

The Effects of Practical Experience on Expertise in Clinical Psychology and Collaboration

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Abstract

Two studies are presented. The first study examined the effects of growing practical experience on expertise in clinical psychology. 85 persons with different amounts of practical experience (novice, intermediate, and advanced students, trainee therapists, and experienced therapists) took part in the study. All participants completed an instrument consisting of a test measuring basic and clinical knowledge in a multiple choice format, two open-format questions on a basic and a clinical concept, and two short case studies. Up to and including the level of trainee therapists, the results followed the picture known from studies on expertise development in medicine. However, at the level of experienced therapists, the results point to a decrease in knowledge. The second study examined the effects of domain experience on interdisciplinary collaboration of physicians and clinical psychologists. 27 dyads with different experience levels (student dyads, trainee dyads, and experienced dyads) collaborated on a complex case study. In most measures on the quality of the collaboration, experienced dyads scored lower than trainee dyads and advanced student dyads. For the quality of the joint solution, results were more mixed. When discussing the results, it should be noted that the experienced therapists taking part in our studies had not undergone postgraduate professional training comparable to that completed by trainee therapists in Germany today.

Keywords: Expertise; Clinical Psychology; Interdisciplinary Collaboration

Introduction

Current overviews of expert problem solving and expertise development were provided in 2005 by a special issue of *Applied Cognitive Science* and in 2006 by the *Cambridge Handbook of Expertise* (Ericsson, Charness, Feltovich, & Hoffman, 2006). Although many domains have already been investigated, there are virtually no studies on expertise in the domain of clinical psychology and psychological psychotherapy. At the 2006 Cognitive Science conference, we presented first results on expertise development in this domain that were gained by studying psychology students and graduated trainee therapists (Hauser, Spada, Rummel, & Meier, 2006). The present paper aims at shedding further light on how practical experience influences expertise in clinical psychology by comparing students and trainees with experienced psychotherapists.

The combined insights from our first study on expertise in clinical psychology and existing research in medicine (e.g. Boshuizen & Schmidt, 1992) were used to address a further

shortcoming of expertise research: Up to now, expertise research has concentrated on individual problem solving. Today, however, a great deal of work is carried out in interdisciplinary teams. Therefore, a second study investigated the effects of growing practical experience on interdisciplinary collaboration.

In the following, we review the relevant literature on the nature of expertise, in particular expertise development in medicine. We then focus the presentation of our first study on expertise in the domain of clinical psychology in terms of comparing experienced therapists and trainee therapists. Next, we derive hypotheses for a study on computer-based interdisciplinary collaboration and present this second study.

Expertise

Expertise and expertise development have interested researchers since the seminal work of de Groot (1965) and later on of Chase and Simon (1988) examining expert-novice differences in chess. Since that work, expertise has been analyzed in such different domains as physics, sports, music, law, and medicine etc. Taking into account many of these studies, Bredard and Chi (1992) deduced five characteristics shared by experts from different domains: Compared to novices, experts (1) possess more domain-specific knowledge (2) which is also better organized. Therefore, experts (3) perform better than novices in domain-related tasks. However, (4) expertise does not transfer to other domains and (5) in some situations experts are not better than novices.

In the domain of psychology, expertise research is still rare. We are especially interested in the relationship between practical experience and expertise, defined as more and better organized domain-specific knowledge.

Expertise in Medicine

Medical expertise has attracted a great deal of research attention since the 1970s, resulting in a large body of literature (e.g. Boshuizen, 2004; Boshuizen & Schmidt, 1992). In order to examine expertise development in the domain of medicine, researchers have usually constructed a text-based case study and have asked medical doctors and novices to think aloud while working on it (Boshuizen & Schmidt, 1992). After diagnosing the case, participants are asked to elaborate on their assessment of the signs and symptoms (post-hoc pathophysiological explanations). Using this approach, novices, intermediate and advanced

students of medicine, and physicians with several years of experience in therapy have been compared.

Regarding the quality of diagnoses, an increase up to the level of expert physicians was found (e.g. Boshuizen, 2004). In terms of the development of knowledge with growing domain expertise, Boshuizen and colleagues postulated three steps (e.g. Boshuizen, 2004): (1) Medical students acquire large amounts of declarative biomedical knowledge. The representation of this knowledge can be understood as a loosely connected semantic network. (2) With some clinical experience, declarative knowledge is then encapsulated under clinical knowledge. Thus, encapsulated knowledge pertains to higher-order concepts (clinical knowledge) under which lower-order concepts (biomedical knowledge) are subsumed. In routine work, experts verbalize only higher-order concepts. Researchers have detected knowledge encapsulations by comparing post-hoc explanations with the think-aloud protocols. Compared to less experienced persons, experts verbalized fewer case-related statements in the think-aloud protocols, but their post-hoc explanations showed an increase in the amount of pathophysiological explanations. These explanations matched with the statements that experts had verbalized in the think-aloud protocols and could therefore be interpreted as knowledge encapsulations. (3) In a final step, medical experts develop illness scripts for each disease. An illness script consists of information on enabling conditions (conditions and constraints of a disease), the fault (major malfunctions in bodily processes), and consequences (signs and symptoms).

Medicine and clinical psychology are related in that in both domains, illnesses are diagnosed and specific treatments are applied that have been developed based on scientific knowledge. However, three main differences between clinical psychologists and physicians have been described and attributed to differences in their training (Kingsbury, 1987): (1) Students of psychology learn to view science as a body of scientific methods that help them to experimentally test theories whereas medical students learn to view science as a body of facts. (2) For physicians, there is a stronger association between particular diagnoses and specialized treatments than for psychotherapists. (3) At German universities, the first years of the psychology curriculum focus on a scientific education in the general field of psychology. Not until their third or fourth year can students decide to specialize in clinical psychology, and only after finishing their university education can they engage in clinical training. Medical students, in contrast, usually start their studies with the goal of becoming a physician, and after two preclinical years they receive clinical training. Against the background of the commonalities and differences described, we investigated whether expertise in clinical psychology and psychological psychotherapy develops in a similar manner to expertise in medicine.

Study One

Method

Participants and Design Psychologists on five levels of experience in clinical psychology participated in our study. We chose the experience levels in a way that mirrored important steps in the formal psychology training in Germany: *Novice students* were in their second year of university studies and had learned about basic principles of human psychology (topics such as learning, cognition, and emotion). *Intermediate students* were in their third year and had learned about the application of these basics. *Advanced students* were in their final two years and had chosen to focus on clinical psychology. *Trainee therapists* were at least in the second year of their on-the-job training after graduation. In Germany, psychologists have to complete postgraduate professional training in order to become a psychotherapist. The psychological psychotherapists taking part in our study (*experienced therapists*) were behavior therapists practicing in Freiburg, Germany and had worked for at least ten years in their profession. It should be noted that therapists taking part in our study had not undergone postgraduate professional training comparable to that received by trainee therapists today because in Germany this was not obligatory before 1998.

Altogether, 55 students (20 novice students, 20 intermediate students, and 15 advanced students), 15 trainee therapists, and 15 experienced therapists took part in our study. All participants received financial compensation for their voluntary participation. Students and trainee psychotherapists were recruited during lectures and workshops. The psychotherapists were contacted by letters and by phone in their practices.

Material and Dependent Variables To guarantee their relevance for clinical practice, all materials were developed in close collaboration with clinical psychologists holding substantial expertise in both clinical research and psychotherapy (Prof. Dr. Franz Caspar and Dipl.-Psych. Katrin Wenning). All participants completed a computer-based instrument consisting of three parts.

(1) A knowledge test comprised 12 multiple choice questions on three content areas: Knowledge on basic principles of psychology (e.g. “What is the result of classical conditioning?”), knowledge on the application of these basics to clinical psychology (e.g. “What kind of learning processes are part of Mowrer’s two-factor theory of avoidance learning?”), and knowledge on clinical psychology (e.g. “What does Beck call the negatively biased thoughts in depression?”). We assessed the percentage of correct answers for each content area.

(2) In two open-format questions, participants were asked to write down everything they knew about (a) a basic concept (*schedules of reinforcement*) and (b) a clinical concept (*schizophrenia*). We measured the amount of correct answers by comparing them to a model solution, and

counted the amount of technical terms. Interrater-reliability was satisfactory ($ICC > .82$) for all variables.

(3) The main part consisted of two case studies. The first case study described a patient with social phobia, and the second a patient with an obsessive-compulsive disorder. Similar to the studies in the domain of medicine, we instructed participants to scan the case, recall important information, diagnose the case, and finally to explain the disorder they had diagnosed. In the recall phase, we assessed the amount of correctly recalled statements and counted the amount of higher-order concepts used. For the diagnosis, a score from 0 (*no or wrong diagnosis*) to 1.25 (*correct and elaborated diagnosis*) was assigned. In the explanation phase, we measured the amount of correct explanations by comparing them to a model solution. The interrater-reliability was sufficient ($ICC > .74$) for all variables.

Results

A multivariate analysis of variance (MANOVA) with subsequent ANOVAs was used to compare the five levels of experience (Pillai's Trace, $F(4, 60) = 2.55, p < .01, \eta^2 = 0.36$). Four a priori contrasts were computed. Due to shortage of space and because of our focus on effects of practical experience, in the present paper we include only the fourth contrast, comparing the experienced therapists and the trainee therapists. For all statistical tests, an alpha level of .05 was used. Table 1 gives a sketch of the descriptive results; we are currently preparing a longer publication describing the results in detail. *Levels of Education* summarizes the trends from novice, to intermediate and to advanced students, up to the level of trainee therapists. *Levels of Experience* summarizes the trends from trainee therapists to experienced therapists.

There was no difference regarding the overall time participants spent completing the instrument ($F(4, 80) = 1.94, n.s.$).

Knowledge Test

Regarding *basic principles of psychology*, the ANOVA revealed a marginally significant effect ($F(4, 80) = 2.3, p = .06, \eta^2 = .10$). The novice students scored the highest, and knowledge then decreased. The trainee therapists outperformed the experienced therapists ($t(4, 80) = 1.68, n.s.$). On the subscale *application of basic principles*, there was an increase at the level of intermediate students, and knowledge then decreased continuously up to the experienced therapists ($F(4, 80) = 4.42, p < .01, \eta^2 = .18, t(4, 80) < 1, n.s.$). The levels differed significantly on the questions on *clinical psychology* ($F(4, 80) = 7.7, p < .01, \eta^2 = .28$). Knowledge increased up to the level of trainee therapists, with a rather strong increase at this level. Experienced therapists scored lower than trainee therapists ($t(4, 80) = 2.0, n.s.$).

Open-Format Questions

Regarding the first open-format question (*schedules of reinforcement*), the levels differed significantly in their use of technical terms ($F(4, 80) = 3.0, p = .02, \eta^2 = .13$). Experienced therapists used fewer technical terms than trainee therapists ($t(4, 80) < 1, n.s.$). With regard to the amount of correct statements ($F(4, 80) = 2.0, n.s.$), no significant differences were found.

With regard to the second open-format question (*schizophrenia*), the levels differed significantly in terms of both the amount of correct statements ($F(4, 80) = 10.4, p < .01, \eta^2 = .34$) and the technical terms used ($F(4, 80) = 8.3, p < .01, \eta^2 = .29$). In both variables, knowledge increased up to the level of trainee therapists. Experienced therapists scored much lower than trainee therapists (amount of correct statements: $t(4, 80) = 3.8, p < .01$); technical terms used: $t(4, 80) = 3.4, p < .01$).

Table 1: Sketch of the descriptive results of Study 1 (↓ = general decrease, ↑ = general increase, → = stability over the levels).

| | Levels of Education Novice to Trainee | Levels of Experience Trainee to Experienced |
|---|--|--|
| Knowledge Test | | |
| Basic Knowledge | ↓ | ↓ |
| Application of Basic Kn. | → | ↓ |
| Clinical Knowledge | ↑ | ↓ |
| Open Format Question on Schedules of Reinforcement | | |
| Correct Statements | ↓ | ↓ |
| Technical Terms | ↓ | ↓ |
| Open Format Question on Schizophrenia | | |
| Correct Statements | ↑ | ↓ |
| Technical Terms | ↑ | ↓ |
| Case Study 1: Social Phobia | | |
| Recall: Correct Statements | ↑ | ↓ |
| Recall: Higher-order Concepts | → | ↓ |
| Diagnosis: Correctness | ↑ | ↓ |
| Explanation: Correct Statements | ↑ | ↓ |
| Case Study 2: Obsessive Compulsive Disorder | | |
| Recall: Correct Statements | ↑ | ↓ |
| Recall: Higher-order Concepts | → | ↓ |
| Diagnosis: Correctness | ↑ | → |
| Explanation: Correct Statements | ↑ | ↓ |

Case Study 1: Social Phobia

Participants differed significantly in the amount of recalled statements ($F(4, 80) = 5.6, p < .01, \eta^2 = .22$) and the amount of higher-order concepts used ($F(4, 80) = 4.8, p < .01, \eta^2 = .19$) across experience levels. Up to the trainee

therapists, the participants recalled approximately the same amount of statements, while the experienced therapists recalled significantly fewer statements than the trainees ($t(4, 80) = 3.4, p < .01$). Regarding the higher-order concepts, there was an increase up to the level of trainees and a decrease at the level of experienced therapists ($t(4, 80) = 2.0, p = .06$).

In terms of the quality of the diagnosis, the experience levels differed significantly ($F(4, 80) = 6.7, p < .01, \eta^2 = .25$). Diagnosis improved at the level of intermediate students and then leveled off. Experienced therapists scored slightly lower than trainees ($t(4, 80) = 1.8, n.s.$).

With regard to the explanation, the levels differed significantly in the amount of correct statements ($F(4, 80) = 4.1, p < .01, \eta^2 = .17$). Again, the already familiar picture was found, with the trainees scoring the best. The experienced therapists scored lower than trainee therapists ($t(4, 80) = 1.7, n.s.$).

Case Study 2: Obsessive-Compulsive Disorder

Participants differed significantly across experience levels in the amount of higher-order concepts used ($F(4, 80) = 3.1, p = .02, \eta^2 = .13$). Again, there was an increase up to the level of trainee therapists and then a decrease at the level of experienced therapists ($t(4, 80) = 1.4, n.s.$). Regarding the amount of correct statements, the experience levels did not differ significantly ($F(4, 80) = 1.5, n.s.$).

In terms of the quality of the diagnosis, the levels again differed significantly ($F(4, 80) = 3.2, p = .02, \eta^2 = .14$). Diagnosis improved at the level of intermediate students and then leveled off. Experienced therapists scored as highly as trainee therapists ($t(4, 80) < 1$).

With regard to the explanation, the data showed the usual picture, with the trainees scoring best. The levels differed significantly in the amount of correct statements ($F(4, 80) = 5.3, p < .01, \eta^2 = .20$). Again, the experienced therapists scored lower than the trainee therapists ($t(4, 80) = 1.4, n.s.$).

Discussion of Study One

The goal of this study was to shed light on expertise development in clinical psychology and compare the insights gained to existing research in medicine. Psychologists with different amounts of experience completed an instrument measuring theoretical basic and clinical knowledge. Up to and including the level of trainee therapists, the results can be predicted from the organization of the university curriculum in psychology in Germany. At the beginning of university studies, students are taught mainly basic principles of psychology and their application, and we consequently found that these students outperformed the other levels on these variables. Later on, students also learn clinical knowledge, and we therefore found improvements in clinical knowledge at this level. After graduation, trainee therapists deepen their knowledge in clinical psychology further; and consequently, we found another substantial increase. However, at the level of experienced therapists, our results point to a decrease in

knowledge, particularly in clinical knowledge. It should be noted that the experienced therapists did not undergo a certified on-the-job training comparable to that of today's trainees and thus our results can partly be explained by differences among these cohorts. A systematic training program for practitioners would probably help to keep their knowledge up to date and counteract the trend we found. These results contradict findings in medicine that have shown a continuous increase in biomedical knowledge (e.g. Boshuizen & Schmidt, 1992). An explanation for this may be that studies in medicine have usually looked at persons with about 4 years of experience at the highest level. Our study, by contrast, examined persons with at least 10 years of practical experience. This long period may have led to the therapists forgetting theoretical clinical knowledge. In the variables measuring practical clinical competencies – the diagnoses – experienced therapists scored as highly as trainee therapists. This may be due to the fact that diagnosing is an activity that is very familiar for expert therapists.

As stated above, up to now, research on expertise has concentrated on studying individual problem solving, while in their daily work, experts often have to work in an interdisciplinary fashion. On the basis of the findings of our first study, we conducted a second study to examine how growing domain experience affects the collaboration of physicians and psychological psychotherapists on a complex, interdisciplinary case study. We examined collaboration via a videoconferencing system. Compared to face-to-face collaboration, this setting allows recording the collaboration more easily, and enables to attribute single statements or action in the shared editor to the contributor.

Study Two

Assumptions

For our second study, we used findings from our first study in order to predict collaboration process as well as process outcome:

For the collaboration process, we assumed that knowledge encapsulation (Boshuizen & Schmidt, 1992) or even loss of theoretical knowledge (see above) leads to a reduced capability to exchange domain-specific information. Thus, communication processes such as grounding (Clark & Brennan, 1991) should be more complicated with growing domain expertise. Moreover, Dreyfus & Dreyfus (1986) postulated that experts' decision making is more intuitive, leading us to the assumption that experienced persons do not discuss their arguments as much as less experienced persons.

Making assumptions for the joint solution was more difficult: For the planning of therapy steps, research on expertise is lacking, even in medicine (Norman, Eva, Brooks, & Hamstra, 2006). Expertise research on diagnosing ability revealed that experienced persons generally diagnose as correctly as or even more correctly than less experienced ones. However, predictions are

difficult because the quality of joint solution is not only influenced by the individual ability of the collaborating partners but also by the quality of the collaboration process. In our study, the medical members of a dyad served as authentic partners with whom psychologists often collaborate. Medical expertise is not investigated in this study. Instead, we focused on the psychological part of the process and the outcome.

Method

Participants and Design Three levels of domain experience (student dyads, trainee dyads, and experienced dyads) were compared. At the student level ($n = 11$ dyads), medical students who were in at least their third clinical semester (fourth year of study) collaborated with students of psychology who had completed their specialization in clinical psychology (also in the fourth year). At the trainee level ($n = 10$ dyads), residents who had been working in a hospital for at least one year after graduation collaborated with trainee therapists who were in at least the second year of their on-the-job training after graduation. Finally, at the experienced level ($n = 6$ dyads), physicians working as general practitioners collaborated with psychotherapists. The experienced persons had worked in patient care for at least 10 years. All participants received financial compensation for their voluntary participation.

Setting and Procedure During their collaboration, participants communicated via a desktop videoconference system. They were provided with individual text editors to take notes, and a shared text editor to compile the joint solution. After they had successfully completed a technical training, participants were given 15 minutes to read the case study individually and to skim the textbooks that were available for their aid. In the next 60 minutes, dyads collaborated on a threefold task: They were asked to (1) diagnose the case, (2) state differential diagnoses, and (3) plan medical and psychological therapy steps.

Dependent Variables To assess the quality of the outcome, the written solutions of all dyads were blind-rated by one of the psychotherapeutic experts who had helped to construct the case study. The expert rated the quality of the diagnoses, differential diagnoses and therapy steps on a six-point scale (1 = very bad to 6 = very good), resulting in three psychological ratings.

The videotaped collaboration was assessed by a trained rater with the help of a rating scheme consisting of nine dimensions (Meier, Spada, & Rummel, 2007): sustaining mutual understanding, dialog management, information pooling, reaching consensus, task division, time management, technical coordination, reciprocal interaction, and task orientation. In contrast to all other dimensions, task orientation was assessed on the individual level. Thus, ten variables resulted. Each dimension was rated on a five-point rating scale ranging from 0 (very bad) to 4 (very good). The

psychometric properties of this instrument have been found to be satisfactory (see Meier et al., 2007).

Results

Collaborative Process A multivariate analysis of variance (MANOVA) of the ten process variables revealed a significant overall effect for the experience level ($F(2, 24) = 1.9, p = .05, \eta^2 = .62$). Subsequent ANOVAs showed that the trainee dyads scored best, followed by the students and then the experienced dyads. Figure 1 illustrates this pattern by showing the results for *reciprocal interaction*. Altogether, eight out of ten dimensions followed this pattern. We found significant differences between the experience levels on the dimensions of *information pooling* ($F(2, 24) = 3.34, p = 0.05, \eta^2 = 0.22$), *technical coordination* ($F(2, 24) = 6.39, p = 0.01, \eta^2 = 0.35$), and *reciprocal interaction* ($F(2, 24) = 4.46, p = 0.02, \eta^2 = 0.27$). On five other variables, the same pattern was found (*sustaining mutual understanding, dialogue management, reaching consensus, task division, task orientation psychological participant*), although the group differences did not reach the significance level.

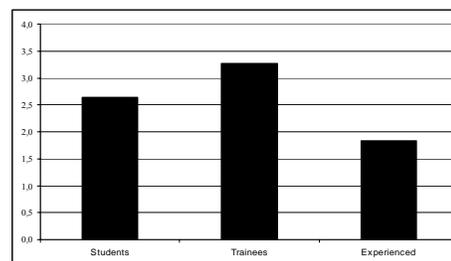


Figure 1: Results for the dimension reciprocal interaction

Joint Solution The dyads differed significantly in terms of the psychological differential diagnoses. The trainee dyads scored best, followed by the student dyads and the experienced therapist dyads ($F(2, 24) = 4.63, p = .02, \eta^2 = 0.28$). Although not significant ($F(2, 24) = 1.78, p = 0.19, \eta^2 = 0.13$), the same descriptive pattern could be found in the psychological diagnoses. No significant differences were found regarding the therapy steps ($F(2, 24) < 1$).

Discussion of Study Two

Study 2 examined the effects of growing domain experience on the collaboration of persons with medical and psychological backgrounds. Student dyads, trainee dyads, and experienced dyads worked via a videoconferencing system on an interdisciplinary case study. Data were gathered from the collaboration process with a rating scheme developed by our research team in earlier studies (Meier et al., 2007) and from the joint solution with the help of domain experts.

As expected, trainee dyads showed the best collaboration, followed by the advanced students, and then the experienced dyads. The results in the joint solutions were more mixed.

The experience levels only differed in the psychological ratings of differential diagnoses and marginally in the ratings of the diagnoses. One explanation might be that the joint solution is not only affected by individual competencies of the collaboration partners but also by the quality of the collaboration. Thus, one can assume that enhancing the quality of collaboration, for example by providing model collaborations before the real collaboration takes place (Rummel & Spada, 2005), would also enhance the quality of the joint solution.

Overall Discussion

The two studies presented in this paper aimed to fill in two gaps in the research on expertise development. The first is the lack of research on expertise development in the domain of clinical psychology. Although it is related to the well-studied domain of medicine (e.g. Boshuizen, 2004), we found – besides commonalities – relevant differences between the two domains in the way in which expertise develops. In both domains, students first acquire basic knowledge. Then, clinical knowledge is acquired and basic knowledge is encapsulated under clinical knowledge. At the highest level of experience, however, in contrast to medicine, our results point towards a decrease in theoretical clinical knowledge. A further study is underway, examining illness scripts in psychology.

A shortcoming of expertise research is the exclusive investigation of individual problem solving, whereas in reality, experts often have to work with experts from other domains. As experts are often not co-located, they are frequently forced to collaborate in a computer-based manner. Consequently, the second study examined the effects of growing domain experience on the computer-based interdisciplinary collaboration of physicians and psychological psychotherapists. As expected from findings on expertise, we found that high domain experience complicates collaboration processes. These detrimental effects of experience partly affected the outcome of collaboration negatively. Thus, we proposed the development of support measures to enhance the collaboration process.

It must be noted that the sample sizes in both studies were relatively small. In addition, the studies took place in a laboratory setting, using carefully constructed materials. Thus, our results allow only tentative generalizations.

In conclusion, it should be emphasized that the present studies attempted to connect basic research on expertise development with more applied research, e.g. on computer-based interdisciplinary collaboration.

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