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Understanding the Microstructure of Practice: Training Differences Between Various Age Classes, Expertise Levels and Sports

Stefanie Hüttermann[1*], Daniel Memmert[1] and Joseph Baker[2]

Abstract: The Deliberate Practice framework proposes conditions for maximizing time engaged in practice in order to facilitate learning and performance improvement (Ericsson, 2007). Certainly, deliberate practice is a highly effortful activity that cannot be sustained for extended periods of time. As a result, a large proportion of athlete training likely contains considerable time in "non-deliberate" practice; however, there are relatively few studies examining the microstructure of individual practice sessions across development. The present study considered coach-led training sessions and investigated time and frequency of deliberate and non-deliberate forms of practice (the latter simply termed "structured practice"). Analyses showed significant differences between athletes of various age classes, expertise levels and sports. The data provide support for the deliberate practice framework and identify avenues for future research.

Keywords:
deliberate practice, structured practice, training observation

Over the past two decades, research on the acquisition of sports skill has highlighted the critical role of training to expertise (see Williams & Ford, 2008 for a review). According to Ericsson, Krampe and Tesch-Römer (1993) the most effective learning occurs during "deliberate practice", which is defined as engagement in a practice activity designed to improve a particular aspect of performance though immediate accurate feedback, opportunities for gradual refinement with repetition after reflection and problem solving. Deliberate practice requires cognitive and/or physical effort, is highly relevant for improving current levels of performance and is relatively low in enjoyment. Studies of sports ranging from individual domains such as wrestling (Hodges & Starkes, 1996) and triathlon (Baker, Côté, & Deakin, 2005) to team domains such as basketball (Helsen, Starkes, & Hodges, 1998) and soccer (Ward, Hodges, Starkes, & Williams, 2007) have reinforced the conclusion that time spent in high quality, deliberate training is a powerful predictor of attainment.

However, deliberate practice, by virtue of the significant effort it requires, cannot be sustained for long periods of time without leading to mental or physical exhaustion (Ericsson et al., 1993). As a result, optimal training design involves balancing the most deliberate practice possible without compromising concentration and effort. This can be a difficult task since the amount of deliberate practice athletes can handle at a given point in their development is highly individual and likely dependent upon the extent of their exposure to deliberate practice in the past. Moreover, some researchers (e.g., Côté, Baker, & Abernethy, 2003; Memmert, Baker, & Bertsch, 2010) advocate that the amount of deliberate practice children and youth are exposed to should be minimal, with a greater emphasis on sport specific play activities that are inherently enjoyable and intrinsically motivating.

[1] *German Sport University Cologne, Germany*
[2] *York University, Toronto, Canada*
[*] *Corresponding author. Institute of Cognitive and Team/Racket Sport Research, German Sport University Cologne, Am Sportpark Müngersdorf 6, 50933 Köln, Germany. Email: s.huettermann@dshs-koeln.de*

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In their review, Côté, Baker, and Abernethy (2007) proposed a continuum of training that placed deliberate play (unstructured, play-oriented activities done in the absence of supervision and corrective feedback, that is, outside of organized sport programs) at one end and highly structured deliberate practice at the other. They also distinguished these from their concept of structured practice (training in organized sport settings designed to improve the current levels of performance but without the rigors of deliberate practice), which fell between free play and deliberate practice. They argued that during early development more time should be spent in deliberate play, with deliberate practice gradually increasing as the athlete develops.

Although studies over the past two decades have provided considerable information about the dynamics of athlete development, much of our understanding is still very general and some (Memmert & Roth, 2007; Starkes, 2000) have argued for increased attention to the microstructure of athlete training (i.e., during individual training sessions). Recently, two studies (i.e., Ford, Yates, & Williams, 2010; Partington & Cushion, 2011) have categorized athletes' training activities into either "training form" (e.g., physical training, technique, and skills practices) or "playing form" (e.g., small-sided/conditioned games). Ford et al. (2010) found that two thirds of practice time was spent in training form activities (similar results were reported by Partington & Cushion, 2011); moreover these practice patterns tended not to change as a function of age or skill of the players coached (Ford et al., 2010). This latter finding seems counter to existing models of athlete development which propose that activities more closely related to deliberate practice (such as training forms) increase with age (c.f., Côté et al., 2007) and skill level (Ericsson et al., 1993). The reason for this difference may relate to the method of categorization used in previous studies; for example, both training and playing forms as defined by Ford et al. (2010) and Partington and Cushion (2011) may be deliberate practice (i.e., effortful training that is highly relevant to improvement) depending on the specific goals of the activity. Moreover "play" is usually seen as an unstructured form of involvement that takes place outside the confines of organized training.

In the current study, we considered developmental differences in organized club training; more specifically, we examined athletes' involvement in deliberate practice versus other forms of training (i.e., structured training as proposed by Côté et al., 2007). We considered both the frequency and the amount of time that young athletes of various age classes, skill levels and sports engaged in deliberate practice and structured practice in their sports clubs. Although Côté et al. (2003) differentiated between structured and deliberate practice there has been no descriptive research regarding how club training content (i.e., structured practice and deliberate practice) changes throughout development, particularly with different age groups, skills and sports. The present study was designed to explore this research gap using three short studies.

Study 1: Involvement in Structured and Deliberate Practice Among Different Age Groups

Several studies have considered the control and organization of athlete training during childhood and adolescence (e.g., Baker, Côté, & Abernethy, 2003; Soberlak & Côté, 2003). Generally, these studies propose that training should be structured based on age to ensure that athlete development coincides with phases of biological and psychological growth and maturation. According to this perspective, the early phase of an athlete's career in most sports (gymnastics is one exception, see Law, Côté, & Ericsson, 2007) should focus on deliberate play-like involvement (see e.g., Côté, 1999) with a gradual increase in deliberate practice with advancing age. However, previous studies have typically included all organized sport training collectively without distinguishing between different types (deliberate practice versus other forms of practice) and locations of training (e.g., at the club level versus at the representative level). For example, Soberlak and Côté (2003) proposed that professional ice hockey players spent progressively more time in deliberate practice activities as they became more skilled; however, they grouped

all forms of organized ice hockey training as deliberate practice and compared this to time spent in deliberate play (i.e., unorganized, flexibly structured activities).

In the studies that follow we examined training done at the sports club and distinguished between structured and deliberate practice. In the first study, we examined differences in the quantity and duration of structured and deliberate practice between pre-adolescent and adolescent basketball players. According to the training recommendations advocated by Côté et al. (2007) that younger athletes perform less deliberate practice than older athletes, we hypothesized that younger players (8–10 years of age) would report a greater proportion of time spent in structured practice and less in deliberate practice than older players (12–14 years of age).

Method

Participants. Two male basketball teams (younger/older) participated voluntarily and without remuneration. The 14 players of the younger team were between 8 and 10 years of age ($M = 8.97$, $SD = 0.67$) and the 13 players of the older team were between 12 and 14 years of age ($M = 13.06$, $SD = 0.56$). All were members of a local basketball club playing in the first national division of their respective age classes. The training goals of both teams were almost identical. In addition to the individual improvement of each player, both teams aimed to be among the top three teams in their division. Both coaches possessed the second highest basketball license in Germany. All participants provided informed consent before commencing the study.

Materials. Duration of time spent in the various forms of training was measured using an observation form developed specifically for use in the current study. It allowed the observers to view the elements of a training session and determine the amount of time spent in structured practice and deliberate practice. Although this approach is similar to the one used by Ford et al. (2010) and Partington and Cushion (2011) we used these deliberate practice versus structured practice instead of playing form versus training form since these former terms are more relevant to existing models of skill acquisition and athlete development. Highly effortful activities specifically designed to improve the current levels of performance were classified as deliberate practice (cf. Soberlak & Côté, 2003; Helsen et al., 1998). In contrast, activities that did not meet the criteria of deliberate practice (e.g., if they were "game oriented" or "play-like") were classified as structured practice. Athlete enjoyment was not considered in making these distinctions due to the lack of consensus among researchers on this criterion of deliberate practice (c.f., Helsen et al., 1998; Hodges, Kerr, Starkes, Weir, & Nananidou, 2004). The observer form was made up of a table composed of five columns; number of exercise, content of exercise, structured practice, deliberate practice and exercise duration. One row of the table was used for the observation and analysis of each completed exercise the team performed. While in the first column the corresponding number of the respective exercise was listed, in the second column, the exercise was described (e.g., "free throw", "layup", "1 on 1 playing situation"). The observers then subjectively assessed the exercise and marked it with a cross in the third ("structured practice") or fourth ("deliberate practice") column. For example, the following activities were categorized as structured training: eight ball contacts per team, king of the court, 5 vs. 5 games, 2 vs. 2 games, games without the basket, and games on one side of court. In contrast, the following activities were categorized as deliberate practice: passing on one leg, layup, free throw, lockstep, sprints, and blocking practice. In the fifth column, observers noted the duration of the exercise in minutes and seconds. By way of example (table 1), exercises like practicing free throws in the absence of an opponent were assigned to deliberate practice while exercises like "scrimmage" games (e.g., "3 vs. 3") with play-like characteristics were considered as structured practice.

Table 1. Example of an Observation Form Listing Two Different Exercises, One of Deliberate Practice (Free Throw) and One of Structured Practice (3 vs. 3)

Number of exercise	Content of exercise	Structured practice	Deliberate practice	Exercise duration [min]
1	Free throw		X	15.00
2	3 vs. 3	X		20.00

Procedure. Over a four-week period, five random training sessions were observed for both participating teams. The examination took part in December and January – in the middle of the season. For each training session, two observers conducted assessments independently. Both observers were sports students possessing trainer certifications and were active as players and coaches in the sport under examination. During the training sessions there was no communication between the observers and any of the coaches, players or trainers. Thus, observers rated the training sessions independently and, as a result, their evaluations can be verified to determine inter-rater agreement.

Data Analysis. All training observations were categorized as either structured practice or deliberate practice, along with the duration of each category. Both observers showed excellent agreement in their classification of structured and deliberate practice as well as in the measurement of the different exercises durations. The intraclass correlations were above the crucial limit of .90. The observations across the ten training sessions (five training sessions per team) were included in the statistical analysis with the number of exercises of structured practice and deliberate practice of the separate teams analyzed using chi-square. Additionally, the duration of time spent in structured practice and deliberate practice was analyzed using a 2 (younger team versus older team) x 2 (structured practice versus deliberate practice) analysis of variance (ANOVA).

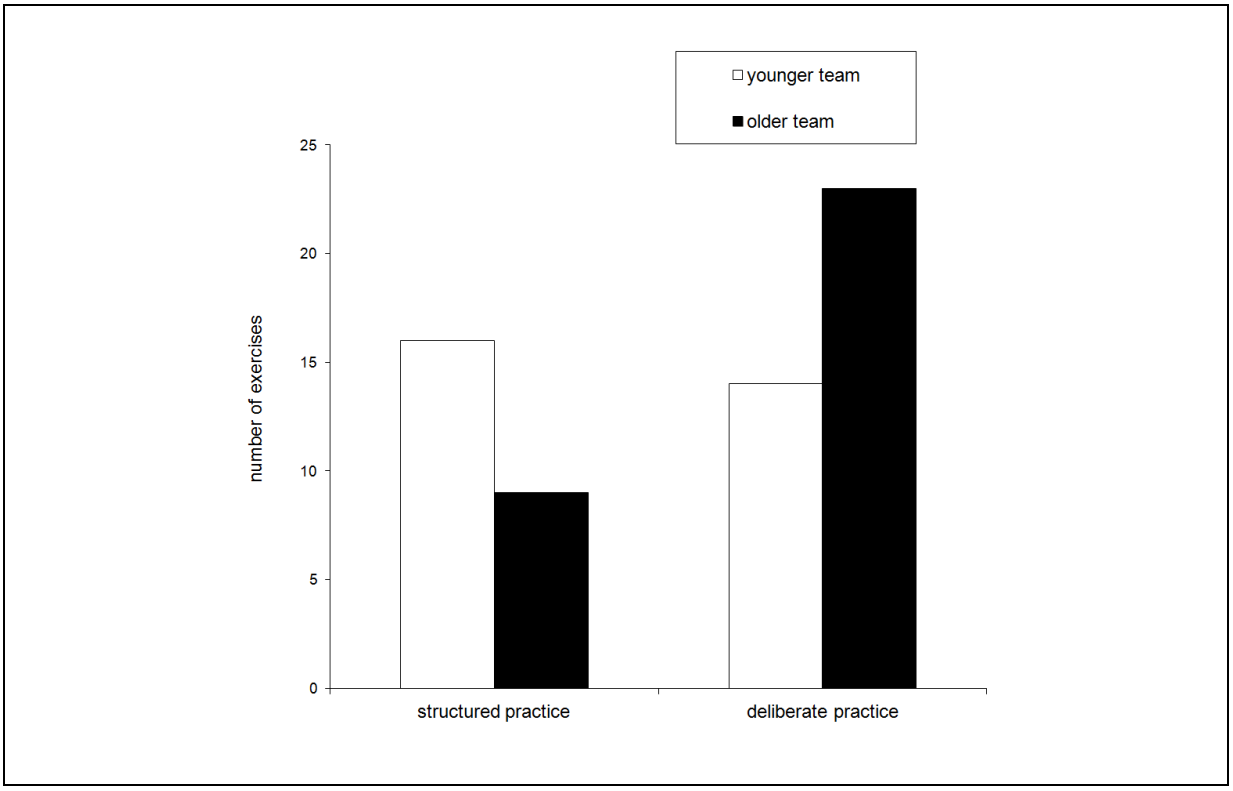

Figure 1. Number of structured practice and deliberate practice exercises for the basketball teams (younger team aged 8–10 years; older team aged 12–14 years) in Study 1.

Results

Chi-square analyses revealed a significant difference between the teams on number of exercises of structured and deliberate practice, $\chi^2(1) = 4.089$, $p < .05$. Across the five training sessions the younger team performed 16 structured practice exercises and 14 deliberate practice exercises. Conversely, the older team performed 9 structured practice exercises and 23 deliberate practice exercises (see figure 1).

There was also a significant difference between the mean duration of structured and deliberate practice exercises, $F(1, 58) = 6.336$, $p < .05$, $\eta^2 = .098$. In total, the teams implemented structured practice exercises for an average of 14.92 minutes ($SD = 6.59$) and deliberate practice exercises for an average of 10.65 minutes ($SD = 6.87$). ANOVA yielded neither a significant effect of teams, $F(1, 58) = .427$, $p = .516$, nor a significant group x number of exercises interaction effect for the factor exercise duration, $F(1, 58) = .699$, $p = .407$. Exemplified in figure 2, the duration for the structured practice exercises was an average of 13.94 minutes ($SD = 7.31$) for the younger team and 16.67 minutes ($SD = 5.00$) for the older team while the duration for the deliberate practice exercises was an average of $M = 10.86$ minutes ($SD = 4.83$) and $M = 10.52$ minutes ($SD = 7.97$) for both teams respectively.

Discussion

This first study examined differences in training structure between two different age groups at similar levels of competition, specifically the amount and duration of time spent in structured versus deliberate practice. As expected, younger basketball players performed more structured and less deliberate practice exercises than older basketball players. For both groups, there was a greater duration of time spent in structured than deliberate practice; however, there was no interaction between these variables (i.e., both groups spent more time in structured than deliberate practice), which was counter to our hypothesis that older athletes would not only perform more exercises focusing on

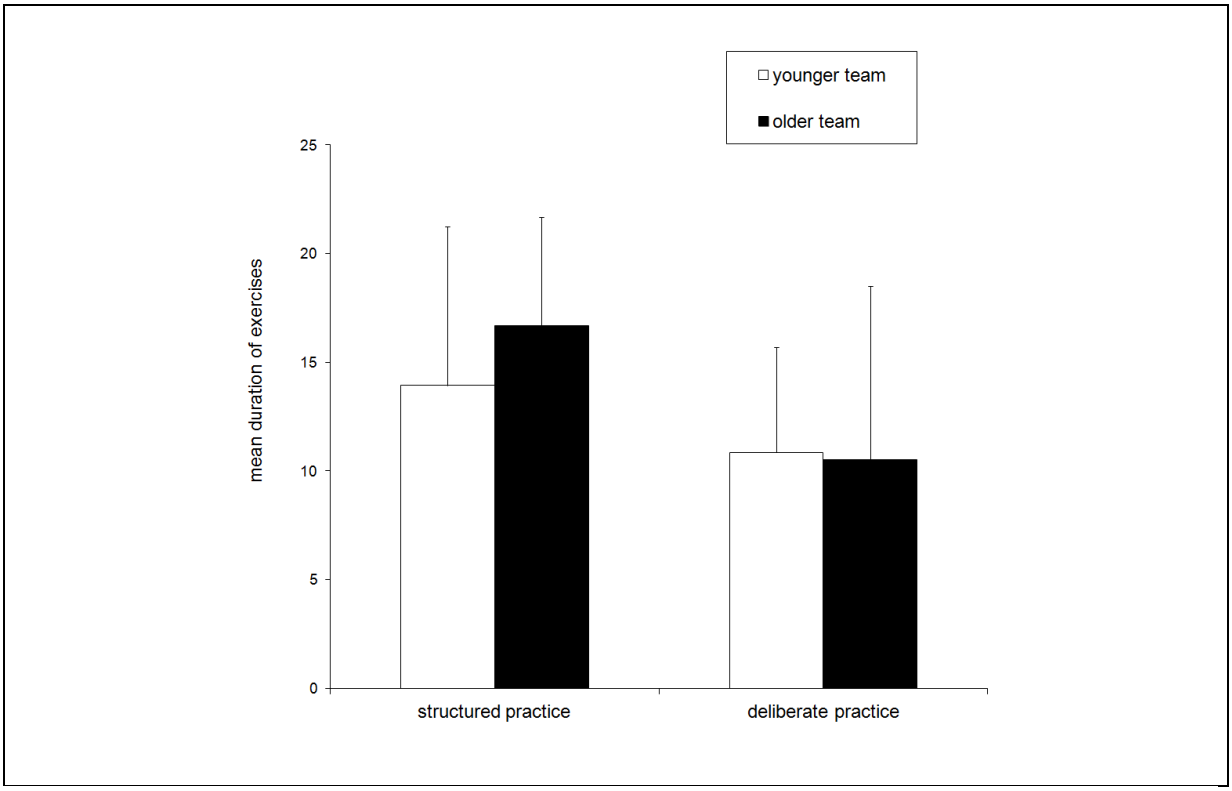

Figure 2. Average duration of structured practice and deliberate practice exercises for the basketball teams (younger team aged 8–10 years; older team aged 12–14 years) in Study 1 (error bars represent the standard deviations).

deliberate practice, but this training difference would be reflected in a greater proportional duration in structured versus deliberate practice. It is possible that the age groups were not distinct enough to identify the training differences proposed by Côté (1999) and colleagues (Soberlak & Côté, 2003). The younger athletes in the current study would be in the middle of the "sampling years" as delineated by Côté and colleagues' Developmental Model of Sport Participation (Côté et al., 2007) while the older athletes would be either ending the sampling years or entering the specializing years. Future research may wish to compare athletes at more discrepant stages of development (e.g., between the sampling years and the investment years in Côté et al.'s model) to confirm that time spent in structured and deliberate practice differs by age.

Study 2: Involvement in Structured and Deliberate Practice Among Different Expertise Levels

Study 1 considered differences in structured and deliberate practice within a single sport performed by athletes at similar levels of competition but different ages. In Study 2, we examined differences in training structure (i.e., structured practice and deliberate practice) for similar aged athletes from a single sport but at different competition (i.e., skill) levels. According to Ericsson et al. (1993), deliberate practice is directly proportional to the achieved level of performance; therefore, by considering two similar aged teams from the same sport, we can examine whether teams playing at higher performance levels spend a greater amount of their training time in deliberate practice and less in structured practice compared to a team playing in a lower-division.

Method

Participants and Materials. Two male soccer teams (high expertise, low expertise), recruited from the soccer departments of two local sports clubs, participated voluntarily without financial payment. The examination took part in December – during the last games before the winter break – as well as in the beginning of January – during the winter break. The high expertise team, with a mean age of $M = 15.52$ ($SD = 0.50$), typically trained with 25 players while the low expertise team, with a mean age of $M = 15.66$ ($SD = 0.48$), normally trained with 20 players during a training session. The high expertise team played in the first division of the national youth league; the low expertise team played in the ninth division of the national youth league. Hence, both teams had competitive playing experiences but different expertise levels. Furthermore, the goals of each team were different; while the high expertise team wanted to become champion of their division the low expertise team was focused on steady exercise and a sense of communal spirit. Coaches both possessed the third highest soccer license. All athletes provided informed consent to participate in this study.

Procedure. Observation was conducted using the same method as in Study 1. Examples of activities rated as structured practice in this study included 5 vs. 5 games, games with just one goal, games on one side of court, 1 vs. 2 player games, and games on smaller than normal courts, while activities categorized as deliberate practice included passing and shooting drills, practicing feints, heading after rotation, dribbling, and free kick practice among others.

Independent of one another, two observers assessed four different training units of both participated teams. Again, observers, players and coaches did not communicate with each other during data collection.

Data Analysis. The observations of all eight training sessions (four training sessions per team) were included in the overall evaluation and statistical analysis. However, four out of a total of 86 exercises could not be clearly assigned to one of the categories (structured practice versus deliberate practice) and were removed from further analyses. As in Study 1, observers' classification of structured and deliberate practice showed outstanding

agreement (after the four un-categorizeable exercises were removed), with intraclass correlations above .90. The number of exercises of structured and deliberate practice for the separate teams was statistically analyzed using chi-square and the duration of different types of exercises were submitted to a 2 (high expertise versus low expertise) x 2 (number of exercises of structured practice versus deliberate practice) ANOVA.

Results

Interestingly, the analysis showed no significant mean difference between the teams for the number of exercises, $\chi^2(1) = .020$; $p = .887$. Figure 3 presents the number of structured practice and deliberate practice exercises for both soccer teams. During the four training sessions, the high expertise team conducted 22 structured practice exercises and 26 of deliberate practice while the low expertise team performed 18 structured practice exercises and 20 of deliberate practice.

The ANOVA revealed neither a significant effect of team, $F(1, 82) = .015$, $p = .901$, nor a significant difference between the mean duration of structured practice and deliberate practice exercises, $F(1, 82) = 1.875$, $p = .175$. In total, the teams performed structured practice exercises for an average of 11.95 minutes ($SD = 7.91$) and deliberate practice exercises for an average of 10.41 minutes ($SD = 5.52$). There was a significant group x number of exercises interaction effect for exercise duration, $F(1, 82) = 6.540$, $p < .05$, $\eta^2 = .074$. As presented in figure 4, the average exercise duration for the structured practice exercises was $M = 10.23$ minutes ($SD = 5.66$) for the high expertise team and $M = 14.06$ minutes ($SD = 9.76$) for the low expertise team. Conversely, the average exercise duration for deliberate practice exercises was $M = 11.92$ minutes ($SD = 4.91$) for the high expertise team and $M = 8.45$ minutes ($SD = 5.75$) for the low expertise team.

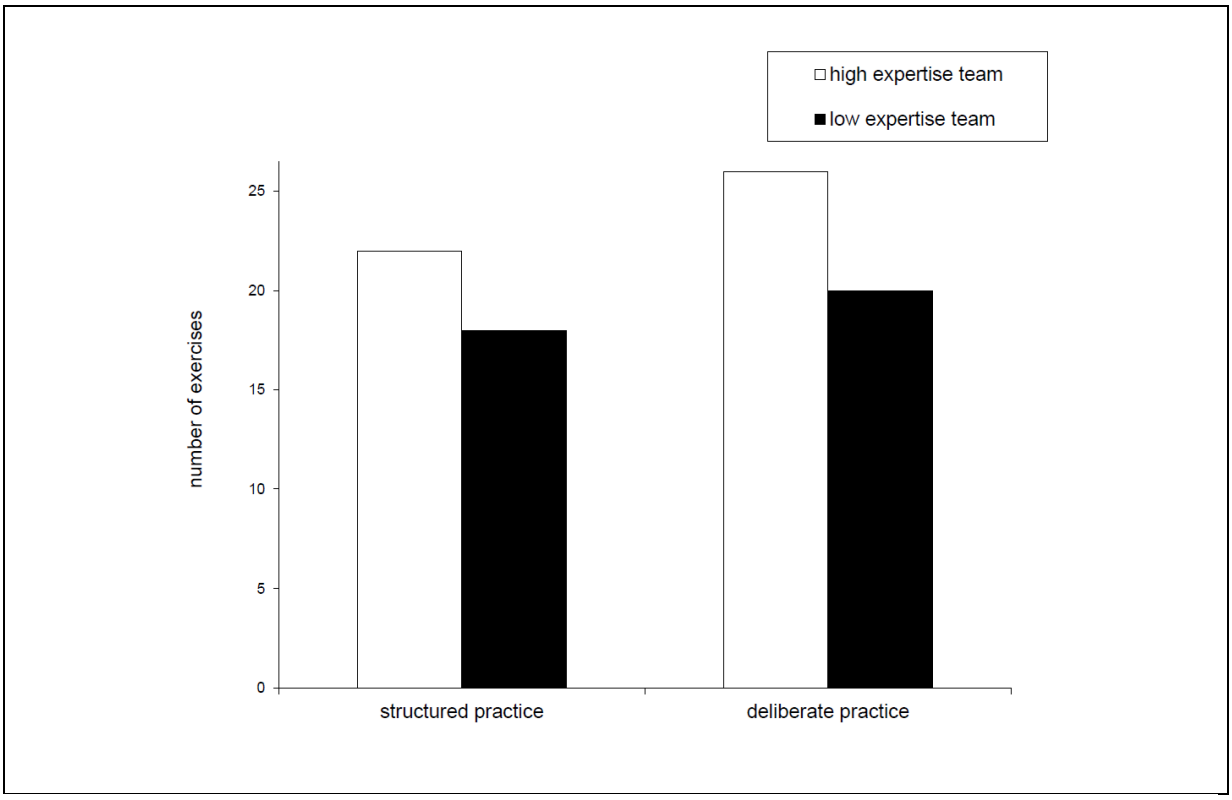

Figure 3. Number of structured practice and deliberate practice exercises for the soccer teams (high expertise team; low expertise team) in Study 2.

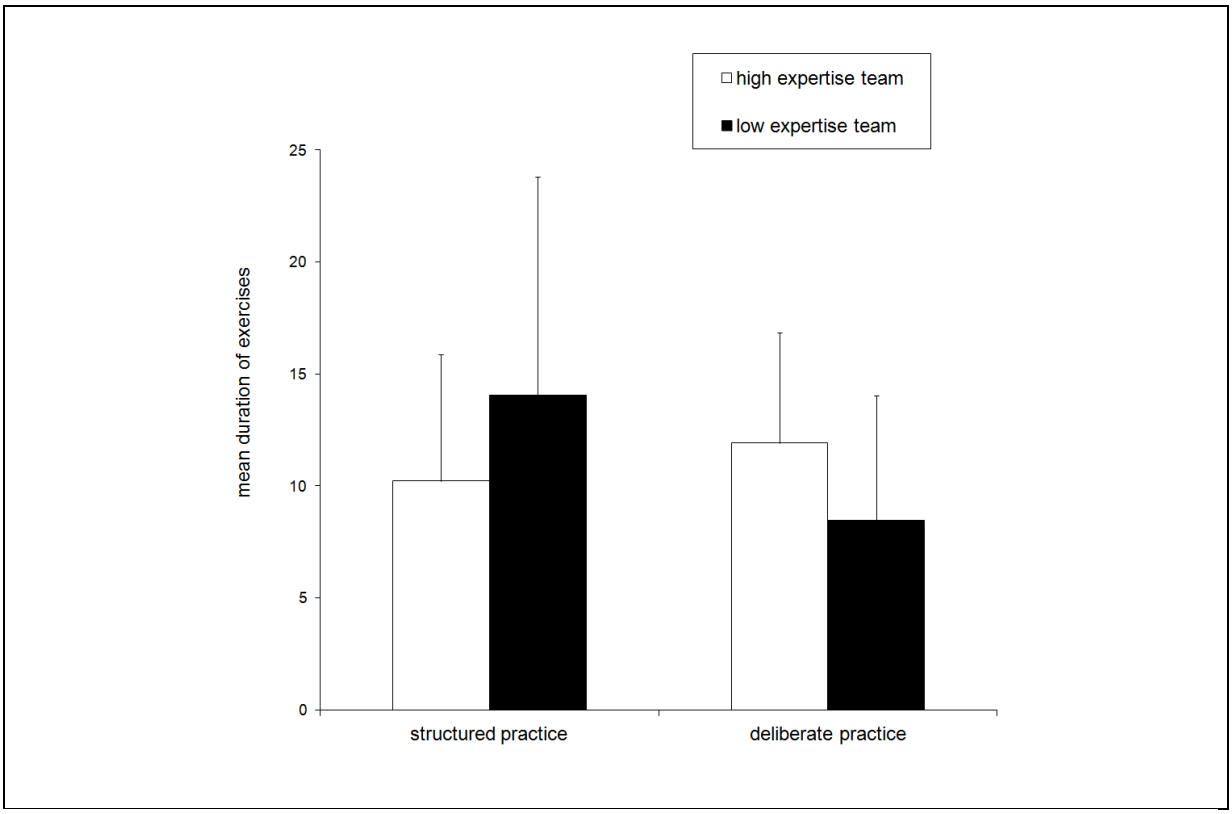

Figure 4. Average duration of structured practice and deliberate practice exercises for the soccer teams (high expertise team; low expertise team) in Study 2 (error bars represent the standard deviations).

Discussion

Contrary to our assumptions, no significant differences for the number of structured versus deliberate practice exercises occurred between the two soccer teams with different expertise levels. However, the significant group x number of exercises interaction indicates that a greater duration of time was spent in structured practice (roughly 14 minutes) than deliberate practice (roughly 8.5 minutes) for the lower expertise group, while the high expertise team spent similar amounts of time in both activities (between 10 and 12 minutes approximately).

The greater amount of time spent in non-deliberate forms of training by the lesser skilled group supports Ericsson's contention that focused deliberate practice is the critical predictor of skill attainment. These results highlight training-based differences among athletes at the same stage of chronological development but different levels of expertise, which has been notably lacking in expertise research. Moreover, the comparison of time spent in structured and deliberate practice amongst even the highly skilled group seems supportive of our contention that grouping all athlete training as deliberate practice can be misleading.

Study 3: Involvement in Structured and Deliberate Practice Among Different Sports

After considering how varying age (Study 1) and expertise levels (Study 2) affect training structure, in Study 3 we examined this issue across sports. Understanding between sport differences could provide critical evaluative data regarding general models of athlete development (e.g., The Long-Term Athlete Development Model, see Balyi & Hamilton, 2004). To this end, the following investigation examined differences in training structure

(i.e., structured practice versus deliberate practice) between team sport players of similar ages and expertise levels but different sports. Most models of athlete development do not distinguish between sports and as a result, we did not propose any specific hypotheses in this study and our analyses were largely exploratory.

Method

Participants and Materials. Two teams, recruited from two different local sports clubs, participated in this study. The first was a female handball team (n = 19) with a mean age of M = 11.02 years (SD = 0.55), and the second was a female soccer team (n = 17) with a mean age of M = 11.07 years (SD = 0.54). All participants had less than two years of handball or soccer experience and were considered as novices (following Ericsson's point of view, 1996) having approximately the same low expertise level in their particular sport. The goals and motives of both teams were to learn the sport and to improve individual elements. The coaches of both teams possessed a basic trainer certification and had experience as an athlete in the respective sports. The examination took part in December and also in January. Informed consent was obtained from all participants before commencing the study. As in Studies 1 and 2, the same observation form and procedure were used to assess the training sessions. Examples of structured practice activities in soccer were 5 vs. 5 games, games on just one goal, games on half court etc., and in handball were ten ball contacts per team, games with larger goals, and "burning ball". The following activities were categorized as deliberate practice in soccer: free kick, heading, penalty shootout, while practicing jump shots, dribbling, and free throws constituted deliberate practice in handball.

Data Analysis. As in the prior analyses, observations of twelve training sessions (six training sessions per team) as well as of all individual exercises were included in the overall evaluation and statistical analysis. Similar to Studies 1 and 2, both observers showed very good agreement with intraclass correlations above .90. Chi-square was used to compare the number of exercises of structured practice and deliberate practice between the teams while the duration of structured and deliberate practice was analyzed statistically using a 2 (handball team versus soccer team) x 2 (structured practice versus deliberate practice) ANOVA.

Results

The results showed a significant mean difference between the teams for the number of exercises for structured and deliberate practice, $\chi^2(1) = 4.048$, $p < .05$. During the six training sessions, the soccer team completed 29 structured practice exercises, while, the handball team performed 19. However, the handball team completed 25 deliberate practice exercises, the soccer team just 16 (see figure 5).

ANOVA yielded neither a significant main effect of group, $F(1, 85) = 0.104$, $p = .748$, nor a significant difference between the mean duration of structured and deliberate practice exercises, $F(1, 85) = 1.531$, $p = .219$. In total, the teams implemented structured practice exercises for an average of 11.95 minutes (SD = 7.91) and deliberate practice for an average of 10.41 minutes (SD = 5.52). However, the ANOVA revealed a significant group x number of exercises interaction effect for exercise duration, $F(1, 85) = 4.837$, $p < .05$, $\eta^2 = .054$. As illustrated in figure 6, the exercise duration of structured practice was an average of M = 15.86 minutes (SD = 4.45) for the soccer team and M = 13.68 minutes (SD = 5.49) for the handball team while the duration of deliberate practice was an average of M = 11.88 minutes (SD = 6.02) for soccer and M = 14.80 minutes (SD = 5.68) for handball.

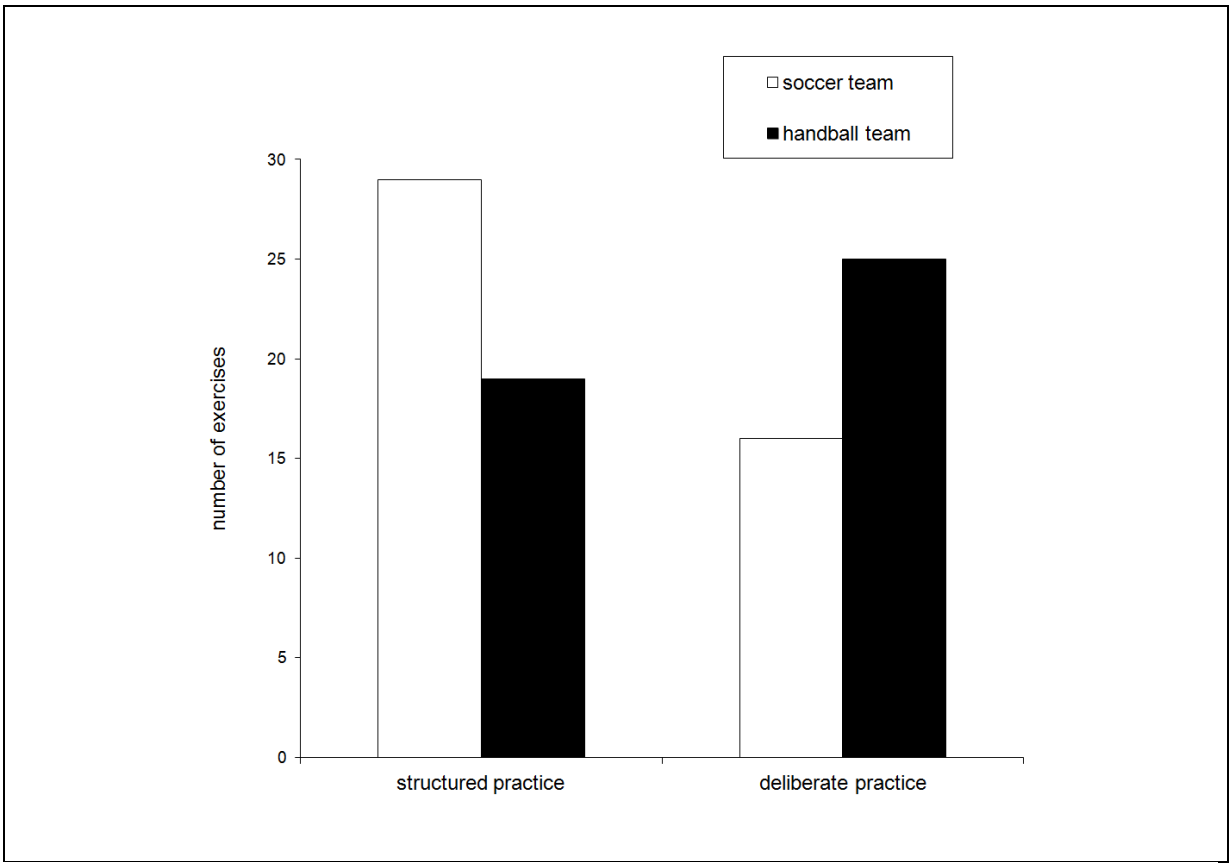

Figure 5. Number of structured practice and deliberate practice exercises for the female soccer and the female handball teams in Study 3.

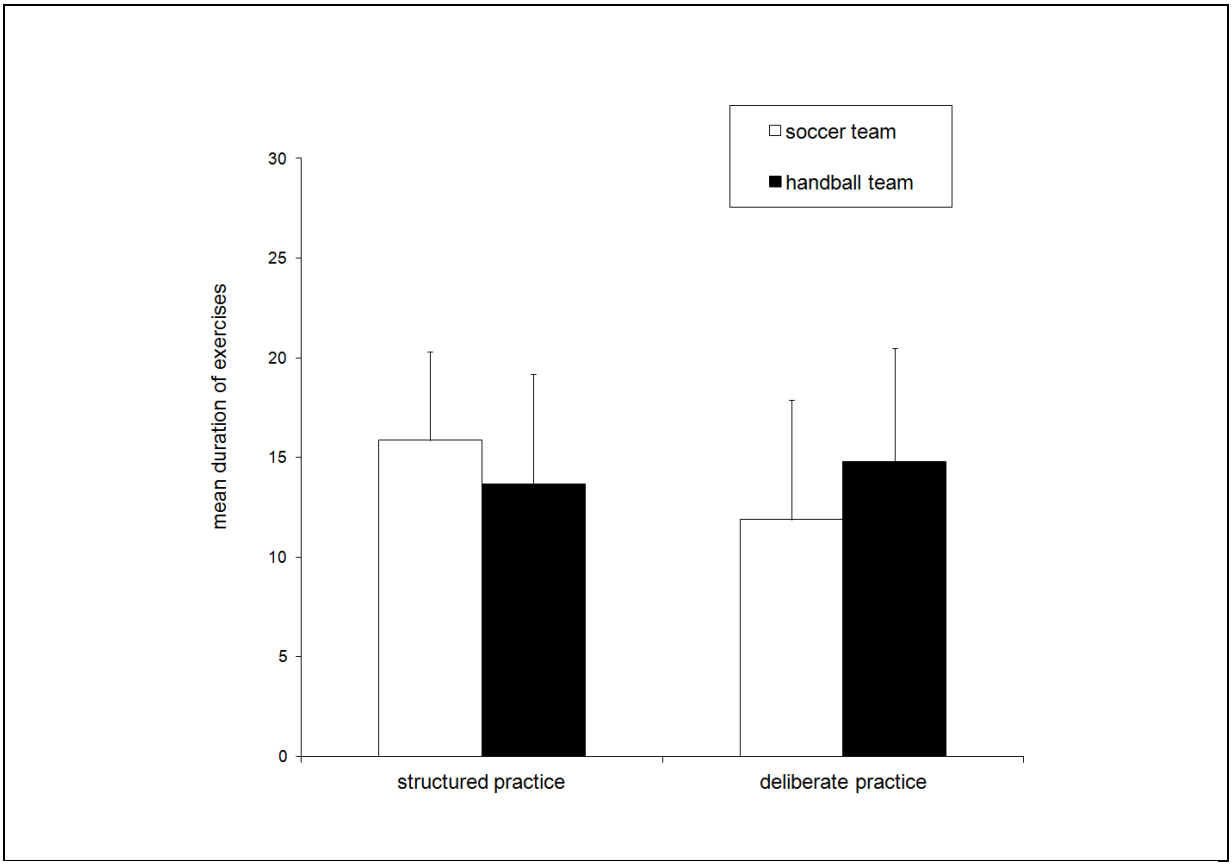

Figure 6. Average duration of structured practice and deliberate practice exercises for the female soccer and the female handball teams in Study 3 (error bars represent the standard deviations).

Discussion

The third study investigated differences in structured and deliberate practice between female handball and soccer players who were matched for age and expertise. The results indicated the handball team performed more deliberate practice and less structured practice than the soccer team both relative to the number of exercises each team performed and as revealed in the significant interaction in the ANOVA results.

These between sport differences highlight a critical assumption of general models of athlete development (e.g., Balyi & Hamilton, 2004) namely that general training prescriptions (e.g., regarding the amount of deliberate practice) are adequate to capture the subtleties that exist between sports. Even team sports like handball and soccer, which share many qualities (e.g., dynamic time-constrained decision making, structured offensive and defensive patterns of play), have obvious differences (e.g., use of hand versus foot, number of players, size of playing surface) that may affect the nature of training as an athlete develops. It is also important to acknowledge the role that culture and tradition play in pre-determining athlete development decisions.

General Discussion

The present investigation examined differences in training microstructure between athletes of different age classes, expertise levels and sports, specifically as they relate to structured versus deliberate practice. Within the scope of the first study we considered whether younger athletes spent more time in structured practice and less in deliberate practice activities compared to older athletes participating in the same sport. As expected, there was a difference in the number of exercises of structured and deliberate practice but not in the duration of time spent in both training forms. Contrary to our assumptions, both basketball teams spent more time in structured than in deliberate practice exercises. Although some researchers (e.g., Côté, 1999) have proposed different stages of expertise development in sport delineated by differences in the type and amount of training (c.f., deliberate play and deliberate practice), we could not identify differences in structured versus deliberate practice at least as measured by duration.

Study two examined Ericsson et al.'s (1993) conclusion that greater expertise results from greater involvement in deliberate practice. We investigated whether athletes playing at higher performance levels completed more deliberate practice than athletes of lower expertise. Although there were no differences between teams in the number of exercises, a significant interaction effect indicated a lower duration of time in deliberate practice compared to structured practice in the lower expertise group. While these data support Ericsson et al.'s contention, the duration of time spent in structured and deliberate practice for the higher performing team was approximately equal, which supports the conclusion that grouping all forms of organized sports training as deliberate practice may be misleading.

Our final study investigated differences in the utilization of structured practice and deliberate practice between athletes from different team sports. The soccer team performed less deliberate practice and more structured practice than the handball team, which could be due to the distinctions between both types of team sports. For instance, Hong and Pu (2002) identified distinctions in the physical requirements of soccer and handball (among others) primarily with regard to agility and running speed. While handball players scored higher on agility tasks, soccer players were characterized as being more "speedy" possibly because of the greater playing field in soccer compared to handball.

Collectively, our analyses reinforce the need for further examination of the microstructure of training. The current results require replication and expansion to different age groups, skill levels and sports, particularly because they run counter to those reported by Ford et al. (2010). Moreover, expanding the focus to different types of training may yield additional information about the process of athlete development. For example, structured

training may include individual and group training spent in dynamic or static environments. Although the current study considered all "non-deliberate" training as a single category, it is clear that there are important subtleties within this category.

To conclude, these preliminary analyses are important to develop evidence-based models of athlete development; moreover, because long-term athlete development is contingent on high levels of motivation to continue training and participating, this type of research may also provide important information regarding the most (and least) effective methods to promote long-term involvement in sport. The current study extends previous research by examining general training structure. Collectively, the above results indicate that the process by which athletes acquire skill may be more complex than proposed by general models of long-term athlete development. Future research may consider a larger-scale examination of these issues where the varying factors examined here in separate studies (i.e., age, skill, and sport) are entered into a single analysis. Although the use of more complex models requires a larger sample of athletes, these models likely encapsulate the nuances of athlete development better than the small samples traditionally used.

In the present study we explored the nature of structured practice activities as viewed by those external to the experience (i.e., the observers who rated the various activities); however, it is possible that the distinguishing characteristics of important aspects of practice are not discernible by simply observing practice, regardless of how informed or knowledgeable those observers may be. Moreover, the goals of deliberate forms of practice are highly individual; however, this study examined group-related practices. Future research, for example, may wish to obtain more detailed information about the specific goals of practice as they relate to changing important aspects of athletes' performance, such as gathering data on physical and cognitive effort during different forms of training/practice, which could be linked back to the explicit goals of that particular element of training. Importantly, these preliminary analyses should be seen as a starting point for more comprehensive examinations of the balance between deliberate practice, structured training and play across athlete development.

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The Authors

Stefanie Hüttermann is a research assistant at the Institute of Cognitive and Team/Racket Sport Research at the German Sport University of Cologne, Germany. Her primary research interests are in visual attention and its role in visual perception. Other interests include cognitive science and sport psychology. She is a professional athlete in beach volleyball and plays successfully in national as well as international tournaments.

Daniel Memmert is a professor and head of the Institute of Cognitive and Team/Racket Sport Research at the German Sport University of Cologne, Germany. He is a football coach who deepened his coaching skills with a PhD in cognition in team sports and a Post-Doc in creativity in team sports that he both gained at the Elite University of Heidelberg. His research interests are cognitive science, human movement science, computer science, and sport psychology. Daniel is a reviewer for several international (sport) psychology journals who transferred his expertise to business and to several professional soccer clubs within the Bundesliga.

Dr. Joseph Baker is an associate professor in the School of Kinesiology and Health Science at York University, Canada. His research examines the factors affecting athlete development across the lifespan.