items provided by Expert Coaches

a $P < .05$  b $P < .10$
Discussion

The purpose of this study was to measure behavioral correlates of self-regulation in elite youth soccer players. First, behavioral items regarded as indicative of good and poor self-regulation were identified by interviewing six expert youth soccer coaches. The expert coaches associated the behavioral items with several self-regulation aspects and mostly mentioned verbal approach behaviors, coaching of teammates, and behaviors referring to focused practice as expressions of self-regulation of learning. Second, the behaviors mentioned by the coaches were observed using video-taped practice sessions of elite youth soccer players. Third, players completed the SRS which measures self-regulation of learning. The SRS scores were combined with behavioral observation in order to describe behavioral correlates of self-regulation. Self-regulation of learning as reported by the players seemed to be associated with behaviors referring to providing and receiving information, and focused practice. The results of the coach interviews will be discussed first, followed by a discussion of behavioral correlates and a general discussion.

Coach Interviews

Generally, the expert coaches perceived practice behaviors that reflected a proactive approach to learning as indicative of self-regulation of learning. Self-regulated players were assumed to display behaviors which indicated that they create optimal learning conditions, are aware of their abilities and disabilities, assume responsibility and initiative, are focused, and are prepared for practice. These results appear to be in accordance with self-regulated learning theory, in that self-regulated learners are thought to proactively approach their learning tasks and to display personal initiative, perseverance, and adaptive skills that stem from facilitative metacognitive strategies and motivational beliefs (e.g., Zimmerman, 2006, 2008).

The coaches’ responses to the interviews were in accordance with findings of previous qualitative studies in youth soccer. Holt and Dunn (2004) found that commitment, resilience, discipline, and social support were factors facilitating progression in academy youth soccer. In line with our results, the subcategories of personal responsibility, determination to succeed, career planning, and openness to criticism were mentioned. A more recent study among expert coaches of rugby union, soccer, and rugby league teams also mirrored our interview results (Oliver, Hardy, & Markland, 2010). Several behaviors found in the current study replicated the ones found by Oliver et al., such as “being on time”, “being prepared with the correct kit for training”, “admitting to errors”, “doing extra work to improve”, “working hard, not taking the easy way”, “asking questions”, “answering questions”, “being attentive during instruction”, and “no messing around”.

Several behaviors were regarded as an expression of more than one self-regulation aspect (see Table 1). These behaviors were also mentioned in the first part of the interviews in which the coaches were asked to appoint behaviors indicative of self-regulated learning, metacognition and motivation. This result confirms other research on self-regulated learning that also revealed that different aspects of self-regulation are related (e.g., Cleary & Zimmerman, 2001; Kitsantas & Zimmerman, 2002).
Note that, although the responses to the interviews seemed to indicate that self-regulated players show a proactive approach to learning, one could ask how many of the self-regulation behaviors indeed are intrinsically regulated. There are several behaviors that players may show because they are aware that the coach appreciates them. The high level the soccer players in the current study play at brings about that these players have two goals: to make progress towards becoming a professional and to become selected for the next match or next season. Obeying the coach or showing the behaviors a coach appreciates may become a goal in itself in order to become selected and being selected is important to make progress. Thus, behaviors perceived by the coach as indicative of self-regulation can then become extrinsically regulated, in that players are motivated by the extrinsic reward of becoming selected by the coach. As a consequence, some behaviors that were identified during the interviews may, in addition to an intrinsic, self-regulation component, contain an extrinsic, other-regulated component. It is possible, for instance, that players make sure that they are in the front part of the line, because they know that the coach pays attention to this kind of behavior. Furthermore, players may frequently ask for the ball to get noticed by the coach, not necessarily because they are confident. Findings by Holt and Dunn (2004) and Oliver et al. (2010) support this view. Besides love of the game and determination to succeed, obeying orders and production (i.e., effective performance in competition) were mentioned as subcategories of the conforming dedication that was perceived as important for progression in youth soccer (Holt & Dunn, 2004).

The coaches seem to some extent neglect the fact that self-regulation of learning is individually determined. Behaviors such as “not looking at the coach during instruction” or “not watching teammates performing an exercise” do not necessarily mean that players are unfocused. One can also pay attention when only listening and not watching others could also mean that a player is focused on himself, preparing for the actions he is supposed to execute when it is his turn. Additionally, “being in the front part of the line at the start of an exercise” could mean that a player is merely enthusiastic instead of planning to learn. Although all this means that the perceptions of the coaches may not be accurate, the coach is the person who decides on playing formations and which players stay in the talent program. This means that coaches’ perceptions of behavior are crucial, whether accurate or inaccurate. We therefore recommend that coaches be made fully aware that behaviors can be interpreted in different ways.

Behavioral Correlates
The total self-regulation of learning score seemed mostly associated with “coaching of teammates (with gesture)”. Self-regulation of learning involves that players try to benefit maximally from practice and competition, which means that they pursue high-quality practice. Given that soccer is a team sport, performing well and thus practicing at a high level includes helping teammates in order to improve team and individual performance. It has been suggested that the dynamic nature of soccer holds that players must continuously adapt to changes from macro- to microstates of play (i.e., broad vs. narrow attention) and balance their defensive and offensive responsibilities (Williams &
Players can use peripheral vision in the 180-degree visual field in front of them, but they cannot easily detect what is going on behind their back without turning to look (Jordet, 2005). Coaching of teammates improves team performance by making teammates aware of task-relevant information (e.g., Eccles & Tenenbaum, 2007; Williams, Davids, & Williams, 1999).

An alternative explanation for the link found between self-regulation of learning and coaching behavior may be that players who coach their teammates a lot are the ones that are better skilled. These players’ soccer skills may provide them relatively more time to look around and direct or correct other players. As highly skilled players typically need less attention to perform their tasks relatively automatically, they can focus on environmental information and the outcome of a skilled action (e.g., Abernethy, Maxwell, Masters, Van der Kamp, & Jackson, 2007). This may also be an explanation for the (negative) link that was found between effort scores and “asking for the ball”, as better skilled players may report lower effort scores because of their higher abilities. It may be that they are able to create space for themselves more frequently to receive the ball, which means that they can more often ask for the ball. Future research should gain more insight in coaching of teammates and its relationship with self-regulated learning and soccer performance.

Although the total self-regulation score was related to “verbally approaching the coach during instruction and during exercises”, the aspect of evaluation seemed to underlie this relationship. “Verbally approaching the coach during instruction or exercises” mostly meant that the players asked questions. Approaching others to ask questions has been considered a strong metacognitive strategy involved in seeking help (Karabenick & Newman, 2009; Kitsantas, Winsler, & Huie, 2008). The relationship between self-regulated learning and help-seeking behaviors has been found in the academic context as well (Karabenick & Knapp, 1991; Kitsantas et al., 2008). Karabenick and Knapp (1991) showed that the more self-regulated learners were, the more they were likely to seek help when needed. Our results supported this idea: the higher the total self-regulation scores, the more questions players asked. Players scoring high on evaluation specifically asked more questions during instruction and during exercises. It is suggested that these players check whether they understand the coach’s instruction and whether they perform the exercises correctly, and that they ask questions when they notice things are unclear to them. However, as pointed out by Karabenick and Newman, (2009; p.30), just knowing whether learners have sought help, without additional information, is insufficient to understand the adaptive significance of the behavior. This was also stated in the current study by one of the expert coaches, who indicated that, “players should not ask unnecessary questions, because those players are considered to have low levels of confidence or not to attend to what was explained.” With respect to “answering questions” it should also be taken into account whether the answers given were substantive. Future research should, therefore, address the questions asked and the answers given in order to make the link with self-regulated learning more explicit.

“Making errors” during an exercise was negatively related to the total self-regulation of learning score reported by the players.
themselves, meaning that players high on self-regulation made relatively few mistakes. Players who self-regulate their learning well are supposed to aim at gaining the most out of practice and competition, which implies that they are focused during practice and competition. Consequently, one would expect players who report high levels of self-regulation to make relatively few errors during practice. This result seems to support deliberate practice theory, which indicates that many years of sustained, focused practice are necessary to reach expert levels of performance (e.g., Ericsson, Krampe, & Tesch-Römer, 1993; Ford et al., 2009; Helsen et al., 1998). However, players who scored high on self-regulation of learning may also seek out easier tasks or make decisions involving easier and safer options. They may have self-images that are more correct, causing them to take options that fit their abilities. Another explanation may be that players pick easier and safer options to make sure they will be selected for the next match, because they believe that making errors could mean that the coach will not select them. To find out the why behind certain behaviors, an implication for further research is to interview individual players while watching video-taped practice sessions and ask them why they displayed these behaviors. As the coaches pointed out in the interviews, it seems particularly important how players cope with making errors.

Reflection scores were associated with "apologizing to teammates after an error". Reflection has been suggested to be a process central to learning, because it is the process by which players translate thought into action (Ertmer & Newby, 1996). Players who reflect upon their actions are supposed to know when they make errors and take responsibility, which enables them to learn. The link between reflection scores and apologizing to teammates after making an error seems to support this idea and it may support the suggestion made in previous studies that high-level players may learn more effectively than lower level players through reflective thinking (Toering et al., 2009a, 2009b).

**General Discussion**

Overall, the expert coaches’ view was supported by the relationships found between behavioral items and the scores that the players obtained on the self-report instrument. Some behavioral items thought by the coaches to reflect certain self-regulated learning aspects, appeared to be associated with other self-regulation aspects as reported by individual players. Although the interviews were structured with the intention to provide coaches a clear understanding of the self-regulated learning concept, it remains possible that their understanding of the concept differed. However, the coaches’ responses largely overlapped findings of previous studies on talent development in sport (e.g., Holt & Dunn, 2004; Oliver et al., 2010). Because of the major role coaches play in soccer and in other sports, we recommend that practitioners and researchers be aware that players’ and coaches’ interpretations of behavior may differ.

It is possible that certain behaviors indicative of self-regulation of learning were not mentioned by the coaches. Although the coach interviews formed a rich data set, interviews with individual soccer players may provide additional information and further reduce the chance that behavioral items were excluded. Future research should address this issue. Moreover, further research should take into account that practice
sessions differ in the extent to which certain behaviors can be displayed. Coaching behavior may, for instance, be more prominent during practice sessions that are focused on tactical training than during sessions that are focused on endurance or sprinting capacity.

In conclusion, this study examined behavioral correlates of self-regulation of learning within the practice context among elite youth soccer players. Six expert youth soccer coaches provided behavioral items they regarded as indicative of good and poor self-regulation. These behaviors were observed during practice and linked with self-regulated learning scores on a questionnaire in order to describe behavioral correlates of self-regulation among elite youth soccer players. The expert coaches most frequently mentioned verbal approach behaviors, coaching of teammates, and behaviors referring to focused practice as expressions of self-regulation of learning. Results also showed that coaches' and players' perspectives on self-regulated learning differ, which researchers and practitioners should be aware of. Self-regulation of learning as reported by the players seemed to be associated with behaviors referring to providing and receiving information, and being focused during practice, which is in accordance with self-regulated learning theory. Taken together, the results of the present study emphasize that self-regulation of learning is reflected in taking responsibility for learning. The study indicates that the practice environment (i.e., coaches, teammates) should be taken into account when investigating youth soccer players’ learning and development. Furthermore, it highlights the importance of measuring overt behavior to gain a complete impression of players’ self-regulated learning skills.

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