Towards Defining Dental Drilling Competence, Part 2: A Study of Cues and Factors in Bone Drilling

Ioanna Ioannou, B.E., B.Com.; Linda Stern, Ph.D., Dip.Comp.St.; Edmund Kazmierczak, Ph.D.; Andrew C. Smith, B.D.S., M.D.Sc., F.D.S.R.C.S., F.D.S.R.C.P.S., F.R.A.C.D.S.; Lisa Z. Wise, Ph.D., M.Tech.

Abstract: The study of expertise in surgery aims to facilitate the development of improved training methods by understanding the characteristics of expert practitioners. In this article and its companion, we present our study of the characteristics of competence and expertise in the field of oral surgery. We observed participants of different skill levels as they performed an ex vivo drilling task designed to test the psychomotor skill of distinguishing the material boundaries between tooth and bone. Part 1 of this study examined the physical characteristics of drilling performance, while this article examines the cognitive aspects of performance. In this article we investigate the psychomotor cues used for decision making during drilling and explore other factors that affect a participant's ability to distinguish tooth from bone. Our results suggest that visual and tactile cues were the most important cues guiding drilling performance in all participant groups. Our results also suggest that when compared to experts, novices relied more on visual cues rather than tactile cues and lacked the psychomotor skills required to utilize the broader range of cues used by experts.

Ms. Ioannou is a Ph.D. student, Department of Computer Science and Software Engineering, University of Melbourne; Dr. Stern is Senior Lecturer, Department of Computer Science and Software Engineering, University of Melbourne; Dr. Kazmierczak is Senior Lecturer, Department of Computer Science and Software Engineering, University of Melbourne; Dr. Smith is Head of the School of Dentistry, Director of the Oral Health Centre of Western Australia, and Winthrop Professor, University of Western Australia; and Dr. Wise is Senior Lecturer, Social Science Group, Swinburne University of Technology, Victoria, Australia. Direct correspondence and requests for reprints to Ms. Ioanna Ioannou, Department of Computer Science and Software Engineering, University of Melbourne, 111 Barry Street, Carlton, Victoria 3053, Australia; 61-402-385-439 phone; 61-3-9348-1184 fax; ioannoui@unimelb.edu.au.

Keywords: dental education, preclinical dental training, oral surgery, psychomotor skills, technical expertise, virtual reality simulation

Submitted for publication 12/9/09; accepted 3/2/10

Competence in surgical psychomotor skills is crucial for oral surgeons. Psychomotor skills are most effectively acquired by observation, practice, and feedback.[1] Dental curricula often include limited hands-on practice. As a consequence, the acquisition of practical skills occurs primarily during clinical practice, in which students work with real patients. This model of training can put patients at risk and does not guarantee practice with an adequate caseload and case mix. Practice is crucial to the development of motor skills, procedural skills, and problem-solving abilities seen in experts.[2] Virtual reality (VR) simulators with force feedback offer the potential to improve surgical training by providing better extraoperative opportunities to practice specific skills and to engage in clinical problem-solving.[3]

One issue with many VR-based training systems in surgery is that their development has often been technology-driven, rather than focusing on the training objectives and the needs of trainees.[4] Implicit in the notion of VR simulations for training is the idea that the closer a simulation is to perfect realism, the better training it will provide.[4,5] In striving for perfect realism, unnecessary time may be spent simulating aspects of reality that are not important in achieving the learning objectives, while other more crucial aspects may be missed altogether. To maximize training effectiveness and minimize development costs, training simulators should represent all crucial skill-related cues and responses in high fidelity. Information that is not crucial to the skill being taught can be represented in low fidelity, and unimportant information may be omitted from the simulation. The biggest issue in relation to simulation fidelity is identifying precisely which combination of cues is critical to the skill being taught and whether the importance of different cues changes as training progresses and proficiency improves.

To develop simulators of appropriate fidelity for optimal training outcomes, we require a better understanding of the cognitive processing taking place as a technical skill is employed in a surgical task. Essentially, we need to understand the progression from beginner to expert and the information that must be present during practice to facilitate that progression. To date, the development of expertise in dentistry and oral surgery has not been systematically studied or understood.

The study of expertise is important in designing tools and training methods that facilitate the development of expert performance. This importance has been strongly emphasized in fields such as aviation, sports, and music.[2,6,7] In aviation, the study of expertise has brought about major changes in the way pilots are trained.[2] Training programs designed to focus learners' attention on task-related knowledge and skills critical to expert performance have been effective and have shown promise in facilitating skill acquisition among nonexperts and in reducing errors by experts.[6]

Our study is a step toward understanding the mechanisms underlying expertise in oral surgery and designing training tools to improve skilled performance. The companion article presented the background and motivations driving our study of expertise in oral surgery, and examined the physical differences in the performance of participants with varying proficiency.[8] This article focuses on the cognitive aspects of performance. We investigated which sensory-motor cues are used in distinguishing tooth from bone during a drilling task by participants of different skill levels and how important each cue is perceived to be. To achieve the objectives of this study, we observed and interviewed predoctoral dental students, dental practitioners, and oral surgeons as they performed a small oral surgical drilling task: removing the bone surrounding an ovine tooth without damaging the tooth itself.

Study Design

This study is of an exploratory nature. Cognitive task analysis[9] was chosen as a basis for our experimental method because it is well suited to qualitative exploratory studies and can provide valuable initial insight into the subject being studied.

This study focuses on understanding the cues and factors affecting the acquisition of a particular psychomotor skill in oral surgery. We studied the skill of distinguishing bone from tooth during drilling, which is utilized in many oral surgery procedures. According to dental science teaching staff at the University of Melbourne, this is a skill that students have great difficulty acquiring. The drilling task chosen to test this skill was that of removing jaw bone to expose the root of a tooth without damaging the tooth itself. This task was chosen because it is simple to demonstrate to participants and can be rapidly assessed whilst still requiring enough cognitive processing to enable an investigation of the cues used for decision making. Cognitive task analysis was applied to uncover the cues utilized during this drilling task.

The participant groups consisted of dental students of the University of Melbourne and practicing dentists. Participants were divided into three groups—experts, journeymen, and initiates—based on Hoffman et al.'s expertise classifications.[10] Table 1 summarizes the participant numbers and characteristics of each group. The use of human subjects in this study was approved by an ethics committee at the lead author's home institution.

Data Collection Methods

Figure 1 illustrates the physical setup of the experiment, which was detailed in the companion article.[8] All participant groups followed the same experiment procedure. This procedure involved 1) watching an instructional video that explained and demonstrated the task and its requirements; 2) a pretask interview; 3) carrying out the drilling task; 4) a post-task interview; and 5) completing a written questionnaire. The physical setup, interview protocols, and written questionnaire used in this study were developed in consultation with academic staff from the School of Dental Science at the University of Melbourne and were refined with the help of a small pilot study carried out with three participants.

Interviews were semistructured, and questions were tailored to each participant group. Appendix A contains the discussion questions used in interviews (journeymen and experts were asked the "Expert" set of questions, while initiates were asked the "Novice" set of questions). The entire session for each participant was recorded using video cameras.

It should be noted that while cognitive task analysis typically involves participants' talking through their thought processes during a task, this was not practical in this case due to the noise level of the drill, the short duration of the task being analyzed (fifteen to ninety seconds), and the concentration required to perform the task. Observing participants without interruptions and explanations also enabled us to observe what they actually did, as opposed to what they would say they did when answering questions.[11]

Table 1. Participant groups, numbers of participants, and group characteristics

Group	Number	Conceptual Definition[1]	Description
Initiate	5	A novice who has began introductory instruction.	Dental science students in their fourth year of study. By this stage they have performed under five similar tasks in a skill laboratory and have been training in the clinic with patients for approximately six months.
Journeyman	5	An experienced and reliable worker, or one who has achieved a level of competence.	Practicing dentists with six months to ten years of dental experience, who were undertaking postgraduate study in oral surgery.
Expert	4	A distinguished journeyman, highly regarded by his or her peers, whose judgments are uncommonly accurate and reliable, whose performance shows consummate skill and economy of effort, and who can deal effectively with rare or "tough" cases.	Practicing dentists and oral surgeons with more than ten years of experience in oral surgery. Ten years is the period of practice that is typically required to attain expertise in an area.[2]

Sources:
1. Hoffman RR, Shadbolt NR, Burton AM, Klein G. Eliciting knowledge from experts: a methodological analysis. Organ Behav Hum Decis Process 1995;62(2):129–58.
2. Fiore SM, Hoffman RR, Salas E. Learning and performance across disciplines: an epilogue for moving multidisciplinary research toward an interdisciplinary science of expertise. Mil Psychol 2008;20(1):S155–S170.

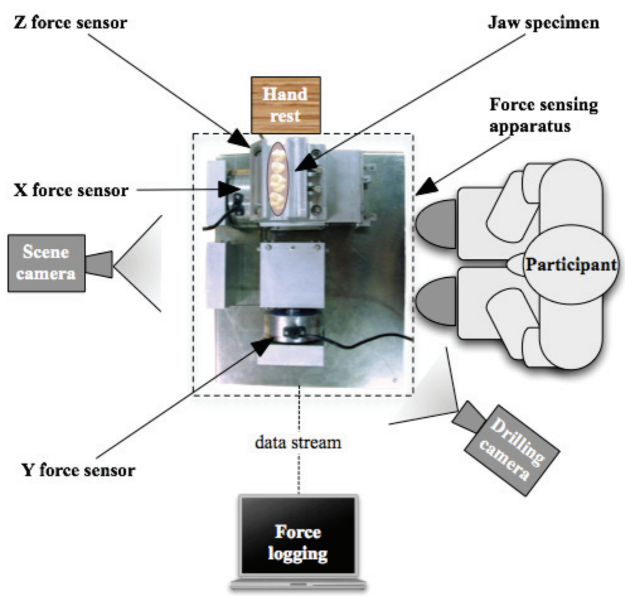

Figure 1. Setup for the experimental procedure

Answers to questions on the written questionnaires took the form of a continuous scale, in which participants marked the importance of specific cues from "Not important" to "Crucial." A sample questionnaire appears as Appendix B. We employed this additional data collection method because collecting data from more than one standpoint increases concurrent validity by enabling triangulation of the data.[12]

Data Analysis Methods

Interview data analysis aimed to identify which cues each participant used (in the form of a Yes/No answer). Analysis of questionnaire data aimed to cross-validate the interview results and identify how important each cue was to each participant.

To carry out interview analysis, the video recording of each session was annotated using qualitative coding[13] in order to identify the cues referenced by each participant to differentiate tooth from bone during the drilling task and any other factors affecting his or her performance. Participants were recorded as using a particular cue if they discussed it at least once during their interview in explaining how they identify the boundaries between tooth and bone or how they differentiate materials. The interview coding scheme initially contained the cues examined by the written questionnaires to allow cross-referencing of the results. The coding scheme was further developed and extended based on the most commonly discussed cues and performance factors emerging from the interviews.

Questionnaires were analyzed by deriving a rank for each cue based on the value assigned to it by the participant, thus obtaining an ordering of cues for each participant. From this information, the average rank for each cue was calculated for each group. We used rankings rather than absolute values in our questionnaire analysis because this eliminated individual participant bias towards higher or lower values.

Results

We examined the cues that participants referenced during drilling to determine whether they are approaching the boundary between tooth and bone or whether they have crossed a boundary and must back away; we then categorized them into visual, tactile, and sound cues. These categories were chosen because they correspond to the modalities that can be simulated in VR, thus allowing easy translation of our study results to VR simulator requirements.

Figure 2 shows the percentage of participants recorded as using each general category of cues. Visual and tactile cues were used by all participants, while sound cues were used less, particularly in the initiate group.

Visual Cues

The visual cues most commonly discussed in interviews were anatomical structure of tooth and bone, changes in color, and position and angulation of the bur in relation to the tooth. Across all groups, some participants discussed visual cues only in general terms (for example, stating that "tooth and bone look different," without elaborating on the specific differences), while others described specific cues such as how they use their knowledge of anatomy when looking at the specimen to infer where the tooth root is. Figure 3 presents the percentage of participants using each type of visual cue.

As Figure 3 shows, a high percentage of experts discussed all visual cues. Color cues were discussed by more experts than those in the other groups. Experts also ranked color cues significantly higher than initiates in the questionnaires (Table 2). The perceived importance of color expressed in the questionnaires increased from the least experienced to the most experienced participant groups.

Interview data shown in Figure 3 suggests that initiates focused primarily on anatomical cues, i.e., looking at the ovine jaw and guessing where the root

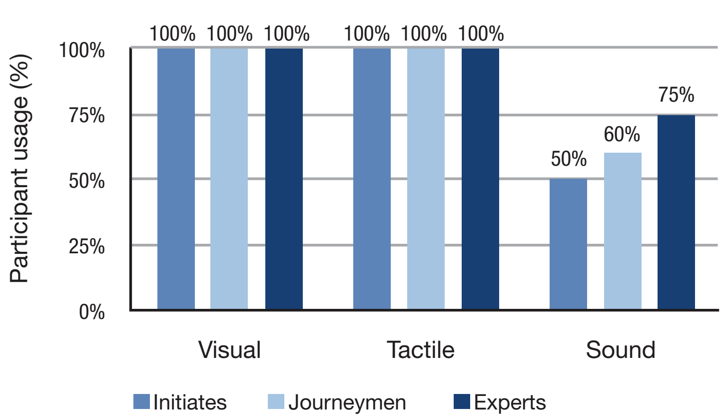

Figure 2. General cue categories referred to in interviews, by percentage of participants in each category

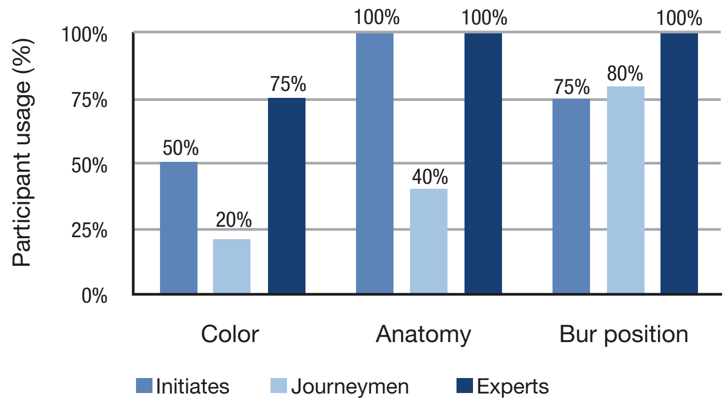

Figure 3. Specific visual cues referred to in interviews, by percentage of participants in each category

of the tooth should be based on their knowledge of anatomy. This is also reflected in the questionnaire results (Table 2), where initiates ranked tooth shape as the second most important cue. Journeymen ranked tooth shape as third most important, and experts ranked it as fourth. Thus, the questionnaire results suggest that tooth shape is decreasingly important as experience increases across groups.

The position of the bur tip in relation to the tooth and the angulation of the bur were considered important by a very high portion of participants across all groups. The importance of drill position in relation to the tooth was ranked first or second by all groups in the questionnaire results. In interviews, all participants except one initiate and one journeyman stressed the importance of maintaining correct drill angulation throughout the task.

Table 2. Average ranks for specific visual cues in questionnaires

	Initiates	Journeymen	Experts
Color	6	4	3
Tooth shape	2	3	4
Bur position	1	1	2

Tactile Cues

All participants reported that they used tactile cues in some way. Some initiates simply talked about a general change in "feel" across different materials, while most journeymen and experts discussed more specific cues such as changes in hardness, texture, and drill vibration. Figure 4 shows the percentage of participants using each type of tactile cue based on interview data.

From Figure 4 it is evident that material hardness was a very important cue for journeymen and expert participants, with all participants using it. Only one initiate recognized this cue as important. In interview discussions, the majority of initiates indicated that they were trying to use tactile cues such as hardness, but they could not utilize them because they did not have enough practical experience to know how each material should feel. Questionnaire results suggest that the ability to use hardness cues develops with experience, with journeymen and experts ranking the hardness cue significantly higher than initiates (Table 3).

Vibration and texture cues were discussed by a very small portion of the participants. This is consistent with questionnaire results for the vibration cue, where it was ranked relatively low by all groups. Interestingly, texture was ranked third by initiates in questionnaires, but this fact was not at all reflected in interview data.

Sound Cues

Figure 2 shows that at least half of the participants in each group used sound cues in some way, but very few discussed different types of sound cues such as changes in amplitude and pitch. Only a few participants from the journeymen and expert groups were able to offer some detail regarding the specific

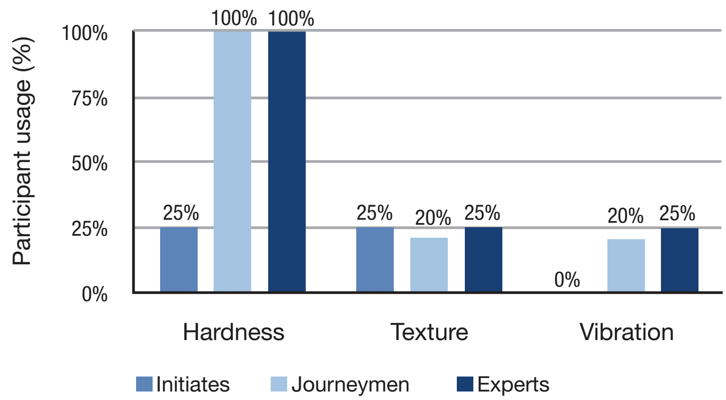

Figure 4. Specific tactile cues referred to in interviews, by percentage of participants in each category

Table 3. Average ranks for specific tactile cues in questionnaires

	Initiates	Journeymen	Experts
Hardness	4	2	1
Texture	3	5	5
Vibration	5	6	7

sound changes that they listened for during the task (Figure 5). Just half of initiates discussed sound cues in any form (Figure 2). The majority of participants realized that the drill produces a different sound when drilling tooth and bone, but they had not thought of it as a cue nor had they thought of what specific sound changes occur when crossing material boundaries. Figure 2 suggests that sound cues are utilized by more participants as experience increases, and Figure 5 shows that more experts were able to discuss specific sound cues.

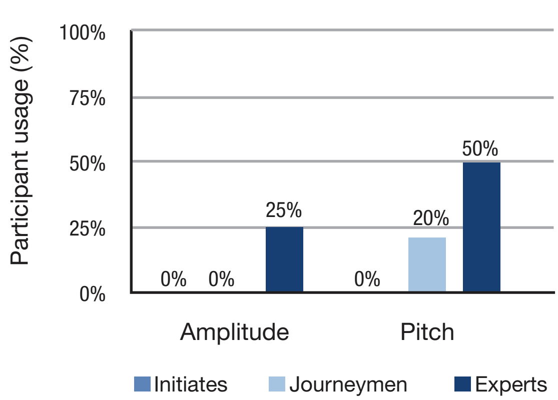

Figure 5. Specific sound cues referred to in interviews, by percentage of participants in each category

When interviewed, the majority of experts and a large portion of journeymen reported using sound cues, yet in the questionnaires sound was ranked last or second last by all groups. This may indicate that sound is a secondary cue that is useful but not crucial.

Other Factors Affecting Performance

There were other factors that participants deemed to affect their performance. Such factors were obtained from interview data as a by-product of cue analysis. The factors most commonly discussed related to the experimental setting and included the ability to obtain a stable hand rest or finger rest close to the tooth being drilled, the ability to use the second hand for support, the shape of the burr, and the type and speed of the drill. These factors were found to affect a relatively uniform percentage of participants across groups. Therefore, it is reasonable to assume that they are not significantly affected by experience, though more experienced participants found it easier to adapt to the conditions of the experiment.

Discussion

This study explored important psychomotor cues involved in the skill of distinguishing tooth

Table 4. Cues ordered by significance for each participant group based on combined interview and questionnaire data

Initiates	Journeymen	Experts
1. Anatomy of the area	1. Bur position	1. Changes in hardness
2. Bur position	2. Changes in hardness	2. Bur position
	3. Anatomy of the area	3. Anatomy of the area
		4. Changes in color

and bone during drilling for three participant groups of varying skill levels. Table 4 shows the most significant cues for each group based on combined interview and questionnaire data. It is clear that as experience increases, there is a shift in the importance of certain cues. For instance, in questionnaires, the importance of the color cue increases from the least experienced to the most experienced participant group. This indicates that color may be a cue that surgeons learn to utilize better as they become more experienced.

The data indicate that hardness was a very important cue in the skill being studied for journeymen and experts (Table 3). We have identified a stark difference in ability to perceive changes in material hardness between initiates and more experienced dentists. In interview discussions, initiates commented that they had trouble perceiving hardness differences due to lack of previous experience. On the other hand, experts and journeymen commented that past experience of drilling bone and teeth significantly helped their ability to differentiate the hardness of different materials. Such statements suggest that the ability to perceive subtle changes in material hardness is developed experientially through repeated exposure to the cue. This finding highlights the need for more opportunities to practice and develop technical skills in settings that provide realistic tactile feedback. It also suggests that any VR simulator designed to train the skill of differentiating tooth and bone needs to be able to represent hardness realistically.

The interview and questionnaire data generally corroborate each other with the exception of hardness and texture for initiates. On average, initiates ranked texture and hardness high in questionnaires (third and fourth respectively); however, only 25 percent discussed these cues in interviews. Another exception is sound, which was ranked last or second to last in questionnaires by all groups, yet it was perceived as a cue by more than half of the participants in any group. This may suggest that sound is recognized as a cue but is not perceived to be important. Sound may be a secondary cue that is not significant on its own but is useful in augmenting other cues such as changes in color and hardness. Put another way, sound cues might be used to monitor the progress of drilling such that "unusual sound cues" will offer an early warning for an approaching material boundary or a possible error. If sound cues play this role, they will be monitored as part of the "contextual background" rather than capturing focal attention and thus will not be rated as being as important as the cues that they augment. However, in terms of training for future expertise, sound cues will need to be incorporated with appropriate fidelity into a VR simulation in order to allow trainees to utilize the cue as an early warning cue to augment visual and tactile cues.

Interview results show that a generally higher portion of experts discussed each cue compared to the other groups. In interview discussions, experts also provided more detailed information as to how and when they use each cue. This information may indicate that experts are better able to articulate their cognitive processes (greater metacognitive awareness), possibly due to extensive experience in teaching technical skills. Overall, the data suggest that more experienced participants utilized a broader range of cues (Table 4), which supports the notion that the ability to identify certain cues is developed through experience and practice. In an information-processing and pattern-matching model of psychomotor skill development, all of the cues that are salient to the expert need to be represented in a training simulation if we expect trainees to extract the multisensory patterns of information used by experts. Further research is required to understand the role of cognitive load in learning to utilize psychomotor cues in surgery and determine whether beginners should be exposed to the full range of cues throughout their training or whether it would be more beneficial to remove cues only recognized by experts until learners become comfortable with basic cues.

Finally, analysis of other factors affecting performance suggests that realistic hand or finger positioning is important, since participants had difficulty with the hand rest that was provided. Therefore, when designing a VR training tool, it would be beneficial to set it up in a way that allows trainees to position themselves as they would in a real-life situation.

The type of drill and bur used was another factor reported by participants as affecting their performance. This is because different drill and bur types require different techniques and produce different tactile feedback. This finding highlights the need to provide opportunities to practice with different types of drills and burs. A VR training tool with realistic tactile feedback would be ideal for such training because a single workbench can simulate a range of different drills and burs.

The findings of this study will be valuable in the development of training strategies and tools such as VR simulators. Knowing the most important cues and factors involved in performing a task enables development efforts to focus on providing accurate simulation of these cues such that trainees can learn to utilize them by practicing on a simulator. By focusing on what is really important for the skill being taught, simulators can become more effective, and the development effort can be reduced.

Conclusion

Conducting this study has revealed a wealth of information that is not otherwise available when developing training tools. With the information provided by studies of this type, there is increased ability to develop training tools that will foster the development of transferrable skills and provide valuable practice opportunities for dental students.

The methods used in this study can be applied to other surgical skills to further improve our understanding of technical skill learning in surgery and identify common learning problems across different skills.

REFERENCES

1. Wanzel KR, Ward M, Reznick RK. Teaching the surgical craft: from selection to certification. Curr Probl Surg 2002;39(6):573–659.
2. Ericsson KA, Charness N, Feltovich PJ, Hoffman RR. The Cambridge handbook of expertise and expert performance. Cambridge: Cambridge University Press, 2006.
3. Cosman PH, Hemli JM, Ellis AM, Hugh TJ. Learning the surgical craft: a review of skills training options. Aust N Z J Surg 2007;77:838–45.
4. Cosman PH, Cregan PC, Martin CJ, Cartmill JA. Virtual reality simulators: current status in acquisition and assessment of surgical skills. Aust N Z J Surg 2002;72(1):30–4.
5. Smallman H, John MS. Naive realism: misplaced faith in realistic displays. Ergon Des 2005;13(3):6–13.
6. Charness N, Tuffiash M. The role of expertise research and human factors in capturing, explaining, and producing superior performance. Hum Factors 2008;50(6):427–32.
7. Fiore SM, Hoffman RR, Salas E. Learning and performance across disciplines: an epilogue for moving multidisciplinary research toward an interdisciplinary science of expertise. Mil Psychol 2008;20(1):S155–S170.
8. Ioannou I, Kazmierczak E, Stern L, Smith AC, Wise LZ, Field B. Towards defining dental drilling competence, part 1: a study of bone drilling technique. J Dent Educ 2010;74(9):931–40.
9. Schraagen JM, Chipman SF, Shalin VL. Cognitive task analysis. Mahwah, NJ: Erlbaum, 2000.
10. Hoffman RR, Shadbolt NR, Burton AM, Klein G. Eliciting knowledge from experts: a methodological analysis. Organ Behav Hum Decis Process 1995;62(2):129–58.
11. McMillan WJ. Finding a method to analyze qualitative data: using a study of conceptual learning. J Dent Educ 2009;73(1):53–64.
12. Cohen L, Manion L, Morrison K. Research methods in education. London: Routledge, 2000.
13. Miles MB, Huberman AM. Qualitative data analysis: an expanded sourcebook. 2nd ed. Thousand Oaks, CA: Sage Publications, 1994.

APPENDIX A

Interview Protocols

Expert Interview Questions

1. Before drilling:
    a. How long have you been practicing?
    b. Have you drilled sheep jaws in the past?
    c. What steps will you take to perform the task?
    d. How will you differentiate between bone and tooth?
    e. What cues will you use to ensure that you don't drill into the tooth?
2. After drilling:
    a. Before the drilling, we asked you what steps you will take to perform this task. Do you feel that you were able to follow your planned set of actions? If not, then what did you do differently and why?
    b. What cues did you use in practice to avoid drilling the tooth? How did you use these cues? (i.e., what changes in these cues did you look for?)
    c. [If they mention following the counter of the tooth] Do you follow the contour of the tooth using your sense of touch or your vision combined with your knowledge of the anatomy?
    d. Did you carve out the bone without damaging the tooth? If not, then how did you know that you cut into the tooth?
    e. How big was the resistance difference you felt between bone and tooth (small/medium/large)?
    f. Does using this drill allow you to differentiate between tooth and bone?
    g. How well do you think you did the task?
    h. Is there anything in your previous experience that helped you with this task?
    i. What was different when drilling this lamb jaw compared to your experiences with drilling human jaws?
    j. If you were teaching someone to perform this task, what would you tell them to pay most attention to?
    k. Do you have any general comments on the task? [As part of this question, ask them if there was anything that stood out in their mind while performing the task.]

Novice Interview Questions

1. Before drilling:
    a. How many semesters of your course have you completed?
    b. Have you done any drilling before during your course? If yes, what was it?
    c. What steps will you take to perform the task?
    d. How will you differentiate between bone and tooth?
    e. What cues will you use to ensure that you don't drill into the tooth?
2. After drilling:
    a. What did you pay most attention to while performing the task?
    b. Before the drilling, we asked you what steps you will take to perform this task. Do you feel that you were able to follow your planned set of actions? If not, then what did you do differently and why?
    c. What cues did you use in practice to avoid drilling the tooth? How did you use these cues? (i.e., what changes in these cues did you look for?)
    d. [If they mention following the counter of the tooth] Do you follow the contour of the tooth using your sense of touch or your vision combined with your knowledge of the anatomy?
    e. Did you carve out the bone without damaging the tooth? If not, then how did you know that you cut into the tooth?
    f. How big was the resistance difference you felt between bone and tooth (small/medium/large)?
    g. Does using this drill allow you to differentiate between tooth and bone?
    h. Is there anything in your previous experience that helped you with this task?
    i. What have you learned during this session?
    j. How well do you think you did the task?
    k. What will you do differently next time?
    l. Do you have any general comments on the task? [As part of this question, ask them if there was anything that stood out in their mind while performing the task.]

APPENDIX B

Written Questionnaire

Participant ID: ____________

Questionnaire

How important was each of the following cues in recognizing the boundary between tooth and bone? Mark your answer with an X at the appropriate position on the line. If you did not consider that cue, mark the leftmost end of the line.

a. **Texture (bumpiness/smoothness) of the surface being drilled**

Not important ———————————————————— Crucial

b. **Color of the area being drilled**

Not important ———————————————————— Crucial

c. **Position of the drill in relation to the tooth**

Not important ———————————————————— Crucial

d. **Shape of the tooth**

Not important ———————————————————— Crucial

e. **Drilling sound**

Not important ———————————————————— Crucial

f. **Resistance/hardness of the material being drilled**

Not important ———————————————————— Crucial

g. **Drill vibration**

Not important ———————————————————— Crucial

h. **Any other factors not mentioned above.** *Please explain in the space below. If there is more than one factor, please mark your X with a number, and match that number to your explanation.*

Not important ———————————————————— Crucial