

Deliberate practice at work: A study with insurance agents

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This paper applies the concept of deliberate practice (Ericsson, Krampe, & Tesch-Römer, 1993) to work settings. Deliberate practice comprises regularly performed activities which aim at competence improvement. It is hypothesized that the amount of deliberate practice is positively related to work performance. Results of a study with 100 insurance agents provided evidence for the occurrence of deliberate practice activities in work contexts. The amount of current time spent on deliberate practice was significantly related to supervisory ratings of insurance agents' work performance. Accumulated amount of time spent on deliberate practice in the past was not related to work performance.

The question of what characterizes experts and high performers has received much interest within psychological research (cf. Chi, Glaser, & Farr, 1988; Ericsson & Lehmann, 1996; Ericsson & Smith, 1991). From the perspective of work and organizational psychology, it is important to know in which respects high performers differ from average performers, how high performers accomplish tasks in order to contribute substantially to organizational success, and how they arrive at their high performance level (Glynn, 1996; O'Reilly & Chatman, 1994). If one assumes that high performance is at least partially attained through experience and learning (Ford & Kraiger, 1995), the question arises as to which aspects of experience and learning are responsible for acquiring and maintaining a high performance level. With respect to high performance in the domains of music and sport, Ericsson and his co-workers (Ericsson, Krampe, & Tesch-Römer, 1993; Ericsson & Lehmann, 1996) suggested that deliberate practice, i.e. regular, individualized learning activities, plays a major role in achieving such a high performance level.

The present study applies the deliberate practice concept to the context of work. We pursue two goals with this study: first, we want to examine whether deliberate

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practice activities are also performed within work settings; secondly, given that deliberate practice does occur in work settings, we examine whether deliberate practice is related to work performance.

The concept of deliberate practice

Ericsson *et al.* (1993) presented a framework explaining the acquisition of expert performance. In this framework, it is not innate abilities or mere exposure to experience, but the accumulated amount of deliberate practice that is regarded to be essential for high performance. The authors characterized deliberate practice as those 'activities that have been specially designed to improve the current level of performance' (p. 368). Thus, the core of deliberate practice refers to an explicit goal of competence improvement. This goal is pursued by executing specific practice tasks that focus on current performance deficits and offer opportunities for improving and refining critical skills. In contrast to other learning activities such as attending training courses, deliberate practice is a continuous effort to improve one's competence through activities performed on a regular basis.

Empirical studies on deliberate practice

Ericsson *et al.* (1993) studied deliberate practice with music students. Based on diary data, the authors found that highly performing violin students spent more time practising than did lower performing music students. Furthermore, the amount of practice accumulated since the age of four was strongly related to violinists' performance level. Similar results were found when comparing highly performing piano students attending advanced soloist classes at a music academy with piano amateurs. A study in the domain of sports showed that international level wrestlers had spent more cumulative time over the years practising with others than did wrestlers at a lower competence level (Starkes, Deakin, Allard, Hodges, & Hayes, 1996). Charness, Krampe, and Mayr (1996) applied the deliberate practice concept to the domain of chess and found that the cumulative amount of practice alone was a significance predictor of chess performance.

Taken together, all these studies showed that deliberate practice is positively related to performance level. Most studies concentrated on the cumulative amount of practice during participants' careers, but the study by Ericsson *et al.* (1993) suggested that the current amount of practice also plays an important role for high performance. Furthermore, it became obvious that the types of deliberate practice activities related to high performance differed across domains. This suggests that there are no one or two deliberate practice activities that are successful in all domains. Performance-enhancing deliberate practice activities vary according to the domains' specific requirements.

Deliberate practice in work contexts

We assume that the deliberate practice concept is not only useful in the domains of music and sports, but that it can also be applied to work settings. However,

deliberate practice activities performed within work contexts may differ from deliberate practice in other domains. Within work settings, deliberate practice may not comprise extensive rehearsal of difficult tasks and sub-tasks or the refinement of isolated processes, but a wide range of activities such as extensive preparation of task accomplishment, gathering information from domain experts, or seeking feedback. Similar to deliberate practice in music or sports, only those activities which are done with the goal of improving one's competence and which are performed on a regular basis are deliberate practice activities. The same activities performed with another goal in mind or performed only sporadically might support immediate task accomplishment, but are not deliberate practice. This implies that there are no specific types of activities *per se* that qualify for being deliberate practice.

When applying the deliberate practice concept to work settings, we must differentiate between supporting activities in general and supporting activities that incorporate deliberate practice. Supporting activities are activities which directly contribute to task accomplishment. Typical examples include activities such as preparing a task by reading material helpful for task accomplishment or contacting colleagues for possible solutions for an emerging problem. These activities can directly affect performance, but they need not be performed on a regular basis and do not necessarily aim at competence improvement. Therefore, they are not in themselves deliberate practice. However, when these supporting activities are performed regularly in order to improve one's competence, they are deliberate practice. For example, it is possible to perform preparatory activities and discussions with colleagues as deliberate practice: imagine someone who regularly reads through preparatory material in order to extend his or her knowledge in the long run and not only in order to be prepared for the task at hand. Similarly, someone who consults colleagues not only for the solution of emerging problems but who tries to learn from colleagues' approaches to problem situations and therefore regularly contacts them, performs this activity as deliberate practice.

Deliberate practice and work performance

Activities aiming at improving one's competence level are necessary within work contexts. Today's work, characterized by continuously changing requirements, makes it necessary for individuals to keep up with new technologies and changing working methods (Hesketh & Bochner, 1994; Parker, Wall, & Jackson, 1997). Higher demands, increasing quality standards, and growing global competition ask for higher levels of competence (Lawler, 1994). Because not all necessary learning processes can be covered within formal training programmes (cf. Tannenbaum & Yukl, 1992), individualized and self-regulated learning becomes increasingly important (Frese, 1997; Hesketh, 1997). In addition to other approaches, deliberate practice offers one way to improve and maintain one's competence level. Therefore, we hypothesize that deliberate practice is positively related to high work performance. More specifically, we assume that the positive effects of deliberate practice activities are due to their associated goal of competence improvement and the regularity of their performance and not to the fact that the respective activities are executed *per se*.

There are several reasons *why* the goal of competence improvement is essential for high performance. Research has shown that individuals who aim at competence improvement apply more successful working strategies (Butler, 1993; VandeWalle & Cummings, 1997) and process information at a deeper level that in turn facilitates long-term retention and better performance (Nolen, 1988). Dweck and Leggett (1988) have argued that a focus on learning and competence improvement is associated with self-monitoring, attention to the task, persistence and sustained effort and therefore results in higher performance. Moreover, focusing on competence improvement might foster a long-term orientation and draws one's interest not only to those facts and procedures that are of short-term importance but also to other features which result in an increased competence level in the long run.

To explain *why* regularity is related to high performance, one might think of three mechanisms: first, by regularly executing an activity, procedural knowledge develops (Anderson, 1982). This implies that when an activity is performed regularly as a learning activity, procedural knowledge of how to approach such a learning task improves. Secondly, regularity results in automaticity of basic processes (Shiffrin & Schneider, 1977) so that time and cognitive capacity become available for higher level processing, such as exploring new working methods (cf. Glaser, 1996). Thirdly, regularity implies that the goal of competence improvement becomes more salient within a person's daily work activities. Therefore, other opportunities for learning will be recognized more easily. The probability that these opportunities can be taken advantage of will increase.

Past deliberate practice research differentiated between currently performed deliberate practice and accumulated time spent on deliberate practice during one's career (Charness *et al.*, 1996; Ericsson *et al.*, 1993). We assume that both currently performed and accumulated deliberate practice are positively related to work performance. Currently performed deliberate practice is important in order to maintain one's competence level, to master emerging job requirements, and to keep up with recent developments with respect to new technologies and working methods. Cumulative deliberate practice as the sum of past investments in one's competence is essential for job performance as well. With long, regular practice it becomes possible to build up a detailed and easily accessible knowledge base and to develop highly trained skills.

Work performance is a complex phenomenon and there are a number of factors in addition to deliberate practice that might impact an individual's work performance, for example an individual's professional experience or the effort devoted to the task. It could even be that these factors override the effects of deliberate practice.

Research findings about the effects of experience in a domain are inconsistent. Studies in the domains of music and chess showed that years of experience are of minor importance for high performance (Charness *et al.*, 1996; Ericsson *et al.*, 1993). However, meta-analyses within work and organizational psychology reported correlations of $r = .18$ (Hunter & Hunter, 1984) and $r = .27$ (Quiñones, Ford, & Teachout, 1995) between experience and work performance suggesting that years of experience might be more relevant for work performance than for performance

in domains covered by past deliberate practice research. Moreover, it may be that time spent on deliberate practice is related to years of experience in a domain. Therefore, it is important to analyse whether time spent on deliberate practice is related to work performance also when controlling for years of experience.

It has been argued that work performance results not only from choosing successful and promising *ways* of working, but also from the amount of effort devoted to the job (O'Reilly & Chatman, 1994). This implies that not only deliberate practice but also the amount of time spent in one's job and the number of tasks accomplished is positively related to work performance (Sujan, Weitz, & Kumar, 1994). Furthermore, a high amount of deliberate practice might simply be a result of a great number of tasks a person is involved in. In this case, the amount of work accomplished would be the third variable which is responsible for the hypothesized relationship between deliberate practice and work performance. In order to rule out this third variable explanation, it is necessary to control for amount of work accomplished.

Taken together, the hypotheses to be tested are as follows:

- (1) The amount of current time spent on deliberate practice activities is positively related to work performance, also when controlling for the time spent on the activities *per se*.
- (2) The cumulative amount of time spent on deliberate practice activities during one's career is positively related to work performance, also when controlling for the time spent on the activities *per se*.

In the empirical study we will control for years of experience and amount of work accomplished in order to rule out that the hypothesized relationship between deliberate practice and work performance is due to long years of experience or a high amount of work accomplished.

Method

Sample

For studying deliberate practice within work contexts, we chose the job of insurance agent. This job offers good opportunities for studying individual differences in deliberate practice since this job allows relatively high autonomy in organizing one's own work and learning procedures (Brown & Corrigan, 1988). Participants in the study were 100 sales agents working for 10 German insurance companies; they had a mean experience as insurance agent of 11.7 years ($SD = 9.3$). Some of the participants worked on a freelance basis (55%), while others were employed by insurance companies or agencies (46%). Participants' mean age was 40.4 years ($SD = 9.4$). The percentage of male participants was 96%.

Measures

Overview. Data collection started with a structured interview in which participants were asked about their work and deliberate practice activities. This interview was specifically developed for the present study in order to assess current and cumulative time spent on supporting and deliberate practice activities. To minimize social desirable answers participants were informed that the study focused on work activities and work procedures of insurance agents. No explicit reference was made to 'learning'.

After completion of the interview participants received diary sheets to be filled in during the following week and to be returned directly to one of the researchers. Finally, performance ratings were obtained from the insurance agents' supervisors.

Development and administration of the interview. In domains such as music and sport it is relatively easy to decide which activities incorporate deliberate practice and which not. However, within work contexts it is more difficult to identify deliberate practice activities. Therefore, a structured interview was developed which assessed (1) work activities, (2) goals associated with each activity, and (3) the regularity with which each activity was performed. Based on the goals and regularity, each performed activity was later categorized as a deliberate practice activity or another activity.

In detail, the interview was designed as follows: a list of activities was compiled comprising activities that were assumed to support insurance agents' task accomplishment and that could be executed as deliberate practice. To be included in the list, the activities had to meet the following criteria:

- (1) the activity can result in performance improvement;
- (2) the activity can incorporate aspects of practice and competence improvement;
- (3) the activity can be regularly performed during daily work activities;
- (4) performing this activity is highly optional and goes beyond the task requirements;
- (5) the activity is only indirectly related to financial rewards.

In pilot interviews, 10 activities that met these criteria were identified; preparation, mental simulation, exploring new strategies, concluding and assessing afterwards, asking for feedback, consulting colleagues, consulting domain experts, formal meetings, informal meetings, and private conversations. Each activity was subsequently covered by a number of interview questions. Within the interview, participants were first asked whether they performed the activity (e.g. "When you intend to contact a client do you do any kind of preparation beforehand?"). When participants did perform the activity they were asked to report the goal with which they performed this activity ("With which goal do you perform (activity)?"; open question). The next interview questions referred to the frequency and duration of the activity. Then, participants were asked when they had last performed the activity. When the performance of the activity was a minimum of one year in duration, the frequency and duration with which the activities were performed in the past was assessed retrospectively.

Interview measures. Based on the interviews, four types of measures were computed: Current time spent on supporting activities; cumulative time spent on supporting activities; current time spent on deliberate practice activities; cumulative time spent on deliberate practice activities. *Current time spent on supporting activities* refers to the weekly amount of time participants currently spent on performing each of the 10 supporting activities covered in the interview. Additionally, the total weekly time spent on all 10 supporting activities was computed. Thus, these supporting activity measures represented time spent on activities supporting task accomplishment, irrespective of the goal and regularity with which they were performed. *Cumulative time spent on supporting activities* was a retrospective measure of total time spent on supporting activities. It was computed by accumulating the time spent on these activities during the respondent's career as an insurance agent. *Current time spent on deliberate practice activities* refers to the weekly amount of time supporting activities were performed as deliberate practice. To decide whether the supporting activities performed as deliberate practice, participants' goals associated with every reported activity were categorized using a category-system comprising three categories: (1) goal related to competence improvement (e.g. asking a colleague for information in order to improve customer service and avoid mistakes in the long run), (2) any goal not related to competence improvement (e.g. asking a colleague for one specific piece of information about one specific customer), (3) no goal. Goals reported by the insurance agents were categorized by two raters who were unaware of participants' performance level. Inter-rater agreement was computed separately for the 10 supporting activities and ranged between 71 and 97% (median = 91%), corresponding to Cohen's Kappas between .53 and .94 (median = .84). An activity reported by a participant was regarded as a deliberate practice activity for this participant if the person performed the activity with a goal related to competence improvement (category (1)) and if the person performed the activity on a regular basis, i.e. at least once a week. This procedure implies that none of the activities was regarded as a deliberate practice activity *per se*, but only if it met the criteria of competence improvement and

regularity. For every activity identified as a deliberate practice activity, the amount of time per week the participant spent on the activity was computed. Additionally, the total time spent for all activities performed as deliberate practice was computed. *Cumulative time spent for deliberate practice activities* was a retrospective measure of total time spent on deliberate practice. It was computed by accumulating the time spent on activities performed as deliberate practice during the participant's career as an insurance agent.

Validity of interview data. In order to evaluate the validity of the interview data, participants were asked to keep a diary for 1 week. For every day within that week they filled in how much time they spent on each of the 10 supporting activities. Diary data were available from 69 participants. Time spent on all supporting activities during the week was summed up and correlated with the interview data on the weekly amount of current time spent on supporting activities. The correlation was $r = .35$; $p < .01$; $N = 69$. Inspection of the interview data showed that participants often reported performing specific supporting activities, but not on a weekly basis. For example, 87 participants reported asking domain experts, but only 30 did that at least once a week. On average, 3.6 (SD = 1.4) supporting activities that participants did perform were not performed on a regular, i.e. weekly, basis. For all these irregularly performed activities interview and diary data never can be identical—even if one assumes perfect validity of both measures. Therefore, this high amount of irregularly performed activities resulted in the relatively low correlation of $r = .35$ between interview and diary data. When excluding all participants who performed four or more supporting activities less than once a week, the correlation between interview and diary data increased ($r = .57$, $p < .01$, $N = 32$). Taking into account that within this subsample, up to three of the reported supporting activities were performed on an irregular basis, the validity of the interview data can be regarded as satisfactory.

Work performance. Performance data were available from six companies. In five of the six companies, supervisors rated insurance agents' performance with respect to 'meeting the sales goals' and 'acquisition of new clients' on a 9-point Likert scale (1 = extremely low performance; 9 = outstanding performance). Intercorrelation of these two items was high ($r = .80$; $p < .01$). To rule out effects of possible company specific response bias, performance scores were z standardized within each company. In one company it was not feasible to have supervisors fill in these two specific performance items. In this company, supervisors rated insurance agents' performance on a 6-point scale corresponding to German school grades (1 = excellent; 6 = very bad). These scores were reversed and again z standardized within the company. In total, performance data were available for 75 insurance agents.

Control variables. Two control variables were included in the analysis: years of professional experience as insurance agent and number of cases handled per day. Both measures were assessed during the interview. The number of cases measure additionally included phone calls and other routine procedures related to specific cases.

Means, standard deviations, and intercorrelations for all variables included in hypotheses testing are displayed in Table 1. All analyses—except those including performance measures—were based on $N = 100$ cases. Analyses including performance measures were based on $N = 75$ participants for whom performance data were available.

Results

Frequency of deliberate practice activities

Table 2 shows the percentage of insurance agents who reported performing the supporting activities, performing them at least once a week, performing them with the goal of competence improvement, and performing them as deliberate practice activities (i.e. at least once a week *and* with the goal of competence improvement).

Analyses revealed that mental simulation belongs to the most widely used deliberate practice activities. Twenty-six per cent of the respondents reported that

Table 1. Means, standard deviations, and intercorrelations between all variables included in hypotheses testing

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
Experience	11.7	9.3						
Cases handled	21.7	15.0	.07					
Current time spent on supporting activities ^a	9.5	8.0	-.23	.23				
Current time spent on deliberate practice ^a	2.1	3.7	-.10	-.11	.53			
Cumulative time spent on supporting activities ^a	118.0	237.8	.25	.07	.38	.24		
Cumulative time spent on deliberate practice ^a	38.7	176.8	.02	.03	.26	.33	.84	
Performance	0.0	0.9	-.11	.37	.05	.21	.06	.13

^aHours per week.

Note. *N*=75 for correlations with performance, *N*=100 for all other correlations.

they regularly ran mental simulations in order to improve their competence. For example, they imagined a difficult situation with a client and mentally explored various behaviour possibilities. Similarly, asking for feedback was relatively often performed as deliberate practice. Twenty per cent of the interviewed insurance agents asked for feedback at least once a week in order to improve their competence. All the other supporting activities were performed relatively seldomly as deliberate practice activities, although they were widely used as supporting activities.

If one regards all activities as a whole it becomes obvious that everybody performed at least one of these activities and the great majority (94%) performed at least one of these activities on a regular, i.e. weekly basis. The percentage of respondents performing at least one of the activities with the goal of competence improvement was 89%. It was also found that 62 insurance agents met the criterion of performing at least one activity on a weekly basis *and* performing it with the goal of competence improvement, thus as a deliberate practice activity.

On average, 1.03 (*SD* = 1.02) of the 10 activities were performed as deliberate practice. When including only those participants in the analysis who engaged at least in one deliberate practice activity, on average 1.66 (*SD* = 0.79) activities were performed as deliberate practice.

Deliberate practice and work performance

Hypotheses were tested with hierarchical regression analyses. For testing Hypothesis 1, years of experience as insurance agent was entered into the regression equation in Step 1. In Step 2 number of cases handled was entered. In Steps 3 and 4 current time spent on supporting activities and current time spent on deliberate practice respectively were entered. Results are shown in Table 3.

Years of experience as insurance agent entered in Step 1 was no significant predictor of performance. Number of handled cases entered in Step 2 accounted for 16% of the variance in performance ($p < .01$) with insurance agents handling

Table 2. Percentage of insurance agents performing supporting activities

Activity	Performing activity	Performing activity at least once a week	Performing activity with goal of competence improvement	Performing activity as deliberate practice ^a
Preparation	100	58	21	16
Mental simulation	58	51	30	26
Exploring new strategies	61	7	22	0
Concluding and assessing afterwards	61	59	14	11
Asking for feedback	43	27	30	20
Consulting colleagues	69	34	22	11
Consulting domain experts	87	30	8	5
Formal meetings	97	14	44	7
Informal meetings	54	3	25	2
Private conversations	52	25	11	5
Any of the above activities	100	94	89	62

^aPerforming activity as deliberate practice: Performing activity at least once a week *and* with goal of competence improvement.

Note. All percentages refer to the total sample of $N=100$.

Table 3. Multiple regression predicting performance from years of experience, number of cases handled, current time spent on supporting activities, and current time spent on deliberate practice

Step and predictor	R^2	F	ΔR^2	F	β	t
Step 1	.01	0.83	.01	0.83		
Experience					-.11	-0.91
Step 2	.17	6.61**	.16	12.24**		
Cases handled					.40	3.50**
Step 3	.17	4.34**	.00	0.02		
Current time spent on supporting activities					-.01	-0.04
Step 4	.24	4.77**	.06	5.21*		
Current time spent on deliberate practice					.29	2.28*

* $p < .05$; ** $p < .01$.Note. $N = 75$.

more cases showing higher performance. The amount of current time spent on supporting activities entered in Step 3 did not contribute to the explained variance in performance. However, the amount of current time spent on deliberate practice accounted for an additional 6% of variance in performance ($p < .05$). The more time insurance agents spent for deliberate practice above the number of cases handled and above the pure amount of time spent on supporting activities, the higher their performance was.

For testing Hypothesis 2, we followed the same procedure as for testing Hypothesis 1. In Steps 1 and 2, years of experience as insurance agent and number of cases handled were entered into the regression equation. In Step 3, the cumulative amount of time spent on supporting activities was entered, in Step 4 the cumulative amount of time spent on deliberate practice was entered. Table 4 shows the results.

The results for years of experience and number of cases handled entered in Steps 1 and 2 are the same as for the test of Hypothesis 1. Analyses further showed that neither the cumulative amount of time spent on supporting activities (entered in Step 3) nor the cumulative amount of time spent on deliberate practice (entered in Step 4) accounted for significant percentages of explained variance in performance. This finding suggests that the amount of deliberate practice accumulated across one's career might be less important for insurance agents' performance than a high amount of deliberate practice currently performed.

Discussion

Our study showed that deliberate practice *is* performed in work settings and that the amount of current time spent on deliberate practice is related to work performance. However, performance was not predicted by the cumulative amount

Table 4. Multiple regression predicting performance from years of experience, number of cases handled, cumulative time spent on supporting activities, and cumulative time spent on deliberate practice

Step and predictor	R^2	F	ΔR^2	F	β	t
Step 1	.01	0.83	.01	0.83		
Experience					-.11	-0.91
Step 2	.17	6.61**	.16	12.24**		
Cases handled					.40	3.50**
Step 3	.18	4.50**	.01	0.40		
Cumulative time spent on supporting activities					.07	0.63
Step 4	.18	3.45*	.01	0.44		
Cumulative time spent on deliberate practice					.16	0.66

* $p < .05$; ** $p < .01$.

Note. $N = 75$.

of deliberate practice. Thus, the assumption that the deliberate practice concept can be extended to work settings and Hypothesis 1 were supported by the data, while Hypothesis 2 was not.

Analysis indicates that deliberate practice activities are not rare events in insurance agents' daily work activities but are relatively common within this professional context. At the same time it became obvious that there is not *one* specific deliberate practice activity that is performed by everybody. Participants varied with respect to the activities they performed as deliberate practice. Furthermore, deliberate practice was not realized for any of the participants in every activity that the participant performed, but in only one or two—individually varying—activities. A reason for this might be that individuals differ with respect to which activities they regard as relevant for high performance and suitable for deliberate practice. For example, not every work situation might offer the possibility of doing a specific supporting activity at least once a week. Additionally, performing activities with the goal of competence improvement may require more time and effort than performing activities aimed at short-term goals. In order to ensure efficient short-term task accomplishment individuals have to prioritize which activities they perform as deliberate practice and which not. As a result, only a small number of activities are regularly devoted to competence improvement.

The analysis clearly showed that the amount of current time spent on deliberate practice is positively related to job performance also when controlling for years of experience, number of cases handled, and amount of current time spent on the activities *per se*. Thus, it is not the time spent on activities such as preparation or asking for feedback that accounts for performance differences, but these activities' specific attributes of regularity and competence improvement goal. This finding is especially noteworthy because current time spent on supporting activities and time spent on deliberate practice were substantially correlated. Despite this correlation, deliberate practice added significantly to the prediction of performance (cf. Cohen & Cohen, 1983).

Cumulative time spent on deliberate practice was not found to be significantly related to performance. This finding can be due to both methodological and domain-specific reasons. The major methodological shortcoming refers to the retrospective assessment of cumulative deliberate practice. It is possible that participants could not adequately remember how much time they spent on specific supporting activity since the beginning of their careers, whether they performed them regularly and with the goal of competence improvement in mind. Therefore, participants' retrospective reports might not be valid measures of cumulative deliberate practice. However, previous studies which used retrospective reports of deliberate practice did find an effect of cumulative deliberate practice on performance (Charness *et al.*, 1996; Ericsson *et al.*, 1993; Starkes *et al.*, 1996). It is possible that the number of hours spent in the past for practising a music instrument can be better remembered than the amount of time spent on preparing task accomplishment or consulting colleagues. This would speak for a differential validity of retrospective methods between domains.

Nevertheless, it is also possible that the inconsistency in findings between the present and previous studies reflects differences in competence development between domains. For arriving at high performance in the previously studied domains of music and sports, it is important to engage continuously in specific activities and to build on past practice in order to maintain and improve one's level of technical skill and fitness. Without such a continuous effort over years—reflected in the cumulative amount of deliberate practice—high performance is not attainable. However, the situation is different in other domains such as the insurance business. Due to the continuous emergence of new procedures to be followed and new products to be sold, already existing knowledge and skills quickly become obsolete. There is only limited possibility to build on past practice. Referring to previously learned information and skills will be of little use. Deliberate practice performed some years ago does not really add to present performance.

One shortcoming of this study is its relatively small sample size. A replication with a larger sample is needed. However, data were collected in a range of different insurance companies suggesting that there is a certain degree of generalizability in the study findings.

Causal processes underlying the relationship between deliberate practice and performance

The data gathered in this study are cross-sectional in nature and therefore allow various causal interpretations. The most obvious are: (1) amount of current time spent on deliberate practice affects performance; (2) performance affects the amount of current time spent on deliberate practice; (3) third variables affect both amount of current time spent on deliberate practice and performance.

The interpretation that the amount of current time spent on deliberate practice effects performance was brought forward in previous research on deliberate practice (Ericsson *et al.*, 1993) and was also adopted for the present study. The following major causal mechanism is assumed: regularly investing time and effort in competence improvement increases skill and knowledge and changes motivational

orientations—which in turn affects performance. Experimental research has shown that persons pursuing a learning goal show better performance than persons focusing on short-term performance goals (Dweck & Leggett, 1988). Aiming at competence improvement and learning activates a feeling of mastery that helps in coping with difficulties and in achieving high performance.

However, the opposite causal process is plausible as well. It might be that high performance has an effect on the time spent on deliberate practice. From a resource allocation perspective (Kanfer & Ackerman, 1989) one could argue that high performers need less cognitive capacity for on-task activities and therefore have more cognitive resources available for additional processes in which they can concentrate on competence improvement. One might speculate that both causal processes complement and reinforce each other: high performance fosters deliberate practice which in turn has a positive effect on performance.

Within a cross-sectional design third variables explanations cannot be ruled out completely. However, two of such possible third variables that were assumed to affect both deliberate practice and performance were entered into the regression equation. The amount of current time spent on deliberate practice remained a significant predictor of performance also when years of experience and number of cases handled were held constant. Thus, the present findings cannot be reduced to the effects of experience or amount of work accomplished. In additional analyses, motivational factors as potential third variables were tested. The relationship between deliberate practice and performance did not change when controlling for motivational factors (cf Kleine, 1996).

Practical implications

Given that deliberate practice has at least partially a causal effect on performance, our study offers practical implications. It is crucial to encourage employees to engage in deliberate practice and to enlarge the number of activities performed as deliberate practice. Employees could be made more familiar with deliberate practice and its benefits as a part of a training or competence development course. In such a course the notion of regularity and the goal of competence improvement need to be stressed explicitly. Also, well-informed supervisors might draw employees' attention to the possibilities of deliberate practice. For example, they might stimulate the onset of deliberate practice when discussing career opportunities or when providing performance feedback to the employee. Furthermore, organizations might instantiate a 'learning culture' by implementing specific interventions and organizational procedures that aim at competence improvement. For example, at the end of each regular meeting, a team or a larger unit could make a habit of briefly discussing competence improvement issues. Additionally, when domain experts are approached for help or information, they might not only provide the requested short-term support but give hints to their co-workers on how they can improve their competence in the long term. With respect to all these interventions and procedures, managerial support seems to be crucial (cf. Birdi, Allan, & Warr, 1997).

Implications for the study of high performance in work settings

The analysis showed that years of professional experience were not related to performance. This finding is in line with recent findings in other domains questioning the notion that length of experience is the crucial factor explaining high work performance (Sonnetag, 1995, 1998; cf. Ericsson & Lehmann, 1996).

Besides the amount of current time spent on deliberate practice, the number of cases handled was a strong predictor of performance. The more cases an insurance agent dealt with, the higher his or her performance. This finding suggests that the pure amount of work accomplished is strongly related to performance. With this result the present study adds to the discussion whether working hard or working smart is essential for high work performance (O'Reilly & Chatman, 1994; Sujan, 1986; Sujan *et al.*, 1994). The number of cases handled can be interpreted as an indicator of working hard, while engaging in deliberate practice can be seen as a smart strategy. The analysis showed that both working hard *and* working smart contributes to work performance. Although more variance in work performance is explained by working hard, working smart adds significantly to the prediction of performance. One can conclude that once no further performance gains can be attained from working hard, performance can be still improved by relying on smart working, such as engaging in deliberate practice.

Taken together, the present study showed that deliberate practice is a promising and fruitful concept for explaining high work performance. Nevertheless, a number of questions remain unanswered such as the role the cumulative amount of deliberate practice plays in explaining high performance across various domains. In a similar vein, the causal processes underlying the relationship between deliberate practice and performance ask for a deeper investigation. Additionally, we still do not know which factors encourage individuals to engage in deliberate practice. Therefore, further research is needed. Since the empirical relationship between deliberate practice and work performance is established it is now time to use longitudinal research designs. They will help in arriving at a better insight in the—maybe reciprocal—processes between deliberate practice and the development and maintenance of high work performance.

Acknowledgements

This article is based on the diploma thesis of the second author, written under the supervision of the first author. We are grateful to Cathy van Dyck for helpful comments on an earlier draft.

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