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**Article Title:** An Investigation of Attentional Foci and their Temporal Patterns: A Naturalistic Study in Expert Figure Skaters

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Abstract

This study aimed to explore attentional foci and their temporal patterns in expert skaters in real competition situations. Individual self-confrontation interviews were held with 8 expert figure skaters while they watched their videotaped program performed in official competitions. Qualitative data analysis revealed that skaters used a substantial number of foci, which were classified by content and characteristics. Event listing was used to display the patterns of foci over time, revealing that skaters used distinct processes to prepare for, perform, and evaluate different program elements. These results highlighted the great flexibility and variability of attentional focus, according to circumstantial factors.
Magill (2003) defines attentional focus as “the directing of attention to specific characteristics in a performance environment or to action-preparation activities” (p. 149). In sport psychology, researchers have focused on the effectiveness of different types of attentional focus. Broadening the perspective on this issue, studies on choking under pressure (Hill, Hanton, Matthews, & Flemming, 2009) have given rise to a number of explanatory theories (e.g., Beilock & Carr, 2001; Gucciardi & Dimmock, 2008; Masters & Maxwell, 2004) of how attentional focus disruptions can significantly hinder performance.

To address these issues, most studies have used an experimental approach to compare the effects of various types of attentional focus on performance involving simple motor tasks or decontextualized sport tasks (e.g., simulated skiing, golf putting). Experimental approaches generally have two main features: The perspective is (a) dichotomous and (b) static. A dichotomous perspective places types of focus in opposition: internal and external (Nideffer & Sagal, 1998; Stevinson & Biddle, 1999; Wulf & Prinz, 2001), broad and narrow (Nideffer & Sagal, 1998), proximal and distal (Bell & Hardy, 2009), or associative and dissociative (Morgan & Pollack, 1977; Schomer, 1987; Stevinson & Biddle, 1999). In the static perspective, a single focus is associated with a discrete action. This focus is imposed by experimental conditions without considering either the preceding or succeeding foci.

Recently, some alternate approaches have shed new light on attentional focus processes in athletes, notably by examining attentional focus in natural performance situations (Oudejans, Kuijpers, Kooijman, & Bakker, 2011). Experimental studies that oppose two focus types have produced inconsistent results (Bell & Hardy, 2009; Salmon, Hanneman, & Harwood, 2010). Some authors claim that this dichotomous perspective could limit our understanding of how athletes use attentional focus in natural performance situations (Bernier, Codron, Thienot, & Fournier, 2011; Salmon et al., 2010). To explore how expert golfers use attentional focus in natural situations, Bernier et al. (2011) conducted self-
confrontation interviews with eight professional golfers based on a video of their playing in two conditions: (a) during a training session and (b) during a competition. They inductively analyzed the collected qualitative data in order to precisely classify the attentional foci used by the golfers in natural situations. Foci were categorized by content, or the object of the golfer’s attentional foci (i.e., process, result, psychological state, and environment), and by characteristics, or how the golfer attends to the object (i.e., sense: visual, kinesthetic or auditory; reality: real or imagined; and deliberateness: deliberate or spontaneous), thereby complementing previously proposed dichotomies.

A few recent studies have also questioned the static perspective of experimental studies. Hutchinson and Tenenbaum (2007) showed that the attentional foci adopted by athletes during long-duration tasks (i.e., isometric handgrip task and stationary cycling task) varied between a dissociative mode (i.e., focusing on task-unrelated objects, such as distractions) and an associative mode (i.e., focusing on task-related objects, such as bodily sensations) according to task intensity. In high-intensity effort, participants centered predominantly on associative attentional foci.

Similarly, Bernier et al. (2011) identified series of attentional foci in expert golfers, highlighting the dynamics at play. Golfers apparently prepared for a same action by concentrating successively on different content types according to different characteristics. Some authors therefore contend that attentional focus includes a temporal dimension (Bernier et al., 2011; Salmon et al., 2010). This perspective departs from that of experimental studies that have assessed the effectiveness of a single type of attentional focus (e.g., internal vs. external) while ignoring the time dimension, or the precise time when the participant focuses on the point (e.g., before, during, or after the movement). This temporal approach has recently been adopted to study other topics in sport psychology. For instance, one research stream examines temporal patterns of athletes’ emotions during competition to better
understand these complex emotional states and their dynamics (Cerin, Szabo, Hunt, & Williams, 2000). More recently, the analysis of temporal patterns has expanded to include psychological response (Mellalieu, Hanton, & Shearer, 2008) and performance-related experience (Nieuwenhuys, Hanin, & Bakker, 2008) using data displays, as proposed by Miles and Huberman (1994). For example, Mellalieu et al. (2008) used composite sequence analysis to examine sequences of cognitions, affects, and behaviors over time in pre-competitive and competitive situations. They found temporal patterns in the psychological responses of elite rugby players across pre-competitive phases.

The aim of the present study was to explore attentional foci in expert skaters in natural performance situations. In order to progress the study of attentional foci, we used a naturalistic paradigm (Lincoln & Guba, 1985), consisting of observing the research topic directly (in this case, attentional focus), in a natural setting (in this case, a high stakes competition in a sport with specific features, namely figure skating), and considering the individual’s perspective (in this study, the expert skater). In this paradigm, we applied the two recent approaches which proved pertinent in previous work: the non-dichotomous framework proposed by Bernier et al. (2011), distinguishing content and characteristics of attentional foci, and the temporal patterning recently used to examine the psychological response patterns of sport performers in situ (Mellalieu et al., 2008; Nieuwenhuys et al., 2008). Different qualitative methods (i.e., self-confrontation interviews, inductive and deductive meaning-unit coding, and visual techniques for qualitative data display) were used to achieve this objective. Taking into account the methodology used, we expected to obtain rich and unique data regarding content, characteristics and temporal patterns of attentional foci.
Method

Participants

The participants were eight expert figure skaters (four men, four women) volunteered to participate in this study. They ranged in age from 17 to 23 years ($M = 20.75, SD = 1.79$) and had from 12 to 19 years of experience practicing figure skating ($M = 15.75, SD = 2.11$). Participants therefore met one of the criteria for “expert” skater (10 years of practice), as defined by Ericsson, Krampe, and Tesch-Römer (1993). Moreover, elite skaters with advanced expertise were recruited using the following criteria: (a) at the time of the study, skaters must have placed among the top three in national senior or junior championships in the present or previous year; and/or (b) skaters must have previously competed in at least two international competitions registered by the International Skating Union (e.g., the Olympics; the World, European, or Four Continent Championships; the Grand Prix). The 30 skaters who met these criteria were contacted by email through their national federation. Of the contacted skaters, eight replied that they were willing to participate and were subsequently given more detailed information about the conditions for participating. All participants signed a consent form validated by an ethics committee, and anonymity and confidentiality were assured.

Data Collection

Depending on the availability of the skater, individual self-confrontation interviews (Trudel, Haughian, & Gilbert, 1996; von Cranach & Harré, 1982) were held with each skater 1 to 6 hr after completing their long program. They were encouraged to recall all the attentional foci of which they were aware while performing. Skaters were confronted with a video of their long program, performed a few hours previously at a high stakes competition (i.e., a national championship or national event that counted toward inclusion on the Olympic team). While the skater and the researcher watched the video together, the skaters were asked
to recall and describe each attentional focus at the precise time they had concentrated on it in the program, lasting 4 min for women and 4.5 min for men, and during the 2 min preceding the program (i.e., announcement of the previous skater’s score, introduction of the present skater, and assuming the starting position). A semi-directed interview guide was designed and validated by a team of experienced qualitative researchers and subsequently approved by the ethics committee. It included questions such as, “What were you thinking about at this point?” and “What were you concentrating on at this particular moment?” Probes were used to determine whether the attentional foci mentioned by the skaters had actually been experienced at the precise moment stated (e.g., “Is that what you were really thinking about at this point?”, “Were you really focusing on that at this point?”). However, when the skaters said that there was no focus at that point, the interviewer did not pursue the issue.

Interviews lasted from 50 to 75 min and were recorded on a MacBook Pro (Mac OS 10.5) using a built-in iSight camera, and the same computer was used to watch the long program, which was filmed from the stands. Camtasia screenshot and editing software (TechSmith, 2010) was used to produce a film of the self-confrontation interview, in which the interview film and the watched program film were shown side-by-side.

**Data Analysis**

The video analysis software SportsCode Elite (Sportstec, 2010) was used to perform all the following analysis steps. The first step was to identify the meaning units (MUs), corresponding to the skaters’ attentional foci, from the interviews. We created instances in the timeline of the film of the self-confrontation interview. Each instance corresponded to the skater’s comment about a single attentional focus. In the second step, MUs were compared and grouped by similarity into categories and subcategories (Patton, 2002). Using multiple coding, each instance (i.e., each MU) was coded by content and characteristics. The number
of occurrences and the frequency of each category and subcategory of content and characteristics were then obtained. In the third step, temporal patterns of attentional foci were characterized using visual techniques for qualitative data display (Miles & Huberman, 1994; Onwuegbuzie & Dickinson, 2008) to reveal temporal order relationships between MUs. Of the time-ordered displays proposed by Miles and Huberman (1994), event listing appeared to be the most appropriate for analyzing the data and presenting the results: Sequences of concrete events are organized into a matrix by temporal order (Miles & Huberman, 1994). Accordingly, temporal patterns of attentional foci were represented as schemes made up of boxes connected by arrows to depict the temporal order. Each box contained one MU, or an attentional focus, with its content and characteristics. Thus represented and analyzed, the MUs revealed distinct attentional focus patterns.

This qualitative data analysis was both deductive and inductive. It was deductive in that some steps were based on Bernier et al.’s (2011) framework: Develop an interview guide, conduct interviews, and code them for content and characteristics. The complementary inductive analysis enriched the results by identifying new categories and findings concerning temporal patterns of attentional foci.

**Validity and Trustworthiness**

The validity and trustworthiness criteria for the qualitative methods, as defined by Lincoln and Guba (1985), were taken into consideration. As suggested by Sparkes and Smith (2009), these criteria were adapted to the specific context of this study. The prolonged engagement of the interviewer (first author) strengthened the study’s credibility: She spent many days observing the participants in natural situations, and had previously gathered extensive background information on the sport, including regulatory, socioeconomic, and cultural aspects. She also had in-depth knowledge of the sport, thanks to her experience
implementing a sport psychology intervention during a competitive skating season. The construction of a representative sample (expert skaters) also enhances the transferability of the results. Dependability was verified by an inquiry audit conducted by two researchers (i.e., the second and fourth authors), who controlled and validated the procedure at each step. These two researchers had extensive experience in qualitative research in sport psychology, as well as several years’ experience implementing psychological skills training interventions with skaters. Regular meetings among all the researchers were held to discuss each protocol step: development of the guide, results analysis, and results interpretation. Confirmability was addressed by using standardized technological tools that improved the quality of the procedure, including an interview guide, Camtasia video recording, direct MU identification, and coding using SportsCode Elite.

Moreover, the use of video in this retrospective method improves the data collection process. Even though the amount of time between program completion and the interview varied from 1 to 6 hr, the quantity and accuracy of the data collected on each skater were not influenced by this large variation in time. It appeared that the video prevented missing data due to the 6-hour delay that sometimes occurred between the performance and the retrospective interview. Skater 2, recalling her performance 6 hr later, mentioned that the video helped her remember all the foci: “Without the video, I would have forgotten a lot of things. It makes me remember everything in detail.”

Once the analysis was completed, an independent researcher (i.e., the third author) coded the data to enhance the results validity. This researcher works in the area of sport psychology, and has previously conducted qualitative research. Using the analysis grid developed by the three other authors after the coding, the independent researcher conducted a second coding on a sample of MUs equivalent to 20% of the total MUs randomly selected from the eight interviews. Intercoder agreement between the first coding and the independent
coding was assessed with the Kappa index (Cohen, 1960). MacKappa software (Watkins, 2002) was used to calculate the overall coefficients and test the significance of agreement between the two codings using the Fleiss (1981) formula. The Kappa index for coding content and the four characteristics showed good intercoder agreement (see Figure 1). These results support the trustworthiness of the coding procedure.

Results

A total of 680 MUs were identified from the data analysis. The content data are first presented, followed by the data on characteristics. Temporal patterns of attentional foci are then identified.

Content of Attentional Foci

The content data are organized into four categories: (a) movement, (b) psychological state, (c) environment, and (d) result (see Figure 1).

Movement. The first category, movement, refers to all the content involved in accomplishing the movements that made up the elements in the skater’s program. In other words, it comprised all the attentional foci on the motor actions produced by the skater during the program. This category was the most represented, accounting for 62% of the content of skaters’ attentional foci. Skaters focused on technical, physical, or artistic aspects.

Technical aspects of movement. The content of these foci included all the technical elements such as body position or a segment of the movement: “Here I’m thinking about picking up speed” (skater 5), “Here I’m concentrating on my left arm: I have to draw it back quickly” (skater 3), and “Here I’m feeling that I wasn’t straight” (skater 3). These content aspects were the most represented, accounting for 43% of all MUs.

Physical aspects of movement. Skaters focused on physiological sensations related to the effort required to accomplish a task: “I started getting pains in my legs” (skater 8) and
“Here, in terms of cardio, I realized that it was getting intense” (skater 5). They also focused on attempts to regulate their effort before or during the program: “Here, I’m thinking about breathing properly” (skater 7) and “I’m trying to concentrate on relaxing so as not to use up too much energy” (skater 8). Taking all skaters together, 14% of all foci concerned physical aspects, ranging from 5% for skater 4 to 25% for skater 8.

Artistic aspects of movement. Skaters concentrated on artistic and aesthetic aspects of movement: “I’m thinking about smiling here” (skater 7) and “I’m concentrating on my facial expression” (skater 1). Artistic aspects accounted for 5% of all MUs, with wide disparity in percentage across skaters. Skater 2 rarely focused on artistic aspects, which accounted for only 1% of all her foci. She explained that the artistic aspects came to her naturally, or automatically. In other words, she paid no attention to them: “I don’t have to think about it.” This did not stop her from being very expressive and earning high artistic scores. In contrast, skater 7 frequently concentrated on artistic aspects throughout the long program, which accounted for 9% of all his foci. He thought about “expressing the music,” “conveying a jazzy feel,” or “being fluid and smooth.”

Psychological state. The second content category, psychological state, corresponded to the skaters’ cognitions and emotions related to their psychological state. This category accounted for 22% of all attentional foci. They addressed thoughts and sensations related to motivation (e.g., “Go,” all skaters except skater 4), confidence (e.g., “Here I’m telling myself, I’m going to make this jump,” skater 4), anxiety (e.g., “I’ve got butterflies in my stomach,” skater 4; “I’m feeling very stressed, like I can’t breathe,” skater 7), happiness, satisfaction, and pleasure (e.g., “I’m happy,” skaters 2, 3, 5, 6, and 7; “Here, at the landing, I’m a little glad,” skater 3), as well as the opposite emotions, such as disappointment (e.g., “Oh no, I was really disappointed,” skater 1).
Environment. The third content category, environment, addressed the situations in which the skaters found themselves, and it accounted for 12% of the foci for all skaters. We distinguished between task-related environmental foci, which accounted for 6% of all MUs, and task-unrelated environmental foci, which accounted for 6% of all MUs. The task-related environmental foci addressed all the skaters’ acquired information and all the elements that contributed to executing the movement: “I’m listening to the music” or “Here, I’m establishing a reference point on the ice. I’m aiming for the point as I do my curve” (skater 3). All eight skaters frequently focused on the music throughout their program, as it was an indispensable reference to express emotion, perform in time with the music, and adjust the choreography to end at the same time as the music. The task-unrelated environmental foci addressed all the environmental elements that were not directly involved in executing the movement: “I heard my friend in the audience call out” (skater 2) or “Just when I was about to take off for my jump, I noticed the camera” (skater 4).

Result. The fourth content category, result, encompassed all the foci concerning rankings, scores, and awarded points. This category accounted for 4% of the foci described by the skaters. For skater 4, it accounted for 10% of the foci. During her program, she focused on “the extra points that the judges would give me,” “the points I lost” when she did a jump poorly, or “the points I earned” when she did a spin.

Characteristics of Attentional Foci

The 680 MUs were also categorized according to the characteristics of the attentional foci (see Figure 1). Reality and deliberateness, characteristics identified by Bernier et al. (2011) in golfers, were revealed in this analysis as relevant for expert skaters as well. The sense category in Bernier et al.’s framework was replaced by a channel category. A fourth characteristic emerged from the analysis: the time lag.
**Channel.** The channel was the modality that the skaters used to focus on something. Foci on kinesthetic sensations were the most numerous, accounting for 55% of all foci. When skaters focused on technical aspects (e.g., “skating fast,” “twirling,” “keeping my arm straight”) or physical aspects (e.g., “breathing,” “pains in my legs”), they were focusing mainly on kinesthetic sensations. Visual foci accounted for 7% of all foci. Skaters 3 and 5 focused largely on visual information to establish their visual references on the ice or the rink boards to orient their approach to the takeoff. Auditory foci accounted for 4% of all foci: They concerned, for instance, the music or environmental sounds.

The three categories (i.e., kinesthetic, auditory, and visual) previously identified in Bernier et al.’s (2011) framework under the characteristic sense did not cover all the foci in the present study, and other categories emerged. Some foci were multisensory, meaning that more than one sense was involved. For example, skaters who focused on the audience would see and hear the audience at the same time.

Of all the foci, 30% could not be coded by sense. These foci operated through self-talk. In such cases, it was impossible to determine whether the self-talk element caused or coincided with a particular sensorial stimulation. These foci are illustrated by skater 5’s conclusion of an interview: “Actually, I talk to myself all the time. Sometimes it’s to give me a boost or for reassurance. And other times I give myself orders, instructions on what to do.”

For skaters 1, 2, and 3, the self-talk foci manifested in the form of cue words, or terms that held a specific meaning for the skaters, which they repeated to themselves at certain points in the program: “Snap” (skater 2), “Hop” (skater 3), and “Calm” (skater 1).

**Reality.** The reality characteristic distinguished foci that operated through mental imagery from foci with no consciously associated image. Imagined foci accounted for only 3% of all foci. For example, skaters 5 and 8 used visual and kinesthetic mental images before performing some of their jumps: “Here, I’m picturing myself doing the Axel. I’m visualizing
the trajectory” (skater 5) or “During the approach to the jump, actually, I’m doing the jump in my head: I have the same sensations in my body, and I feel like I’m doing it in my upper body and hips” (skater 8).

Here, when I place my foot to take off, I have an image in my head that my neck is really straight. [...] My coach, when I was young, he told me to picture a hair standing straight up, perpendicular to the top of my head. So here, I’m visualizing this image. (skater 5)

**Deliberateness.** The data analysis revealed that, on the one hand, the skaters were in complete control of some foci (i.e., deliberate), and on the other, some foci were spontaneous (i.e., unintentional). Deliberate foci accounted for 68% of all MUs, for example, (a) orders or instructions to the self (e.g., “Think about your arm” skater 6); (b) cue words (e.g., “Hop,” skater 1); (c) foci that had been extensively rehearsed in training (e.g., “The curve,” skater 5, or “Keep my back leg very straight,” skater 4); (d) recuperation methods (e.g., “Breathe,” skater 8, or “Relax,” skater 7); and (e) foci to boost self-confidence, encourage, and reassure (e.g., “Go,” skater 6; or “I will succeed,” skater 1).

Spontaneous foci accounted for 32% of all foci. They addressed, for example, (a) the environment: “Here, I’m doing my jump, and I’m hearing the voice that announces the scores” (skater 5); (b) technical or physical feedback on movement-associated sensations that the skater could not control: “I saw myself missing it” (skater 6), “When I was in the air, I felt like I wasn’t straight” (skater 3), “Here, I felt like I was tired” (skater 5); and (c) psychological state: “I felt kind of pleased here” (skater 2), “I was really happy” (skater 3), “I was really disappointed” (skater 1).

**Time lag.** The attentional focus could refer to a situation that was occurring in the moment, one that had taken place previously, or one that might take place in the future. The
fourth characteristic therefore included a temporal component. Attentional foci could refer to events in one of three timeframes: the past, present, or future.

When the skater focused on a past event (e.g., program start, a completed jump, the last competition, the morning’s training session), one of two functions came into play. The first function was to refer to a previously experienced event: “I thought I performed this jump well this morning at the training session” (skater 1) or “I replayed all the times that I had practiced it during training” (skater 2). The second function was to evaluate a completed action: “O.k., well done” (skaters 2, 3, 7, and 8); “The beginning of the program was really good” (skater 3); or “I’ve already missed three jumps. I’ve got to try harder” (skater 1). For all skaters, past foci accounted for 9% of MUs. However, they accounted for 14% for skater 2, who evaluated all her program elements as soon as she had performed them.

Attentional foci on the present were the most numerous, at 60%. They might concern technical, physical, or artistic aspects of movement: “In the spin, I’m counting my turns” (skater 4), “Push” (skater 3), “I’m looking at the judges” (skater 8), or “I’m thinking about breathing properly” (skater 5). They might also address the environment: “The crowd is starting to cheer” (skater 2), “I’m listening to the music” (skater 1). Finally, they might concern psychological state, for example, “Concentrated” (skater 6).

Attentional foci on the future, which accounted for 31% of foci, were used mainly to anticipate and prepare for a program element. For example, when going into a jump or well ahead of time, skaters would focus on technical points: “Here, in the curve, I’m thinking about my hips” (skater 7) or “Here, I’m thinking about my Axel. I’m picturing it” (skater 5). Foci on the future also included the expected result. Skaters had many expectations about the scores they would receive on their elements as well as their total scores and rankings, based on on-going evaluations of their performance.
Temporal Patterns of Attentional Foci

Event listing (Miles & Huberman, 1994) was used to develop MU matrices to observe and represent the patterns of attentional foci associated with specific program elements (i.e., a jump, a jump combination, a spin, and a choreographic sequence). For each program element, the sequences of foci thus identified were organized into three phases that emerged inductively: (a) preparation for the action, (b) performance of the action itself, and (c) evaluation of the completed action. All data on the eight participants were analyzed using this methodology. Examples of sequences are shown in Figure 2, showing a diversity of patterns for the different program elements.

The first three sequences are examples of attentional focus patterns during a jump:

The preparation is characterized by a succession of deliberate foci on technical elements (i.e., technical aspects of the movement). Note that skater 3 also used a task-related environmental focus to prepare for a jump. The performance phase was described as “automatic” by skaters 6 and 7. Skater 7 did not use any attentional foci for this phase, or at least was unaware of any while performing the jump, from takeoff to landing. Skater 6 said he focused one last time on obtaining the correct positioning for the jump before taking off. Because he was correctly positioned, he switched to automatic mode until he “woke up” when his foot landed on the ice. Elaborating on this, he said that:

I’m not thinking about the position in-between, during the four revolutions. At a certain point, I stop being conscious. Otherwise, I might open up while I’m in the air. So I think about the beginning and the landing position. I have to wake up as soon as I land on my foot. (skater 6)

In contrast, skater 3 did not perform this triple Axel automatically. Instead, his spontaneous sensations informed him that he was skewed while in flight. He therefore
focused on the landing so that he could “try to stay upright.” During the evaluation phase, the skaters felt happiness (i.e., a psychological state), expressed as self-talk.

Sequences 4 and 5, which represent the attentional focus patterns of two skaters who performed jump combinations, were then examined (see Figure 2), and two distinct patterns emerged. After spontaneous technical sensations (i.e., technical aspects of the movement) associated with the first jump in the combination, skater 4 deliberately focused on separate technical elements (i.e., technical aspects of the movement) in order to perform the two further jumps in the combination. Skater 5 described only two foci when performing his combination. In the preparation phase, he focused on his speed. The subsequent performance phase was automatic, with no particular attentional focus. After he landed, his first attentional focus addressed the artistic dimension (i.e., artistic aspects of the movement) of the choreography that followed the combination. He explained that, “This combination was really easy for me this time. I didn’t have to think about anything in particular. It was completely natural.”

Sequence 6 reveals the pattern for skater 7 during a spin. No attentional focus was described during the preparation phase. During the spin itself, he successively focused on a technical aspect (i.e., “counting the revolutions”), the result (i.e., “achieving level 4,” or the points awarded for the spin), motivating himself with encouragement (i.e., a psychological state: “Go”), and the task-related environment (i.e., “the music”) so he could finish on time. He then briefly evaluated the completed movement.

**Discussion**

This study aimed to investigate attentional foci in expert figure skaters in competitive situations. Recently, innovative approaches have been proposed to better understand attentional focus in sport performance situations: (a) Bernier et al. (2011) proposed a new
framework to analyze attentional foci, and (b) some authors have highlighted the temporal organization of them (Bernier et al., 2011; Salmon et al., 2010). Both these approaches have been applied in order to better understand the attentional foci of elite sport performers in the specific context of figure skating competition.

**Content and Characteristics of Skaters’ Attentional Foci**

With respect to the content of the foci, similar categories were identified in skaters to those found by Bernier et al. (2011) in golfers (e.g., movement, psychological state, task-related environment, task-unrelated environment, result). However, other categories emerged that were specific to the sport examined in this study (e.g., artistic and physical aspects).

Many (43%) of the foci shortly before and during the skaters’ programs concerned technical aspects of movement. Although we cannot conclude that this content is effective, we note that this was the most frequently observed content in the eight expert skaters. This finding was unexpected, given the experimental results in the literature, which underscore that internal focus or focus on execution tends to decrease performance in expert athletes (Beilock, Carr, McMahon, & Starkes, 2002; Masters & Maxwell, 2004; Wulf & Prinz, 2001).

In particular, the *constrained-action hypothesis*, which was tested and confirmed in several studies by Wulf and colleagues (for a review, see Wulf & Prinz, 2001), proposes that internal focus may interfere with automatic control processes that would normally regulate the movement. We suggest three interpretations of this finding. One interpretation is attributable to a methodological limitation. We may hypothesize that the video that the skaters watched could have incited them to mention foci on movement that they had not actually experienced during their programs. A second interpretation is supported by two studies showing that this type of focus content can indeed be effective, even in expert athletes. First, Beilock et al. (2002) found that not all forms of attention paid to movement are counterproductive in expert
athletes. For some activities, being attentive to execution plans or feedback (e.g., sensations during performance) enabled athletes to improve their execution of the movement. Similarly, Liao and Masters (2001) recommended that expert athletes concentrate on holistic attentional foci that foster automatic skills execution. In the study, we observed the use of this attentional strategy through analogies such as that of skater 5, who pictured "a hair standing straight up, perpendicular to the top of my head," or through the use of global cue words (Gucciardi and Dimmock, 2008) such as “position” (skater 6) or “speed” (skater 5). A third interpretation is that sport specificity has led to the large number of MUs related to technical aspects of task execution. Most of the literature focuses on discrete aiming tasks, most notably golf putting, where the end result is more important than the way in which the movement is executed. In figure skating, however, the way in which the movements are executed is very important because posture and movement execution are explicitly scored by the judges. For this reason, in figure skating it makes sense that attention is also focused on the way in which the movements are executed in competition.

Physical aspects of movement were a noteworthy part of the focus content. For example, they accounted for up to 43% of foci for skater 8, suggesting that she was preoccupied with the physical aspects of her performance. This suggests that it could be critical for skaters to be aware of physical aspects when performing their program. This finding is related to Morgan and Pollock’s (1977) and Schomer’s (1987) findings that associative attentional focus (i.e., focused on bodily sensations related to effort such as breathing or sensations in the legs) was beneficial for performance in endurance sport competitions. Although the long program in figure skating is not an endurance task, the 4-min or 4.5-min length of the program means that lactic anaerobic and aerobic systems are activated, which leads in turn to sensations of pain and/or shortness of breath. Skaters
therefore have to focus on physical aspects in order to appraise their fatigue and optimize their energy commitment throughout the program.

Content in terms of artistic aspects of movement emerged as a new category in the qualitative data gathered. This attentional focus content is related to the specificities of the discipline, which require skaters to move expressively and aesthetically. Attentional focus on the artistic dimension has never before been directly examined and would therefore constitute a fruitful direction for future research.

Previously, Bernier et al. (2011) proposed that athletes might focus on psychological states. This argument was corroborated in the present study, which identified specific psychological states in the focus content of expert skaters. The participants in the present study deliberately or spontaneously focused on psychological states such as motivation, confidence, anxiety and associated sensations, pleasure or satisfaction, and disappointment or sadness. Although the relationships between anxiety and attentional processes have been largely studied in the literature (Beilock & Carr, 2001; Bell & Hardy, 2009), the relationships between other psychological states (e.g., confidence, motivation) and attentional processes have received little attention. By considering these psychological states as specific content of attentional foci, we propose that they impact attentional processes in performance situations. These relationships and effects merit further exploration in future studies.

With respect to the characteristics of the skaters’ attentional focus, reality and deliberateness emerged as two relevant categories, as in Bernier et al.’s (2011) study. The characteristic channel was as an extension of the characteristic sense, and included the categories multisensory and self-talk. The self-talk category evidenced that self-talk is a way to focus attention on specific points, and was frequently used by the skaters. In other words, its constituent words and phrases orient the athlete’s attention toward specific points.
A new characteristic emerged from the analysis: the time lag. Attentional foci could be classified according to whether the event took place in the past, present, or future. It was instructional to note the frequency of foci that referred to past events (i.e., evaluation of a completed element or focus on a significant former event) and future events (i.e., anticipation, expectations, predictions). All the past and future foci could provide relevant information, but they could also distract the athlete from being in the moment and the important information it contained for effective execution. This analysis could be particularly useful for athletes and coaches in identifying which foci on the past or future could contribute to performance. In the present study, attentional foci on the present were in the majority, at 60% of all foci. Some authors in sport psychology (Jackson & Csikszentmihalyi, 1999; Ravizza, 2002) have related the optimal performance state to focusing in the moment. It is said to reduce distractions due to recalling past or predicting future events, thereby reinforcing total absorption in the task, which is the main feature of the optimal performance state. Listening to the program music is an example of focusing in the present that was frequently cited by the skaters.

The analysis suggests that Bernier et al.’s (2011) framework could therefore be extended, and it appears that it should also be adapted to the specificity of the sport.

**Temporal Patterns of Attentional Foci**

Based on event listing (see Figure 2) using SportsCode Elite, the patterns of attentional foci were characterized according to three phases that emerged inductively: (a) the preparation of each program element, (b) its performance, and (c) its evaluation. In contrast to the static and dichotomous perspectives adopted by previous experimental studies, the examination of attentional focus patterns in real situations revealed that they were flexible and varied. They evidenced a highly specific temporal order according to the jump, the...
skater, and the sensations that the skater had when performing the jump. It appeared that when skaters performed an automatized jump, and when they felt correct sensations during the execution (see Figure 2, sequences 1, 2, and 5), they did not report any attentional foci operating during the performance phase. These attentional focus patterns corresponded to automatic performance of the jump. Skaters did not consciously pay attention to the movement, or else they did not remember any attentional foci at this point. Inversely, for some skaters and some jumps (see Figure 2, sequences 3 and 4), attentional foci appeared to operate during the performance phase. The applied process was therefore not automatic.

Skaters were aware of certain sensations and they paid attention to how they executed the movement. We noted two explanations for conscious (i.e., non-automatic) performance of a jump. First, skaters needed to pay attention to a number of specific technical elements during execution, either because they had not yet achieved full automatization of the movement or because they had recently disrupted their automatic mode to apply new parameters to the movement (Beilock et al., 2002). Second, skaters perceived sensorial information during execution of the jump (i.e., kinesthetic, auditory, or visual), telling them that something was incorrect. They then deliberately focused on technical points to correct the execution on the fly (see Figure 2, sequence 3). Interestingly, all skaters recalled using attentional foci while executing a spin (see Figure 2, sequence 6). This suggests that the several seconds required to complete a spin provided enough time for both deliberate and spontaneous attentional foci. In the example given (see Figure 2, sequence 6), skater 7, like all the other skaters, had prepared and rehearsed the attentional foci he used as he executed the spin. It would seem that different factors (e.g., type of figure, degree of automatization, sensory feedback) affect the number of attentional foci in each of the three phases as well as their content and characteristics. This is an area that could be studied in future research based on quantifying the categories of foci and analyzing the distribution according to the three phases.
In the present study, attentional focus patterns operate throughout the long program. This process resembled a pre-performance routine (e.g., Crews & Boutcher, 1986; Lonsdale & Tam, 2008), because it involved cognitive strategies that were fine-tuned during training, and because the common objective was to achieve automatic movement. However, these foci were not used solely in the pre-performance phase. They were also used throughout the program, as established attentional routines, and were related to specific aspects of the discipline in terms of length and structure (i.e., programs consisted of a succession of technical and choreographic elements). As an application, skaters are therefore recommended to learn such attentional routines to execute their program. This would help them structure, organize, and prioritize their attentional foci within a temporal framework.

Although skaters must develop and rehearse attentional focus patterns (i.e., attentional routines), as explained above, we may assume that they should also be able to regulate their attentional foci when disrupted by a spontaneous attentional focus on the task-unrelated environment (e.g., a cheering audience), psychological state (e.g., disappointment, lack of confidence), or an irrelevant event in the past (e.g., a fall at program start, a failed short program the previous day). Indeed, the results on the variety of attentional focus sequences highlighted the crucial adaptability of attention allocation to moment-by-moment circumstances. Recently, several authors have suggested that mindfulness, defined as “receptive attention to and awareness of present events and experience” (Brown, Ryan, & Creswell, 2007, p. 212), is a particular processing mode that may help athletes regulate their attention to adaptive cues (Gardner & Moore, 2007; Moran, 2012). It would be useful to gain a deeper understanding of the link between this attention self-regulation strategy and sport performance.
Perspectives

Attentional focus has been studied mainly in closed sport tasks executed in relatively stable environments such as golf and skating. However, many sports (e.g., combat sports, team sports) involve unstable, unpredictable conditions in which athletes must make decisions in the moment. We would therefore expect these constraints to lead to the use of specific attentional foci, which would be useful to examine.

Finally, the naturalistic paradigm in the present study should enable broad application of the results. Knowing the content and characteristics of athletes’ foci, coaches and sport psychology consultants would be in a better position to advise them. In addition, they could help their athletes identify the content and characteristics of their attentional foci so that they could replicate relevant temporal patterns. Athletes also have to develop flexible attention in order to regulate their focus when it is disturbed by an involuntary focus. Based on the present findings, attention training methods could be developed to address this issue.
References


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**Figure 1.** Classification of 680 attentional foci (MUs) by content and characteristics.

* $p < .05$ *** $p < .001$. 

![Diagram of attentional foci classification](image-url)
**Figure 2.** Examples of sequences with attentional focus patterns. For each meaning unit, content and characteristics of the focus are specified: content (TM = technical aspects of movement, PS = psychological state, PM = physical aspects of movement, ET = task-related environment, RE = result, AM = artistic aspects of movement), channel (K = kinesthetic, ST = self-talk, V = visual, A = auditory), reality (R = real, I = imagined), deliberateness (D = deliberate, S = spontaneous), time lag (PA = past, PR = present, F = future).