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Do Athletes Imagine Being the Best, or Crossing the Finish Line First? A Mixed Methods Analysis of Construal Levels in Elite Athletes' Spontaneous Imagery

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Abstract

The purpose of this article is to illustrate data transformation in a mixed methods research phenomenological study, investigating how athletes use concrete and abstract spontaneous imagery in and around competition. To achieve this, we combined the application of co-occurring codes and numerical transformation in a novel way. A thematic analysis of qualitative interviews with 12 elite athletes identified concrete imagery to focus on strategy generation, error correction, technique, and preparation, and abstract imagery to focus on desirability, symbolic and verbal representations, and regulation of affect, arousal, and mastery. Statistical analysis identified that subjective effectiveness of imagery significantly differed for sport type (reactive/static) and competition times. Researchers wishing to apply statistical analyses to qualitative data are encouraged to employ our methodology.

Keywords

spontaneous athletic imagery, sport psychology, construal level theory, abstraction and concreteness, mixed methods

Mixed methods research is often defined as the blending of qualitative and quantitative data sets (Johnson, Onwuegbuzie, & Turner, 2007). Beyond this, it is also possible to conduct a mixed methods *analysis*. Here, transformation procedures are applied to only one type of data. One such procedure, numerical transformation (i.e., transforming collected qualitative data into a quantitative data set) has often been employed for purposes of result verification or pattern recognition and to complement and enhance qualitative findings (Sandelowski, 2001), for example, in inherently mixed approaches (Bazeley, 2012; Tashakkori & Teddlie, 2010; Teddlie & Tashakkori, 2009). The purpose of this article is to illustrate one form of data transformation in a mixed methods research phenomenological study.

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To facilitate qualitative data analysis, various coding methods have been proposed in the mixed data integration and computer-assisted content analysis literature. Among them is a coding method in which multiple unique codes are overlapped when applied to the same piece of text, termed *co-occurring codes* (Bazeley, 2010; Contreras, 2011; Huber & Garcia, 1991; Kelle, 2004).

Both, numerical transformation methods and co-occurring code application are scarce in empirical research (Collingridge, 2013; Fakis, Hilliam, Stoneley, & Townend, 2014; Kelle, 2004). Consulting a recent review (Fakis et al., 2014), and various search engines, we identified few applications of co-occurring coding (for two instances, see Dillworth et al., 2015; Tyler et al., 2014), and none that applied further quantitative analyses to the found co-occurring codes. The closest example to our study methodology is the description of data handling reported by Bazeley (2010). It is a brief overview on how co-occurring codes can be applied in text and then exported to be used with statistical software, but does not provide an in-depth application of this process.

In the present study, we employ our data transformation method to explore how athletes use concrete and abstract spontaneous imagery (i.e., passive or associative mental representations, Kosslyn, Segar, Pani, & Hillger, 1990). The proposed methodology allows us to analyze how codes interact across different participant groups (i.e., athletes from different sports), and is therefore grounded in code-based analysis as suggested by Kelle (2004) in which a qualitative data set is broken down into quantitatively analyzable data based on the used coding strategy. It facilitates the application of statistical methods such as permutation testing to quantitized data (Collingridge, 2013; LaFleur & Greevy, 2009), and makes their use more intuitively applicable to mixed methods researchers.

We have chosen to develop this mixed methods analysis to be able to expand on findings that are purely derived from our conducted, thematically analyzed qualitative interviews with elite athletes, where we explore the different levels of abstraction and concreteness they experience. We use the method of numerical analysis of co-occurring codes to gain statistical information about the athletes' perceived effectiveness of abstract and concrete imagery between different types of sports and at different points in time. In this vein, we follow Ercikan and Roth (2006) and integrate qualitative and quantitative methodology to answer important *what*, *why*, and *how* questions within the same study. The qualitative analysis provides answers to the questions *how* levels of abstraction appear in imagery and *why*, that is, their functionality. The quantitative analysis adds information on the *what*, that is, which abstractions levels are used in what way and when, but also allows for clarification through mixed methods integration, to find *why* some athletes of different sports prefer abstract or concrete imagery.

Construal Level Theory: Concrete and Abstract Mental Representations

We examine the content and function of spontaneous imagery through the lens of construal level theory (CLT; Liberman & Trope, 1998). CLT (for a review, see Trope & Liberman, 2010) is a social psychological framework that illustrates how and why individuals relate levels of abstraction and distance in their minds. The majority of the research in CLT is concerned with the way we process information depending on our concrete or abstract state of mind. It is founded on categorization theories such as Rosch (1975), which postulate that we create lower ordered, subordinate, and higher ordered, superordinate categories for information, for example, objects and actions. For objects, a volleyball is a lower order category compared with a ball, and a ball is more generally sports equipment. For actions, shooting a goal can be construed at a lower level as *kicking the ball into the net*, which focuses on the *how* of the behavior, or it could be construed at a higher level, such as *winning the match*, focusing on the *why* of the behavior (Vallacher & Wegner, 1989). Lower levels of abstractness contain more concrete details about peripheral context, while higher levels imply more about desirability and valence, often in a central, symbolic way.

CLT proposes further that a person's construal level is susceptible to external influence, in particular through manipulation of distance. Individuals will change the way they process an event or object when the relative spatial or temporal distance is changed (e.g., Liberman & Förster, 2009). Different construal levels have affected various cognitive and behavioral outcomes. Manipulated with brief framing interventions, they affect visual processing (e.g., the perception of distance; Bar-Anan, Trope, Liberman, & Algom, 2007), local and global processing (Liberman & Förster, 2009), and many other psychological processes such as decision making (Armor & Sackett, 2006), confidence (Nussbaum, Trope, & Liberman, 2003), self-control, and self-regulation (Fujita, Trope, Liberman, & Levin-Sagi, 2006). Spontaneously inducing a more abstract construal has been shown to have a positive effect on motivation (Vasquez & Buehler, 2007; Wieber, Sezer, & Gollwitzer, 2014), and performance in a handgrip task (Wieber et al., 2014).

The Use of Abstract and Concrete Spontaneous Imagery in Sports

Few interventions in sport have directly targeted spontaneous mental construals by changing individual processing styles, for example, with priming (Ashford & Jackson, 2010) or by inducing a regulatory fit (Plessner, Unkelbach, Memmert, Baltes, & Kolb, 2009). Considering the widespread use of imagery in sport contexts, and the aforementioned effects of CLT on cognition, motivation, and emotion, the benefit of analyzing levels of construal in spontaneous imagery of athletes (J. Cumming & Hall, 2002; Kosslyn et al., 1990) could be realized.

We propose a new factor for the existing theoretical foundations of imagery (Bernier & Fournier, 2010; Fournier, Deremaux, & Bernier, 2008; Paivio, 1985). While mental imagery interventions have been concerned with concrete representation of various actions and events (Weinberg, 2008), rarely, the high-level, abstract construal has been implicitly (Bernier & Fournier, 2010; Paivio, 1985) or more explicitly (Betts, 1909) mentioned in imagery research. When we look at Paivio's (1985) proposed framework, the motivational general function includes the addition of arousal, affect, and mastery, which can be abstract concepts, such *as I can imagine feeling angry or Imagine yourself as more confident* (Martin, Moritz, & Hall, 1999; Nordin & Cumming, 2008), and in Fournier et al. (2008), we also find that a part of imagery of golfers can be to see a symbolic line in the sky. Paivio (1985) explains that sometimes, the meaning of images is revealed in a symbolic form, and that the motivational function of imagery can lie ‘‘in its capacity to represent [. . .] behavioral situations symbolically or vicariously’’ (p. 23).

Use of Imagery in Reactive and Nonreactive Sports

In addition to exploring construal levels of spontaneous imagery, we investigate whether imagery use differs between athletes who participate in different types of sports. Many sports tasks require different ways of visual processing (e.g., Abernethy, 1991; Wood & Wilson, 2010) and self-regulation (e.g., Chen & Singer, 1992), and we tend to be continually influenced by contextual and situational demands, which affect psychological factors like confidence, affect, self-control, and motivation (for an overview, see Ross, Nisbett, & Gladwell, 2011). It is therefore possible that an interaction of task demand and imagery content could be affecting performance. Paivio (1985) argues that there are different processes at play for tasks that occur in a static versus reactive environments. Static and reactive here refer to the changeability of the environment in which athletes perform. They follow the logic of the open/closed skill definition (Coelho, De Campos, Da Silva, Okazaki, & Keller, 2007; Yazdy-Ugav, 1988), that is, a reactive environment requires participants to react to changes (open skill), such as opponents or balls, while a static environment is relatively constant and the activity is mostly self-paced, often requiring the execution of only one type of skill (closed skill).

There have been contradictory findings for imagery used by athletes performing in reactive versus static environments. It is unclear whether athletes in both types of sports benefit from imagery (Coelho et al., 2007), and if yes, in what way they benefit from the use of motivational or cognitive imagery and external or internal imagery (Hall, Mack, Paivio, & Hausenblas, 1998; Spittle & Morris, 2007; Watt, Spittle, Jaakkola, & Morris, 2008).

Methodology

We used a phenomenological design and applied thematic analysis in the present study to explore whether athletes differentiate between concrete and abstract imagery. This research was carried out in a university setting and during athletes' competitive seasons. We then quantitatively investigated whether elite athletes reported concrete or abstract imagery to be more helpful before, or during their competitive performances, and whether the task demand would affect the perceived usefulness of imagery construal levels.

Participants Recruitment and Characteristics

Participants qualified for participation if they had at least participated in a national-level competition within their sport within the past 5 years. After research ethics board approval, various varsity teams at the host university were approached during practice hours, given letters of information, a general overview of the study, and encouraged to invite other athletes (i.e., snowball sampling). No further participants were recruited when data saturation was reached (Thomas & Pollio, 2004). Thirteen participants (6 female, 7 male) were recruited in total, with 1 pilot participant not included in the final data analyses, as interview questions were altered based on her responses (Turner, 2010). On the day of the interview, the letter of information and consent were discussed and signed. Participants were asked to fill out a demographics sheet and then participated in the interview. An audio device was used to record all spoken information, which was later transcribed verbatim by a research assistant and reviewed by the researcher.

Participants ranged from 19 to 29 years (M = 22.69; SD = 3.22) and were of Canadian (N = 7), Chinese (N = 3), Egyptian (N = 1), Indian (N = 1), and German (N = 1) descent. Table 1 presents a summary of participant information gathered from the demographics questionnaire and their assigned pseudonyms. The final study participants competed in track running (N = 3), triple jump (N = 1), discus (N = 1), golf (N = 1), table tennis (N = 4), badminton (N = 1), judo (N = 1), and boxing (N = 1). For the purpose of this article, we will be grouping these sports using Paivio's (1985) definition of ''reactive'' and ''static.'' Hereinafter, for simplicity's sake, track, jump, discus, and golf can will be called ''static,'' whereas table tennis, badminton, judo, and boxing will be called ''reactive.''

Data Analysis

Analysis 1: Qualitative Procedure. Following Patton (2014) and Turner (2010), a general interview guide with predetermined questions was constructed by two of the researchers with previous experience in developing protocols. It allowed for flexibility, while giving the interview

Table 1. Pseudonyms and Demographic Data of Participants.

Name	Sex	Age	Sport	Competition[a]	Hours[b]	Years[c]
Rose (pilot)	F	19	Table tennis	National	6-8	15
Abby	F	22	Track	National	10	14
Bart	M	27	Boxing	National	10	10
Steve	M	22	Table tennis	National	6-8	10
Amy	F	22	Track	International	10	13
Edward	M	20	Track	National	10	6
Petra	F	26	Judo	International	10	16
Ron	M	29	Table tennis	National	6-8	12
Keith	M	20	Table tennis	National	6-8	14
Sierra	F	20	Discus	National	6-8	6
Harry	M	20	Triple jump	National	6-8	8
Chris	M	26	Golf	International	6	15
Alana	F	20	Badminton	International	8	14

[a]Highest recent competition. [b]Practice hours/week. [c]Competitive career.

structure and direction. The interview development process was supported by an established expert in sport imagery research. We included questions on both the imagery and goal setting applied by participants, but in the present article, only the imagery question subset is relevant and imagery-related data items were combined to produce the presented data set (Braun & Clarke, 2006).

The three relevant sections of the interview guide consisted of (a) the introduction, in which the researcher learned about the athlete, their competitive career and built rapport, attempting to make participants feel comfortable with being audio-taped; (b) the general inquiry in which the researcher learned about the athlete's sport in practice and competition; and (c) the time-dimensional imagery use in relation to the distance from their competition (i.e., the day and morning before the competition; at the competition before the athletic performance; and at the competition while performing). Example questions for each section can be found in Table A1 of Appendix A. In addition to the interview guide, probes were used to remind the participant to stay on topic, and to facilitate additional or more detailed responses (Patton, 2014). Interview duration was on average M = 23 minutes (SD = 5.5). Following the interview, the participants were invited to indicate important missing points, and ask questions about the purpose of the study.

Each audio recorded interview was transcribed into the R package RQDA (Huang, 2014) and analyzed using thematic analysis (Braun & Clarke, 2006). Based on relevant literature on CLT and previous imagery research, main initial themes (i.e., higher order themes) were first identified and grouped in consultation with colleagues in a deductive manner. The transcribed interviews were read multiple times and patterns identified in relation to the previously identified higher order themes. Variations and consistencies within the data were noted and a first interpretation provided. Codes (short phrases that describe how data segments are meaningful in the theoretical context) were then constructed from the themes and rechecked multiple times against the transcripts. An attempt was made to relate significant patterns, inductively deduced from within data, in a logical manner to previous relevant literature (Patton, 2014).

Each text unit was marked with all the possible codes that applied to it. For example, many text units were coded as the type of imagery used (code: imagery_concrete), but could also be coded as reported helpful or not (code: effect_helpful). This is consistent with the idea of applying co-occurring codes to qualitative data mentioned in literature on computerized analysis of qualitative data (Bazeley, 2010; Contreras, 2011; Huber & Garcia, 1991; Kelle, 2004).

Two of the researchers analyzed the transcripts after a first coding, discussing the participants' statements, noting patterns, and ensuring consistency of codes in relation to the textual content until consensus was reached. Data were recoded a second time and checked against the first coding, with further discussion by the two main researchers until consensus was reached. The main focus was high internal homogeneity—ensuring commonalities for all text passages within one code, and high external heterogeneity—distinctive features between codes. For example, text passages coded as abstract could never be coded as concrete imagery and vice versa. Additionally, a research assistant independently coded 10% of the transcripts after a discussion of the existing research on CLT and the predetermined thematic structure to ensure high reliability. The overlap of both raters' codes was compared for consistency and reassessed until interrater reliability was judged to be at a very good level (90%). First-level codes note the main factors of athletes' imagery use and second-level codes detail exploration of imagery content. A summary of thematic analyses and the categorization tree were sent per e-mail to participants for member checks. Checks were not completed, as none of the athletes responded to the e-mail, however, informal discussions with available athletes did provide validation of content and our proposed categorization tree.

Analysis 2: Quantitative Procedure. We employed numerical data transformation, often termed ''quantitizing'' (Sandelowski, Voils, & Knafl, 2009; Tashakkori & Teddlie, 1998), to extract numerical data about construal levels, time levels, and reported effectiveness of imagery use from the codes created for our qualitative data set, in a code-based analysis suggested by Kelle (2004). Quantitizing qualitative data have been described as a process that adds power, information, and a more objective perspective to a researcher's analysis (Bazeley, 2012). In mixed methods research, a representation of the number of times a code appears per interview has been considered a valid methodological approach (Bazeley, 2010; Sandelowski et al., 2009).

Using multiple codes on one text unit (co-occurring codes, as described in Analysis 1) allowed us to look at overlap of themes and check the interactions of codes for various competition times and between individual participants and task types. It facilitated a numerical analysis of instances when certain codes coincided (e.g., How many text units show that athletes in reactive sports consider concrete imagery helpful before the competition? How many text units, coded across all participants, support the idea that concrete imagery is helpful?), which we did, taking into consideration the foundational assumptions and compromises inherently present when quantitizing qualitative data (Sandelowski et al., 2009).

Data items, including information on all attributes per code, were taken from the internal RQDA database (a MySQL database, an open-source relational database management system), and Python programming was used to identify combinations of single, pairs, or triplets of codes, which were written into tables with the matching specifiers such as participant number and sport type. The statistical software R 3.2.2 (R Development Core Team, 2008) was then used to generate item frequencies for each combination. Tables containing our data sets and related programming which produced these tables can be found at the online file repository GitHub (Ulloa, 2015).

After calculating the frequencies of co-occurring codes, we required blocked analyses of variances (ANOVAs) in order to explore whether athletes differed in their use of concrete and abstract imagery based on their task demand (i.e., sport type), the time distance to competition, and reported effectiveness. Due to a small sample size often inherent in qualitative research, some have cautioned against using parametric statistical tools on quantitized data, with the suggestion to use permutation testing instead (Collingridge, 2013). Permutation tests are resampling tests, a subset of nonparametric statistics in which a p value is calculated by checking the

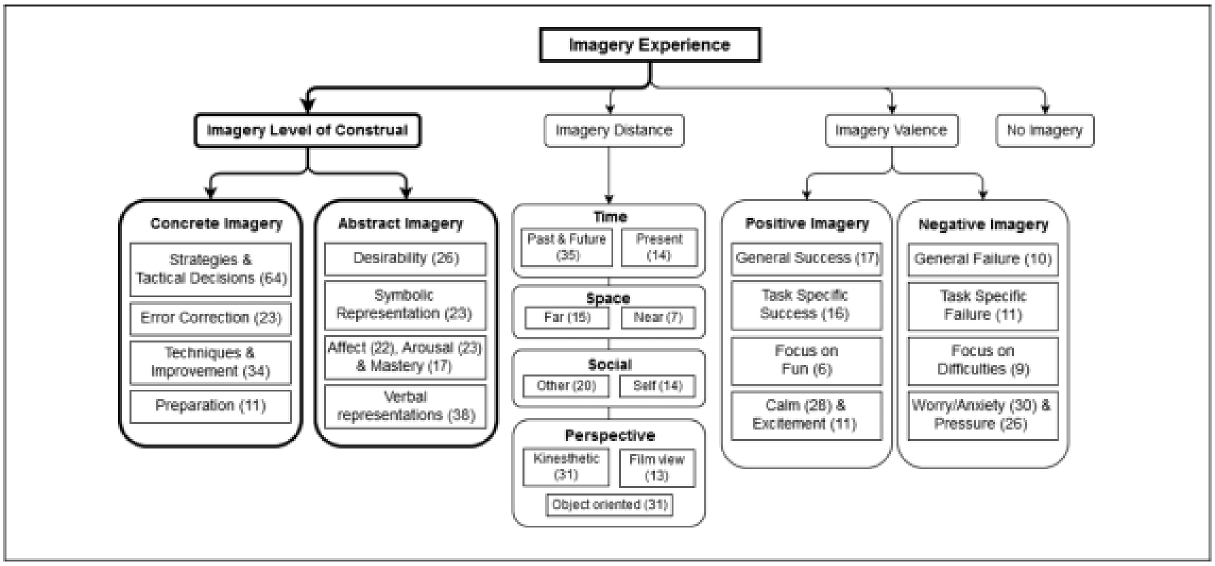

Figure 1. Classification tree of athletes' imagery experiences. Heavier outlined categories and subcategories are further discussed in the present article, while lighter outlined categories are not. The number of coded text units in any given category is noted in brackets.

original mean difference which is found on the distribution, against a high number of further mean differences that are calculated when resampling. If $p < .05$, this means that there is a less than 5% chance that the original mean difference arose by chance (Good, 2000; Kherad-Pajouh & Renaud, 2015).

We applied the ezPerm function from the R package ''ez,'' which yields significance results for mixed measures variance tests, thus avoiding possible violations of parametric assumptions. As no permutation test exists for our mixed design that would yield a reportable statistic, we report both, the *F* statistic and *p* value from parametric ANOVAs, and for each result, a *p* value in brackets, which reflects the significance reported by permutation tests. Additionally, we report tests of normality and homogeneity of variances in Table A2 of Appendix A.

The confidence intervals shown in our results graphs were calculated with the R function ezBoot of the ''ez'' package, which applies bootstrapping to create parameter-free predictions. These are, in the case of small samples, preferable to commonly reported error bars. Significances can so be meaningfully extracted from the figures, that is, confidence intervals that do not overlap have been previously shown to be significant at the .01 alpha level, whereas proportion overlap of 50% of the bar is significant at the .05 level (G. Cumming & Finch, 2005). Further figures that represent our results but are not included in the results section, can be found in Figures A1 to A5 of Appendix A.

Results

A total of 579 meaning units relating to imagery were coded throughout the transcripts; of these, 265 related to imagery construal level and were clustered into concrete imagery (135) and abstract imagery (130). Other coding units related to imagery distance (186) and imagery valence (including emotional imagery, 164). We coded these text units as we perceived that they were an important part of the athletes' experience; however, they are not further discussed in the present article. Additionally, some text units included were participants' descriptions of having experienced no imagery (18). Lower order themes were assigned with textual support in an inductive manner to the theoretically supported themes. Figure 1 provides a visual representation of the structure of the codes, with numbers in brackets reflecting their frequency in the text.

Analysis 1: Qualitative Results

For the qualitative results, we present the two categories found under *Imagery Construal Level*, and some chosen text units that are representative of the coded data, to illustrate how coding was applied to match the deducted higher order themes, and how lower order theme commonalities were inductively established.

Concrete Imagery

Strategies and tactical decisions. The most frequently mentioned concrete imagery is related to the mental rehearsal of, or decision making about strategies and tactics. Keith [table tennis] described using imagery during the table tennis match in the following manner:

> I imagined the game, I imagine myself playing the opponent. [. . .] I'm trying different strategies and thinking of a way to end the game really quickly, as quickly as possible.

Petra [judo] also described how knowledge of an opponent plays a large part in strategically imagining a fight:

> On the day of the competition, you are told who you're fighting against. Then I tried to imagine a strategy, how I would proceed against that particular opponent. It is easier because I already knew many of them, so I would let the exact strategy of the fight run through my head.

Error correction. Sometimes, during the performance, athletes are correcting previously executed movements, or devising ways to correct strategies to react to their opponents' plays. Alana [badminton] described this as important:

> ''I can't play to her low front corner or she's going to run me to the ground'' so there's definitely times where you have to be ready to either try something new or change a part of your game.

On the other hand, it can be a negative experience to use corrections during a competition. Chris [golf] explained:

> . . . the more you can get away from overly analysing technical flaws, especially in competition, because they can become overwhelming psychologically, and can completely debilitate in terms of confidence.

Techniques. Imagery relating to technique and technical skill analysis was frequently mentioned. This type of imagery is often used for skill rehearsal. Sierra [discus] described using imagery the day before the competition while practicing in her mind:

> I think about little things that coaches tell you, ''Keep the disc behind your butt,'' ''Keep your arm behind you,'' ''Keep left arm over left thigh.''

Preparation. Concrete imagery can be useful when organizing one's mind for a competition, or the logistics at a competition. Some athletes describe concretely imagining the surroundings and feel of a competition in practice, but also try to use imagery to prepare. Harry [jump] said:

In practice, we try to get through the motions, try to do the same thing over and over again. It's all about improving without pressure. I try to imagine the audience and the coach and the line where you're supposed to jump off of.

Abstract Imagery

Desirability. Many athletes described mental representations of desirability that were general and seemed to be a main source of motivation, such as doing one's best, running faster, or having fun. Petra [judo] described that imagining winning against someone she has lost to before could be helpful:

Particularly against tough opponents, I wanted to win against them. Especially when I'd lost in previous encounters. I would motivate myself by imagining that I would win against them.

Abby [cross-country] explained that using this type of imagery before her run motivated her:

I try to be about positive motivation. I was thinking, ''obviously you're at a championship you want to run your best . . . ''

Similarly, Chris [golf] added:

You have to get back to the reality of why you're doing what you're doing. Is that's an event and you're doing it and want to because you have fun doing it, right?

Symbolic representations. Some athletes described experiencing imagery that was symbolic, usually in terms of numerical abstractions like point systems or imaginary lines that an object they are focussing on can follow. For example, Keith [table tennis] spoke of representing the score in his mind, and how this influences his performance:

You can't ignore the umpire changing the points, a lot of the time. I can't do it. I try my best, but no matter how I do, the standing still affects me.

Chris [golf] described the symbolic line of the path a golf ball might take through the air; and, following it through into the distance,

It's not imagining myself swinging or anything like that, or actually hitting the shot, it's just kind of imagining the line that it would take if I did that.

Psychological regulation: Affect, arousal, and mastery. Various affect types, arousal levels, and imagery of mastery can be present and accompany the performance of a sport. Affect is generally considered part of the functionality of imagery (Paivio, 1985), but often, we also symbolically represent affect or arousal in our minds, for example, ''I imagine what that would feel like.'' Many athletes deferred to affect or arousal descriptions as their first answer when they recounted imagery. Harry [jump] described using arousal imagery in the moments before his jump:

I think about how it would feel if I failed, if I didn't jump well. Some of my other jumps weren't good, so I think about past failures as well, I think about [. . .] how mad I was after the meet [. . .].

Keith [table tennis] described how the emotional imagery of arousal has blocked concrete strategical imagery he needs to succeed:

> I feel like I have a lot of power and speed and everything? [. . .] it also made me play so aggressively that I missed so many points. I wouldn't have, if I was thinking strategically. [. . .] I think that adrenaline rush is sometimes, like in weight training, very good. But [. . .] I completely lose my mental ability to play.

During the interviews, it became clear that fear and anxiety consume much of mental imagery space, as Edward [track] described:

> I was really nervous and concerned with my ''Oh, if I don't have a good race, it's the end of the world!''

Contrary to this, Amy [track] related that she preferred positive feelings:

> I guess, more focusing on, instead of a numbered goal, focusing on having a good race, or having a positive attitude, imagining how it feels getting through the start line.

Verbal representations. Despite questions relating to their imagery, athletes often mentioned using internal verbalizations in and around competition. Previous literature suggests that verbalizations are distinct from imagery (Kosslyn, 2005; Paivio, 2009), though researchers are still divided as to the nature of imagery (Kosslyn, Thompson, & Ganis, 2006). In CLT, verbal representations are considered the most abstract form of mental representations, at one extreme of the continuum ranging from concrete pictorial to completely conceptual depiction (Amit, Algom, & Trope, 2009). For this reason, we decided to include a mention of verbal representations under the abstract imagery category.

Amy [track] described using self-talk to center herself during her running in competition,

> Sometimes I have a little mantra in my head, ''Stay smooth,'' or ''Stay calm'' or just, something little to focus on?

And finally, in order to prepare for the competition, Ron [table tennis] described using self-talk to regulate his emotions even before arriving to the venue,

> I always prepare myself, especially mentally, before the tournament. So in the morning I would keep telling myself, ''Be patient, no matter you're leading or you're losing the game.'' I tell myself to be patient and calm down, ''Don't get mad because of one edge-ball or a lucky ball or something like that,'' and ''Don't look at the scoreboard.'' I want to try and play it one point by one point.

Analysis 2: Quantitative Results

Based on theoretical considerations, and exploratory hypotheses generated by analyzing our qualitative data thematically, we explored the relationships between our coded text units and sport type. Codes that we included were construal: *abstract* versus *concrete*, effectiveness: *helpful* versus *unhelpful*, and time point: *before competition* versus *before performance* versus *while performing*. Sport type: *static* versus *reactive* was a demographic factor. Our dependent variable was the frequency of our codes co-occurring per participant. The frequency indicates, for example, in how many separate instances participants, on average, described use of *concrete* imagery *the day before* their competition (two codes), or how many times *concrete* imagery was *helpful* at the time *during* competitive performance (three codes co-occurring). Examples of coded text units for concrete and abstract imagery were previously provided in the qualitative analysis. We

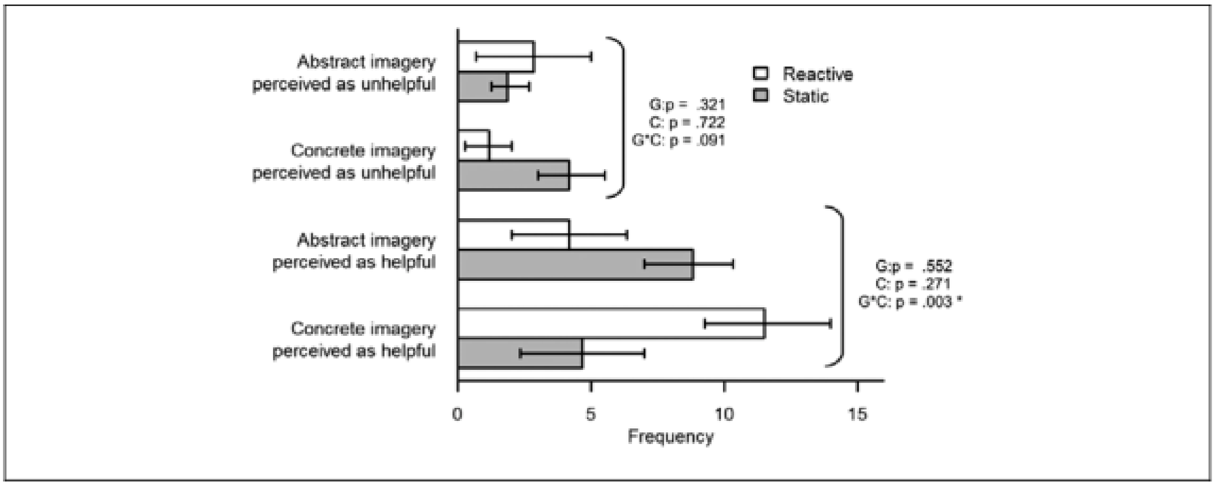

Figure 2. Abstract and concrete imagery reported as helpful or unhelpful. Frequency is the number of coded text units on average per participant. Lighter bars denote athletes performing in reactive environments, darker bars athletes performing in static environments. Reported permutation p values refer to main effects for G (Group, i.e., sport type), C (Code, i.e., construal effectiveness co-occurrences) and the interaction of G * C. Error bars represent bootstrapped 95% confidence intervals.

calculated means and standard deviations, and permutated blocked ANOVAs across all participants to test for significant differences (see Appendix B, Step 3).

We examined differences between sport types, and the general effectiveness of imagery. We did not find a significant difference between sport types for imagery effectiveness, $F(1, 10) = 0.61$, $p = .45$ ($p = .439$); athletes from both static and reactive sports in equal measures spoke of imagery being helpful or unhelpful. However, we did find a main effect for helpfulness of imagery, independent of sport type, $F(1, 10) = 27.38$, $p < .001$ ($p < .001$). Effective and helpful imagery was described by athletes more frequently than was unhelpful, ineffective imagery.

Second, we added imagery construal level to the analyses. We found no significant difference in either frequency of abstract and concrete imagery in general, $F(1, 10) = 0.06$, $p = .80$ ($p = .820$), nor for construal level use when we compared athletes from static and reactive sports, $F(1, 10) = 4.79$, $p = .053$ ($p = .054$). However, when we added the perceived effectiveness of abstract and concrete imagery by sport type to the analysis, we found significant differences, see Figure 2. We found that there was a significant interaction effect for helpfulness and imagery by sport, $F(3, 30) = 10.03$, $p < .001$ ($p = .004$). Abstract imagery was mentioned to be helpful more frequently by athletes from static sports ($M = 8.83$, $SD = 2.85$) than reactive sports ($M = 4.16$, $SD = 4.4$), while concrete imagery was considered effective more often by reactive sports athletes ($M = 11.5$, $SD = 4.08$) than those from static sports ($M = 4.67$, $SD = 3.90$). This interaction was found to be significant $F(1, 10) = 18.35$, $p = .001$ ($p = .003$). While there was no significant difference for unhelpful abstract imagery between the sport types, concrete imagery was considered more frequently unhelpful by athletes from static sports ($M = 4.33$, $SD = 2.33$) than reactive sports ($M = 1.16$, $SD = 1.47$). An interaction between groups and codes on unhelpful imagery was not significant, $F(1, 10) = 4.11$, $p = .07$ ($p = .09$).

Finally, we looked at the perception of imagery construal and effectiveness by time. Analyzing all our factors in combination allowed us to see which components and interactions were dominant in our data set. As in all previous analyses, simply belonging to the group of athletes from the static sports or reactive sports had no significance on the existing frequency of all codes, $F(1, 10) = 0.06$, $p = 0.80$ ($p = .870$). Figure 3 illustrates the time points before competition and during performance. For the time span during performance, we found an

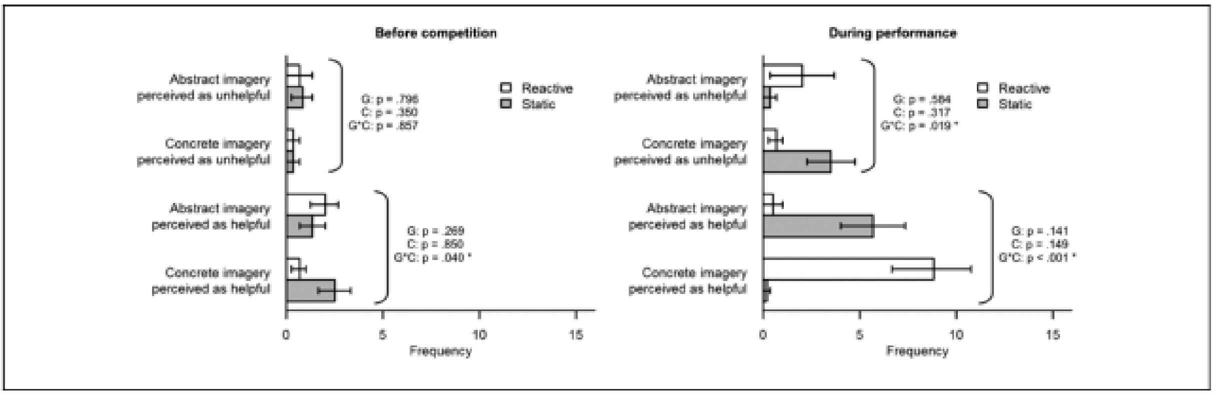

Figure 3. Abstract and concrete imagery reported as helpful or unhelpful at a time the day/morning before competition (left graph), and during performance in competition (right graph). Frequency is the number of coded text units on average per participant. Lighter bars denote athletes performing in reactive environments, darker bars athletes performing in static environments. Reported permutation p values refer to main effects for G (Group, i.e., sport type), C (Code, i.e., construal effectiveness time co-occurrences) and the interaction of G * C. Error bars represent bootstrapped 95% confidence intervals.

interactive effect for our codes and the given sport type, $F(3, 30) = 27.73$, $p < .001$ ($p < .001$). In terms of helpful imagery, athletes from reactive tasks spoke more of concrete than abstract imagery, while athletes from static tasks mentioned more frequently abstract imagery being effective than concrete imagery, $F(1, 10) = 56.93$, $p < .001$ ($p < .001$). The opposite pattern was observed for unhelpful imagery. Athletes from reactive sports more often perceived abstract imagery as unhelpful during their performance, while athletes from static sports perceived the opposite (i.e., they indicated more frequently that concrete imagery tended to be unhelpful), $F(1, 10) = 6.45$, $p = 0.029$ ($p < .019$).

Interestingly, we found an unexpected inversion of these findings for the time before competition: While there was no difference for helpful abstract imagery use at the time before competition, we did see that athletes from static sports tended to judge their own use of concrete imagery more helpful in this moment ($M = 2.50$, $SD = 1.37$) than athletes from reactive sports ($M = .66$, $SD = 0.81$), who did prefer abstract imagery more ($M = 2.0$, $SD = 1.54$). This interaction was significant, $F(1, 10) = 5.82$, $p = .036$ ($p = .040$).

Analysis 3: Integration of Qualitative and Quantitative Analyses

Integration of qualitative and quantitative results has been argued to be the most integral part of use of mixed methodology, yielding results that are more than the sum of their individual parts (Fetters, Curry, & Creswell, 2013; Fetters & Freshwater, 2015; O'Cathain, Murphy, & Nicholl, 2007). We found two functions of integration in our study. First, data from our statistical analysis demonstrate and validate exploratory hypotheses derived from first readings of our qualitative data. Athletes from static and reactive sports did, in instances, mention one type of imagery might be more effective or less effective than the other. For example, one athlete from a reactive sport reported that they would optimally generate even more concrete imagery (''I think that it'd be helpful to use more imagery before I hit that shot,'' Alanna, badminton), whereas abstract arousal imagery was perceived as destructive in comparison with static sports (''I think [. . .] when you're in a game, for me, it's not good, because I completely lose my mental ability to play,'' Keith, table tennis). Concrete imagery was described as debilitating by some athletes performing in static environments, occasionally in a generalized way (‘‘If you’re still thinking about [strategy] when you’re actually performing the shot, when you’re hitting the shot, that interferes with your natural ability to play,’’ Chris, golf). These and other quotes, joined with theoretical considerations from previous sports literature gave us a better idea what to look for when we started exploring the data with our statistical analyses. Generalizations across sports, based purely on text passages from the qualitative data, might not be considered reliable until they are supported with numerical results.

On the other hand, qualitative data can provide additional explanations for unexpected findings from statistical analyses, and therefore provide novel hypotheses that, in the future, can be tested with experimental research. In our data, the statistical analysis drew our attention to an interesting switch for the time before competition, when athletes’ experience of effective imagery was reversed from in competition. Athletes from reactive sports more frequently reported abstract imagery being more helpful, whereas athletes from static sports found concrete imagery more frequently helpful. Going back to the qualitative text, coded units informed this finding with novel information: For many athletes who were going to compete in reactive environments, it seemed to make them feel better to focus on relaxing and distractions (‘‘The night before I can’t do much, except try to relax a bit, try to drink a bit of water, so you need to get yourself settled in,’’ Bart, boxing), as they felt the strategy would be decided by the opponents they would be facing, so it is unpredictable and stressful (‘‘I’m very tense, because I don’t know what to expect. I don’t know who I’m playing, I don’t know what division I’m going to be,’’ Bart, boxing). Some athletes competing in static environments preferred instead to imagine some technical details before the competition (‘‘The night before I can go through it in my mind, check the points in the forest that will be difficult or challenging, and use that to my advantage,’’ Amy, track), feeling that if they left it until the time of the competition, this might break up their performance (‘‘I find if you come [to the competition] too bogged down, and think about what you have to do then, and say, ‘Oh, I’ve got to stick with this person,’ or ‘I want to get this place or this time,’ it’ll throw you off,’’ Edward, track).

Discussion

The present research explored the implications of a mixed methods analysis of qualitative data in an investigation of athletes’ use of different imagery construal levels in competition. We first conducted thematic analyses on interviews (Braun & Clarke, 2006; Patton, 2014) in order to understand the individual experiences of the athletes and their imagery use, and then progressed with a quantitative analysis of the qualitative codes, in order to extract patterns from the athletes’ responses with regard to their use of imagery construal levels related to the dimension of time and their sport type.

While quantitative methodology has, in some previous mixed methods research, been applied to qualitative data, its empirical application is scarce, and when used, numerical counting is predominantly applied (Fakis et al., 2014). In our example, a mixed methods analysis generated a more comprehensive interpretation of our qualitative data and provided a clearer pattern of the use of different levels of construals among athletes. The implication of mixed methods analysis for mixed methods research is that combining both qualitative and quantitative analysis of a single data set can yield enhanced understanding of the source qualitative data. We showed that, by integrating the two, we achieved better validation for our findings by applying statistical methods to exploratory hypotheses preformed by qualitative analysis. We also generated some new hypotheses for further research by using qualitative data to explain statistical findings that would otherwise be left unexplained.

Transformation of data (here: qualitative to quantitative) can thus serve not just to facilitate merging of qualitative and quantitative data sets but also to enhance understanding of a single type of data. Authors who have collected both qualitative and quantitative data, and use data transformation for merging, should consider two analyses: one, compare their interpretation of the qualitative data with its corresponding transformed quantitative data, and two, compare this quantitative, transformed data with their collected quantitative data to further validate their findings.

Construal Levels in Athletes' Spontaneous Imagery

Results from our methodologies suggest that a general framework of construal levels can be applied to athletes' spontaneous imagery, as all athletes described using concrete and abstract imagery in and around their competitions. Concrete imagery included representations of strategies and techniques, using imagery to perform mental error corrections, and to prepare for competition. Abstract imagery included a focus on desirability as a form of motivation, symbolic representations, regulation of affect, arousal and mastery, and verbal representations in one's mind. We found that imagery construals differed by experienced effectiveness between athletes when split by the factors of sport type and point in time, suggesting that whether an athlete imagines being the best or crossing the finish line first depends on what time they are imagining it, and what sport they perform. In particular, we found that during competitive performance, athletes performing in reactive environments more often reported concrete imagery to be helpful, while athletes performing in static environments reported more often abstract imagery being helpful.

With respect to the underlying processes responsible for these effects, previous studies of CLT can provide clues as to how construal level might affect performance. On one hand, abstract construals can inhibit speed of processing in situations where the task heavily draws on cognitive resources. It is hypothesized that active focus on implementation intentions impairs automatic action (Wieber et al., 2014). For athletes from static sports who rely more on execution of automatic behaviors, such as a putt in golf or a discus throw, using concrete imagery (which often has a focus on implementation details) would be more debilitative than abstract imagery which focuses on goal intentions, and increases motivation and self-control (Freitas, Gollwitzer, & Trope, 2004). For tasks in which predictions of future events are important, for example, in reactive environments, concrete imagery might reduce prediction biases and increase attention to detail (Nussbaum et al., 2003; Wakslak, Trope, Liberman, & Alony, 2006).

Another significant finding from our data suggests that the aforementioned pattern could be reversed for the experience of imagery on the day or morning before the competition; in particular, athletes performing in static environments reported concrete imagery to be more helpful on the day or morning before the competition, while athletes performing in reactive environments seemed to prefer abstract imagery at this time. As mentioned, an integration of qualitative data here suggests this might be the case because reactive environments are unpredictable before a competition begins. A focus on implementation details could be considered a waste of resources which might be better spent on motivational or affective processes, such as controlling one's anxiety. On the other hand, performance in a static environment could benefit from strategizing or additional error correction imagery. This would be in line with aforementioned mechanisms of CLT, as an increased attention to detail at this point would not interrupt automated processes for these athletes and could be used as additional preparation or practice without exerting too much energy.

Content and Functionality of Spontaneous Imagery

Paivio's (1985) imagery framework does not make a clear distinction between content (*what is being imagined?*) and functionality (*what is the purpose of it?*), possibly because in concrete imagery, one informs the other in such a way that they are difficult to separate. More recent frameworks (e.g., Bernier & Fournier, 2010; Fournier et al., 2008) report five functions of directed imagery: strategies/tactics, technical improvement, evaluation, psychological state management, and focus, which are presented on one dimension. While our investigation fits a two-dimensional construal level framework, we find intersections in terms of concrete imagery; athletes reported applying the first three of Bernier and Fournier's (2010) functions (termed strategies, technical details, and error corrections in our framework). The lack of preparation imagery in Bernier and Fournier (2010) might be due to it not being directly related to the performance aspect. In terms of abstract imagery, we find functionality to be more ambiguous: Psychological regulation overlaps with psychological state management. Imagery that contains representations of desirability, verbal, and symbolic representations cannot be clearly functionally categorized as any of their functions. This could be due to a lack of a motivational component in their framework. This can be more readily found in Paivio's (1985) framework, which mainly distinguishes between cognitive and motivational mental representations. Imagery reported as part of our desirability and verbal representation categories reflect well in Paivio's motivational function of imagery.

Finally, athletes in our study did not go into detail about the purpose of symbolic imagery, which was reported in a more content-focused manner. Symbolic representations have not, to our knowledge, been a topic in sport imagery research before. Future investigations will show whether they are incidental to spontaneous imagery or whether athletes use them with a particular purpose in mind. They might yield some benefits, such as improve an athletes' ability to switch attentional focus from near to far, a mechanism already inspected in the construal level literature when abstract imagery is induced (Liberman & Förster, 2009).

Limitations

Philosophical arguments have been made with regard to the quantitizing of qualitative data, in particular with open-ended interviews where the number of responses and their direction is only minimally influenced. Instances might be missing from our data that might exist in experience and vice versa (Sandelowski et al., 2009). We attempted to validate our coding procedure by statistical analyses of all applied codes on our data, to show that our codes were well-balanced for our sample across all participants, that is, box plot analyses showed no significant outliers in terms of codes applied per participant, or when split by sport type. There was also no significant differences in the frequency of concrete and abstract imagery experiences across all participants, only when split by sport type. This could be seen as first supportive information of this difference being a reflection of the athletes' experiences and not an artifact of quantization.

Second, our participant number is acceptable for qualitative interpretation, but low for statistical analyses. While for most of our data, parametric demands of normality and homogeneity of variance were met, we supplied results from permutation testing to solidify findings due to possible violations of other parametric assumptions, such as sphericity. While this solution increases the validity of our findings, it is not a perfect solution; it has been argued that permutations tests are not necessarily generalizable due to their lack of parametric assumptions about the general population from which the sample is drawn (Good, 2000). As we could not validate our coding by member checks, and as the sample size is low, findings from our analyses in general should be interpreted with care. They need to be replicated with bigger samples and experimental designs that might include interventions targeting the cognitions of athletes.

To add to the question of generalizability, our sample consisted of only elite-level athletes. Skill level is a factor that needs to be further explored with regard to imagery construal level. Previous research suggests that experts in general benefit more from imagery than novices (Beilock & Gonso, 2008). Some studies have found that novices use less imagery, in particular imagery related to strategy and technique, but that its use can be increased and might be helpful to their performance (Arvinen-Barrow, Weigand, Thomas, Hemmings, & Walley, 2007; J. Cumming & Ste-Marie, 2001). Since these aspects seem to be part of concrete imagery, manipulating spontaneous imagery to induce a concrete construal level in novices might be helpful to them in instances where directed imagery training is not applicable.

It is at the same time possible that our findings do not apply at all to novice athletes, as unlike many elite athletes, they might have no previous experience with directed imagery rehearsal. Elite athletes could be using this previous knowledge spontaneously without consciously considering it, while novice athletes might experience different types of spontaneous imagery than the ones described here.

Contributions and Further Research

To our knowledge, the manner in which we applied codings to the text and used co-occurring code frequencies to implement statistical analyses is novel and advances previously similar approaches of quantization. We present a practical way to apply permutation testing as proposed by Collingridge (2013) to facilitate statistical data analysis even with small sample sizes that violate parametric assumptions. Additionally, ours is one of the first articles in sport psychology to actively integrate qualitative and quantitative methodology instead of using them in a parallel or subsequent manner (Sparkes, 2015), an approach that is rare even in social science research in general (Fakis et al., 2014). Researchers are invited to apply this methodology on their data with the provided materials, in other to test the validity of the method.

Aside from the methodological advance, our findings also open some new avenues for sport imagery research. Spontaneous imagery in sport has not been extensively studied, nor manipulated with means of short-term interventions that change cognitive information processing. The application of construal level manipulations is frequently used in social psychological research in order to change cognitive processing of participants in a short-term manner (for a review, see Trope & Liberman, 2010), and should be considered as a possible way to focus the imagery of athletes in a beneficial way, for example, by preventing debilitative imagery in sport on occasions such as penalty shootings or prior to the start of an important point in a tennis match. The way construal levels are represented in imagery should also be further researched, with a focus on other times during the season outside of direct competitions, across athletes in various team sports, and in other athlete populations of different skill levels.

Appendix A

Table A1. Example Questions for Each Interview Section.

Interview section	Example question asked
(1) Introduction	"Tell me about your sport?"; "How long have you been playing?"; "How many competitions have you participated in?"
(2) General	"How do you usually practice?"; "How do you prepare for competition?"
(3) Before competition + follow-up questions	"I would like you to think back to a competition you remember very well. If you think back to a day before, or the morning before arriving at the competition, what happens then? Can you describe what goes through your head at this time, for example, what kind of imagery?" "How helpful or effective do you think is this for your performance?"
(4) In competition—before performance + follow-up questions	"If you think back to the time during competition, the beginning of the competition for example, what happens then? Can you describe what goes through your head at this time, for example, what kind of imagery?" "How helpful or effective do you think is this for your performance?"
(5) In competition—while performing + follow-up questions	"If you think back to the time during your performance, while you are running/in the match, what is happening? Can you describe what goes through your head at this time, for example, what kind of imagery?" "How helpful or effective do you think is this for your performance?"

Table A2. Parametric Tests.

Co-occurring codes	Shapiro–Wilk normality	Bartlett's K^2
Time points of imagery use	$W = .98$, $p = .56$	$K^2 = 5.07$, $df = 9$, $p = .83$
Effectiveness of imagery	$W = .98$, $p = .86$	$K^2 = 2.65$, $df = 3$, $p = .45$
Construal level of imagery	$W = .96$, $p = .44$	$K^2 = 1.26$, $df = 3$, $p = .74$
Construal level and effectiveness of imagery	$W = .97$, $p = .23$	$K^2 = 1.15$, $df = 7$, $p = .18$
Construal level of unhelpful imagery	$W = .98$, $p = .94$	$K^2 = 0.002$, $df = 3$, $p = 1$
Construal level of helpful imagery	$W = .96$, $p = .52$	$K^2 = 1.57$, $df = 3$, $p = .14$
Construal level of imagery at all time points	$W = .97$, $p = .28$	$K^2 = 2.57$, $df = 7$, $p = .92$
Construal level and effectiveness of imagery, all time points	$W = .95$, $p = .002$	$K^2 = 31.95$, $df = 15$, $p = .007$
Construal level and effectiveness before competition	$W = .98$, $p = .59$	$K^2 = 2.53$, $df = 7$, $p = .92$
Construal level of helpful imagery before competition	$W = .96$, $p = .55$	$K^2 = 0.056$, $df = 3$, $p = .99$
Construal level of unhelpful imagery before competition	$W = .97$, $p = .72$	$K^2 = 0.753$, $df = 3$, $p = .86$
Construal level and effectiveness during performance	$W = .97$, $p = .34$	$K^2 = 4.203$, $df = 7$, $p = .76$
Construal level of helpful imagery during performance	$W = .96$, $p = .54$	$K^2 = 0.643$, $df = 3$, $p = .88$
Construal level of unhelpful imagery during performance	$W = .96$, $p = .45$	$K^2 = 0.288$, $df = 3$, $p = .96$

Note. df = Degrees of freedom. Results of Shapiro–Wilk normality tests and Bartlett's K^2 test for homogeneity of variances on residuals of all factor combinations reported in the article, that is, mixed design analyses of variance with coded text units as within factor and sport types as between factor.

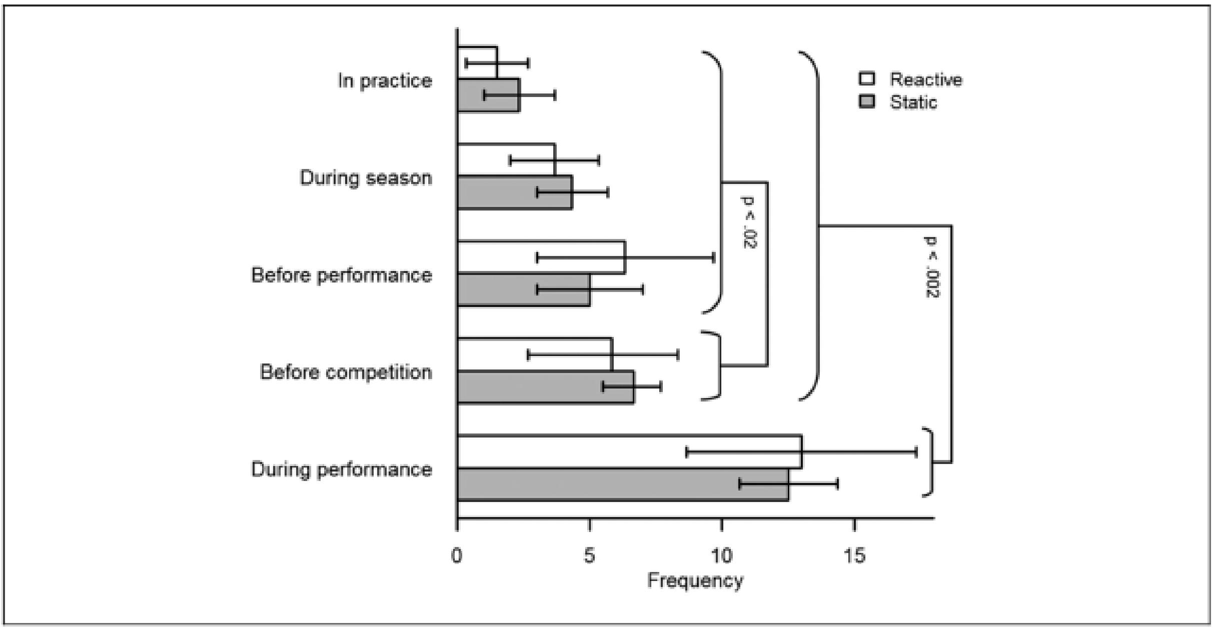

Figure A1. Reported imagery codes over 5 time distances in and around competition. Frequency is the number of coded text units on average per participant. No differences between sports (light and dark bars) were found. Reported permutation *p* values refer to individual comparisons between each of the codes (combined for both sport types). Error bars represent bootstrapped 95% confidence intervals.

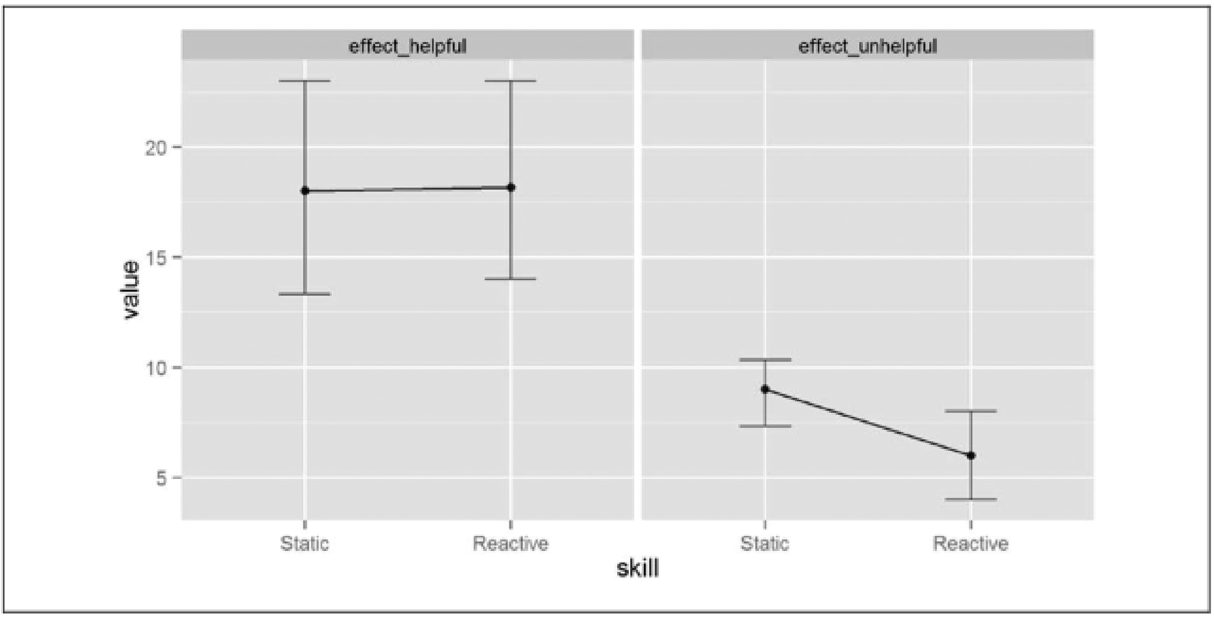

Figure A2. Interaction of effectiveness and sport type. Value refers to frequency of code per participant. Skill refers to sport type. Error bars are bootstrapped 95% confidence intervals.

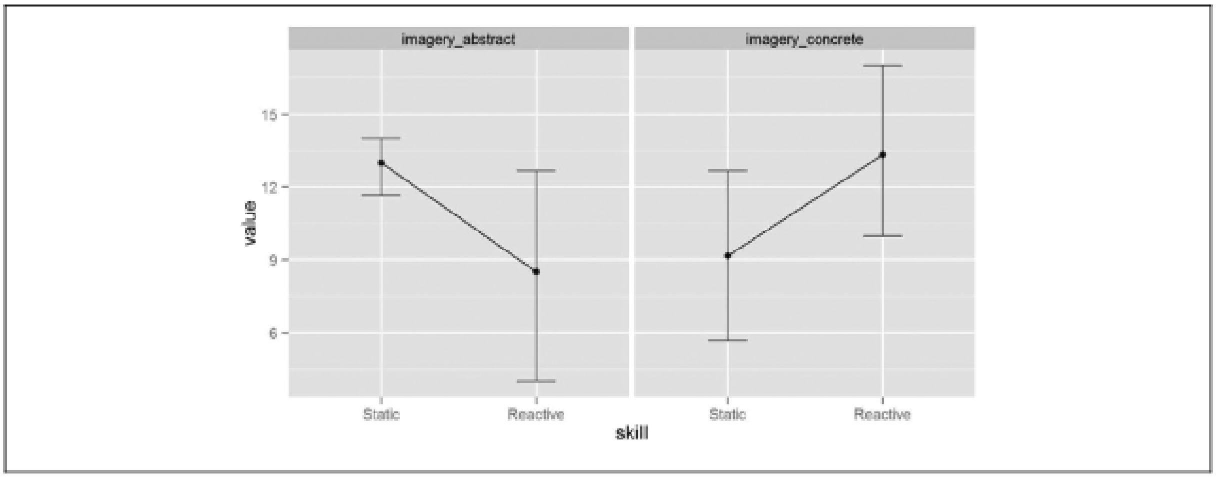

Figure A3. Interaction of imagery construal level and sport type. Value refers to frequency of code per participant. Skill refers to sport type. Error bars are bootstrapped 95% confidence intervals.

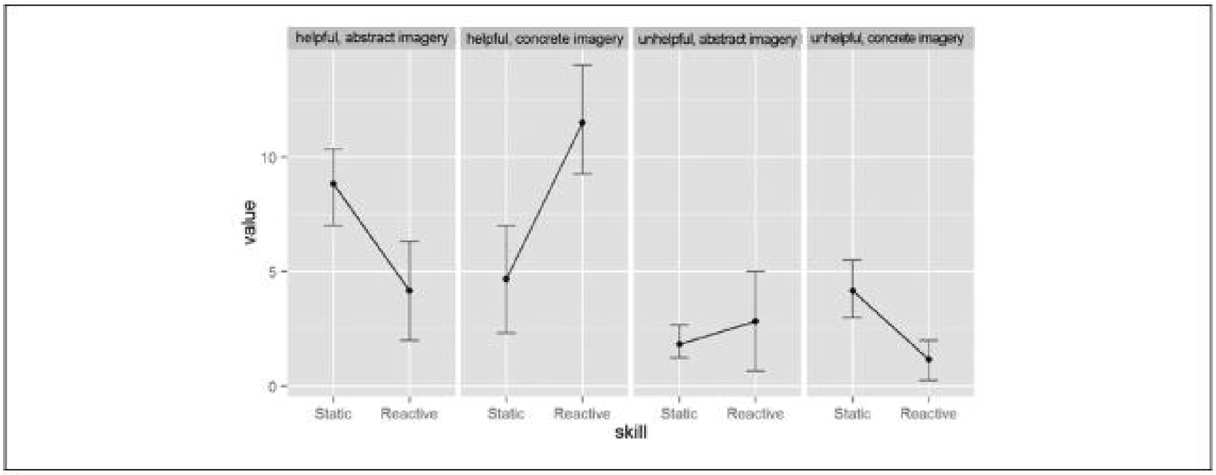

Figure A4. Interaction of imagery construal level, effectiveness, and sport type. Value refers to frequency of code per participant. Skill refers to sport type. Error bars are bootstrapped 95% confidence intervals.

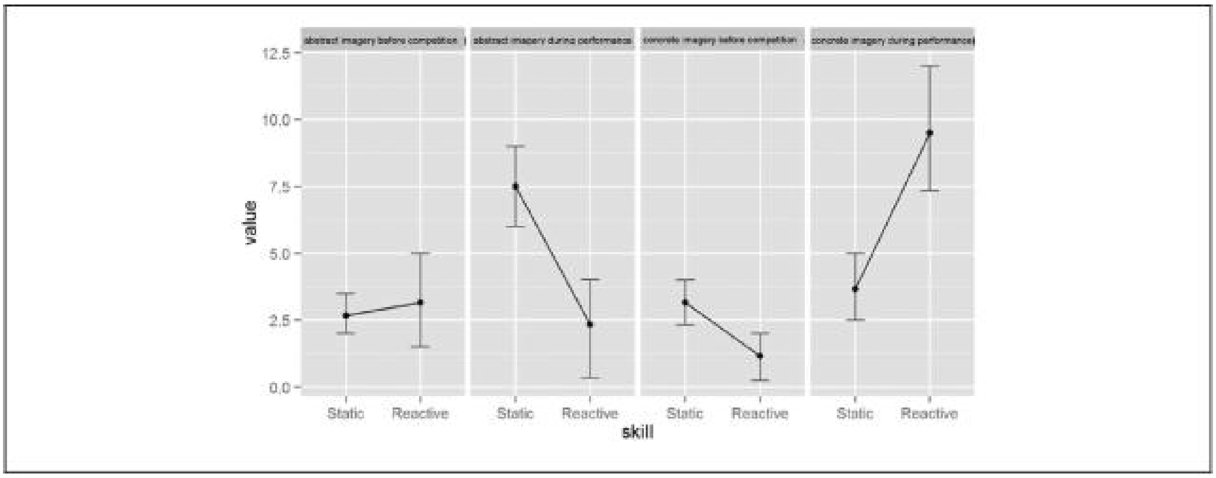

Figure A5. Interaction of time, imagery construal level, and sport type. Value refers to frequency of code per participant. Skill refers to sport type. Error bars are bootstrapped 95% confidence intervals.

Appendix B

Coding and Analysis Example

Step 1: Co-Occurring Coding

In this step, we mark thematically relevant text units with all codes that suit this text section. In RQDA, codes are highlighted in different colors, as can be seen in the examples below. Each text unit that has been marked to belong to a specific code turns blue when we click on the code within RQDA.

All coded text units have their own lengths, so they can end before another coded section starts, or intersect with other coded sections (end in the middle of text units that also have other codes applied to them). In Example 1, *time_before_competition* applies to the entire text segment (''I was . . . same time''), while *imagery_tactics* ranges from ''I actually . . . strategies.'' *Imagery_tactics* and *imagery_concrete* overlap completely.

Q: If you imagine yourself going to that competition, the evening before, the night before, can you describe what went through your mind in that time span?
A: I do remember - <time_before_competition>I was a little nervous and I couldn't really sleep and I was excited, and also<imagery_tactics> <imagery_concrete><imagerypersp_internal><imagery_near_now> I actually sort of imagined the mental game a little bit? So I actually imagined myself playing the opponent? I certainly know the opponent I'll be facing, because I played them before, so I sort of imagined physically, me and my opponent physically playing each other, how each point, will affect it, the possibility, how you serve, each move and an idea of what'd be encountered. I can physically imagine how it would turn out, how it how it would be, right? So I may imagine some of these strategies. <imagery_abstract><affect_arousal>I was also just just pretty nervous. But really excited at the same time.

<effect_unhelpful><time_competition_in_action><imagery_abstract><affect_arousal>I played very aggressively, I don't know why. I was playing really aggressively and actually losing a lot of the points I would usually win, and should have gotten. I lost to him quite quickly, and badly. I wasn't really in my - in the game? I wasn't really thinking strategically? I was so aggressive, I missed so much on my points and opportunities.

Q: So you would say it's more helpful for people during the game to actually think of the strategic points?
A: <time_competition_in_action><imagery_concrete><imagery_tactics><effect_helpful> Depends on how good an opponent you're playing. If you're playing a player who is better, like he was better than me at the time? And at that time, if you don't play strategically, he's very well trained for the type of environment, so he will stay who he is, and I'm very nervous. I think you need to play - I think it's better to play strategically?

Example 1: Table Tennis Player

Q: Can you imagine yourself going into a comeptition, like the day before or the night before, can you explain to me a little bit what goes through your head?

A: <time_before_competition><imagery_concrete><effect_helpful> <imagerypersp_internal>I try to focus on the literal thing inside my head that I can hear. On the rhythm, it has a bom-ba-dom that is the rhythm of discus. That's one thing I try to put in my head.

<imagery_concrete><time_before_competition><imagery_technique><effect_helpful> Then, I think about little things that coaches tell you, like, "Keep the disc behind your butt". "Keep your arm behind you", "Keep left arm over left thigh". There is so many little things that they say and they say it over and over and over again, because they're so important. Those are the things that I try to put in my head.

<imagery_technique><effect_helpful><time_before_competition><imagery_concrete>I even do a little footwork on the floor, just to get myself mentally prepared. So before the competition I think of the technical details.

Q: Can you describe to me what goes through your head in that time, before, as you imagine yourself for your first throw.

A: <time_competition_before_action><effect_helpful><imagery_distant_future> <imagerypersp_objectoriented><imagery_abstract><affect_arousal>For my first throw, it's totally calm, usually calm. You have to retrieve somebody elses before you can throw your own, so it's a nice little break where you have to run out there and retrieve, and you have to focus on that for just a second. It's a good distraction.

<effect_unhelpful><time_competition_before_action><affect_arousal>And you come back and right before you throw, it's pretty nerve-wracking, I'd say. There's an anxiety part to that. The first throw is usually okay, because you usually know that you have six more and it's gonna be ok. Nearing the end, it's usually pretty stressful.

Example 2: Thrower

Taunting in this sport can be really important. <effect_unhelpful> <time_competition_in_action><imagery_none><affect_arousal>Sometimes opponents taunt each other because that increases the aggression, and when you increase your aggression, you have less time to think; and when you have less time to think, you make more mistakes.

There was this person that wouldn't stop putting his tongue out during the match. It was very strange, and very dangerous, because if he gets punched, he can sever his tongue. But he was really stupid in that way, and he would, you know, say things when you're up close, just to increase that animal instinct, so to speak. In you.<effect_unhelpful> <time_competition_in_action><affect_arousal> <imagery_none>And that's when you lose it, you get really angry, and really aggressive, and you start making so many mistakes, and you, just in a flash second you lost a fight because you gave into his stupidity.

Example 3: Boxer

So, in golf, it is kind of a interesting dichotomy and <imagery_tactics> <imagery_technique><effect_helpful><imagery_concrete> <time_competition_before_action>there's a really idealistic perspective there when, before you hit the shot, you are being very analytical and being very logistics and you're looking at how the best way to hit the shot is and the best strategy for the next shot after that and everything that way, so, it's very analytical and you're thinking very intensely that way.

<time_competition_in_action><imagery_concrete><imagery_near_now> <effect_unhelpful><imagery_tactics><imagery_technique><affect_arousal>But if you're still thinking about that when you're actually performing the shot, when you're hitting the shot, that interferes with your natural ability to play and to actually perform. <time_competition_before_action><imagery_tactics> <imagery_technique><effect_helpful><imagery_concrete>So you have to analyze everything, decide on the appropriate shot to hit, <time_competition_in_action><effect_helpful><imagery_abstract><imagery_none>and then accept that and then forget everything and just commit and do that and try and be more automated when you're just hitting it. <time_competition_after_action><imagery_concrete><imagery_technique> <imagery_tactics><effect_helpful>And then you go back to thinking afterwards.

Example 4: Golfer

Step 2: Table Extraction

(the following example is not based on the above text units)

The python scripts provided in Github (https://github.com/robertour/RQDA-to-CSV#python-code) extract .csv files (can be opened in Excel) that hold a list of instances in which codes co-occur (i.e., in which a text unit has been marked by more than one code simultaneously). Below is a screenshot of a table for a simplified example where we attempt to extract all *triple*

	A	B	C	D	E	F	G	H	I	J	K
220		2 - boxing	1	1	effect_negative_imagery_concrete_time_before_competition						
221		2 - boxing	1	1	effect_negative_imagery_abstract_time_in_competition						
222		2 - boxing	1	1	effect_negative_imagery_abstract_imagery_concrete						
223		2 - boxing	1	1	effect_negative_imagery_abstract_time_in_competition						
224		2 - boxing	1	1	effect_negative_imagery_concrete_time_in_competition						
225		2 - boxing	1	1	effect_negative_imagery_abstract_time_in_competition						
226		3 - table te	1	1	effect_negative_imagery_abstract_time_in_competition						
227		4 - Runnin	0	0	effect_negative_imagery_concrete_time_before_competition						
228		4 - Runnin	0	0	effect_negative_imagery_concrete_time_in_competition						
229		4 - Runnin	0	0	effect_negative_time_before_competition_time_in_competition						
230		4 - Runnin	0	0	effect_negative_imagery_concrete_time_before_competition						
231		4 - Runnin	0	0	effect_negative_imagery_concrete_time_in_competition						
232		4 - Runnin	0	0	effect_negative_imagery_concrete_time_in_competition						
233		2 - boxing	1	1	effect_negative_goal_abstract_time_in_competition						
234		3 - table te	1	1	effect_negative_imagery_concrete_time_before_competition						
235		4 - Runnin	0	0	effect_negative_imagery_concrete_time_in_competition						
236		4 - Runnin	0	0	effect_negative_imagery_concrete_time_in_competition						
237		4 - Runnin	0	0	effect_negative_imagery_concrete_time_in_competition						
238		4 - Runnin	0	0	effect_negative_imagery_internal_imagery_external						
239		6 - Runnin	0	1	effect_negative_imagery_concrete_time_in_competition						
240		6 - Runnin	0	1	effect_negative_imagery_concrete_imagery_internal						

co-occurring codes (three codes that appear together). Column B has been assigned to hold the identifier, column C, the reactive/static sport type distinction (1 or 0 respectively), column D, the participant's sex (male is 1), and the triple code combination is written into column E. This allows us to ‘‘count’’ how many times a triple code exists overall, per participant, per sport, and per participant sex.

Step 3: Analysis of Data With R

With a set of scripts in R (the example for triple codes is here: https://github.com/robertour/RQDA-to-CSV/blob/master/R-scripts/codings3.R), we can extract from the .csv file (which holds a table like the one we present above), the frequencies at which the three co-occurring codes have been used, overall, per participant, per sport type, and so on. In the example above, the athlete who is a boxer counts three instances of abstract imagery being reported negative at the time in competition.
It is then possible to analyze frequencies, for example, per participant (column B), who in turn belong to defined group (such as sport type, see column C, or sex, see column D). In our table above, two participants belong to group 1, as they perform reactive sport tasks (boxer, table tennis player), and two participants belong to group 0, performing static sport tasks (runners). As is done with common statistical analyses, differences between groups can then be analyzed, for example, by using an ANOVA or a permutation testing procedure.

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