INNOVATIONS

Mental Practice to Maintain Procedural Competency of Faculty with Decreased Opportunities

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ABSTRACT

Background: Physicians practicing in pediatric critical care medicine (PCCM) should maintain procedural skills competency. Faculty practicing in academic centers face challenges that may affect their procedural skills maintenance. The overall clinical opportunities are decreasing in PCCM. Faculty also have the dual role of supervising and supporting the achievement of trainee competence. Mental practice (MP) does not need direct procedural involvement and could be a helpful strategy for faculty.

Objectives: This study's objective was to explore how faculty in an academic center use MP to maintain their procedural competency when faced with decreased clinical opportunities.

Methods: The study was conducted in a tertiary academic center in 2023. We used a qualitative methodology using semistructured interviews as our data source. Participants were faculty practicing in PCCM. Interviews were transcribed verbatim and then analyzed and coded inductively and deductively using Guillot and Collet's Motor Imagery Integrative Model. A faculty member and a trainee performed the analysis. Differences were resolved through discussion. Triangulation was done through member checking.

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Results: Thirteen interviews were conducted with academic PCCM faculty. Thematic and data saturation was achieved. All faculty used MP to rehearse strategies to anticipate and troubleshoot problems. Fewer faculty members used MP to rehearse the procedural steps. MP consequently increased self-confidence and reduced anxiety.

Conclusions: MP is used by faculty in performing and maintaining procedural competency. The low-resource nature of MP could make it a useful adjunct in the maintenance of procedural competency.

Keywords:
mental practice; procedural skills; maintenance of competence

Physicians practicing in pediatric critical care medicine (PCCM) should maintain procedural skills competency as part of their continuous professional development. The clinical opportunities for the maintenance of these skills are decreasing because of reducing frequency of bedside procedures in pediatric critical care (1) and increasing numbers of PCCM trainees and faculty staff (2, 3). The decrease in procedural volume coupled with an increase in healthcare providers leads to fewer opportunities for practice (4). Simulation-based training augments clinical learning opportunities but also presents challenges with the transfer of learning to the clinical environment. Although beneficial in the initial stages of learning, it does not provide the necessary opportunities for expert clinicians (5–7).

In this shifting landscape, faculty practicing in academic centers have additional challenges that affect their maintenance of procedural skills. Faculty have the dual role of supervising and supporting the achievement of trainee competence while maintaining their own. Unlike other competencies, the technical components of a procedural skill require direct involvement for continued proficiency. This might cause constraints in faculty members' ability to maintain their procedural competence.

In this paper, we refer to Dr. Olle Ten Cate's definition of competence, which he described as three hierarchical layers: *1*) core, context-independent knowledge and skills; *2*) context-dependent knowledge and skills, portraying competence that is needed to adapt to different environments and patients; and *3*) personalized knowledge and skills, interests, habits, and convictions (8).

Mental practice (MP) is mostly described as the mental rehearsal of actions through mental imagery without engaging in actual physical movements. In medical education and sports literature, terms such as "mental practice," "mental imagery," and "mental rehearsal" are used to describe the same phenomenon. Although the most used description is the mental representation of action without any concomitant body movement, Morris and colleagues (9) compiled the definitions of MP into a more complete description. They defined MP as the "creation or recreation of an experience generated from memorial information, involving quasi-sensorial, quasi-perceptual, and quasi-affective characteristics, that is under the volitional control of the imager, and which may occur in the absence of the real stimulus." On the basis of this definition and a review of the extensive literature on MP in sports, Guillot and Collet

devised the Motor Imagery Integrative Model (MIIM) as a guiding framework for MP interventions, focused on outcomes such as *1*) motor learning and performance; *2*) motivation, self-confidence, and anxiety; and *3*) strategies and problem solving (10). This model describes individuals using different types of MP for distinct goals, such as rehearsing tactical skills and strategies and using imagery to regulate anxiety, improve motivation and self-confidence, and correct or perfect technical aspects of a motor skill.

In the past two decades, a growing literature in medical education, especially for surgical skills, has provided evidence that MP facilitates the acquisition of skills for novice learners (11–17). Considering that direct procedural involvement is not needed for MP, it could be a useful strategy for faculty. The objective of this study was to explore how faculty in an academic center use MP to maintain their procedural competency when faced with decreased clinical opportunities.

METHODS

To address our research question, we used a qualitative methodology using semistructured interviews as our data source. A qualitative approach was believed to be the most appropriate method to address the aims of the study. Individual in-depth interviews were assessed to afford the best context for eliciting faculty perceptions of the mental practices used to maintain competency.

The study took place in 2023 in a tertiary PCCM department. The institution's Research Ethics Board approved the conduct of this study. Informed written consent was obtained from each participant. All faculty in PCCM for whom maintenance of competence in procedural skills is a requirement were invited to participate in this study. A semistructured interview lasting approximately 30 minutes was conducted by both authors, both with experience in interviewing and qualitative methodology. The interview explored different aspects of MP as a strategy for maintenance of skill competence (*see* Appendix E1 in the data supplement). Although the interview protocol served as an initial guide, it was modified after data collection and analysis to explore new themes that were identified through constant comparative analysis. Audio recordings of the interviews were transcribed and deidentified. The data from interview transcripts were analyzed and coded inductively as well as deductively using Guillot and Collet's MIIM, exploring the distinct outcomes of performance, motivation, and problem solving (10). The completeness of the definition and its focus on outcomes made it the preferred lens for analyzing the data to answer our question. Analysis and coding themes were performed by a faculty member and a trainee (T.K.K.W. and B.M.). Data were coded manually using an interpretive approach to thematic analysis, establishing patterns and relations among themes. Our aim of exploring MP though the MIIM influenced our decision to use thematic analysis. Differences were resolved through discussion. Both authors actively identified and openly discussed personal experiences and perspectives of MP to keep their data interpretations in check.

An approximation of 20 participants to be interviewed was planned on the basis of our study aims, our sample specificity, theoretical perspectives on MP, and the potential richness of data of the interviews (predicated on our interviewers' experience and participants' expressivity). The adequacy of the final sample size was

constantly evaluated during data collection and analysis. We achieved data and thematic saturation as the data collection and analysis occurred concurrently. We concluded that we had achieved data saturation during our data collection as the new interviews repeated what was previously expressed. We also achieved thematic saturation during our data analysis, as there was no emergence of new codes or themes. Member checking was performed by presenting the results to participants, who confirmed that the themes resonated with them.

To ensure that our analysis was rich, robust, and comprehensive and to enhance its quality and credibility, we used different types of triangulations: *1*) review by inquiry participants (presenting the data to participants) or member check-in and *2*) researcher or investigator (having a diverse group of researchers analyze the data: trainees and faculty members).

RESULTS

We obtained consent from 18 faculty members in PCCM; however, after 13 interviews, we reached thematic saturation and decided not to conduct the remaining 5 interviews. The interviewed faculty members included six men and seven women. Their years in practice ranged from 2 to 30, with some faculty having practiced for at least 15 years. They all practice in a large training program that enrolls 25–30 PCCM subspecialty trainees per year.

The themes presented here emerged from using Guillot and Collet's MIIM framework to guide our data analysis. We found that all faculty used MP to rehearse strategies to anticipate and troubleshoot problems that might arise during procedures. These problems and strategies were accumulated through their own practice or in discussions with others and frequently rehearsed before procedures. These mental images of what might happen and potential alternatives were believed to help create various plans that facilitated making immediate and best decisions during the performance event.

> Would I rehearse the steps before an individual procedure? Probably not. If I was thinking about the procedure, I would certainly go through a range of possibilities, I have a mental repertoire. "If this doesn't work out, what would I do?" (F3)

> Is it like Michael Jordan standing, imagining how you're going to perform and what it's going to look like and then you deliver that type of performance? I don't think I do it quite like that. I try to think what is going to be slightly tricky and what are my options? (F6)

We found that fewer faculty used MP for task purposes, to rehearse the steps of a procedure, to remember its execution, or to maintain their technical aspects of the performance. When this was done, the form of imagery used was visualization or a cognitive rehearsal of the steps.

> I've never been a visual thinker, to be honest, if that's what you were asking me about....I may deliberately think through the steps rather than how I move my hand. (F11)

> I do visualise prior to starting a procedure, the steps involved in a procedure. Particularly if it's something that I haven't done so...and especially if it's something which requires a number of different pieces of equipment. Just kind of going through it sequentially in your mind, and then you kind of check off in your mind. (F5)

The use of MP for rehearsing strategies or task execution consequently increased self-confidence and reduced anxiety in the new landscape of fewer direct opportunities that came with a supervisory role.

> Because I think that the secret of an experienced intensivist is having a plan B, C and D and that's what gets you out of trouble. It's not knowing that plan A always looks like plan A....It is about what happens if this happens. (F6)

> Because if you haven't done it in a while, it's important to make sure you remember the steps all the way to completion. (F2)

Additional results are presented in Table 1, Figure 1, and Appendix E2.

DISCUSSION

Faculty in academic centers need to maintain their procedural expertise while facing decreased clinical opportunities and direct involvement. In this shifting procedural landscape, new strategies are needed, and we investigated MP as a potential solution. We found that faculty used MP the most as a cognitive tool for preparation and problem solving. As a result, MP also helped in anxiety reduction and self-confidence. Faculty used MP less often to improve motor performance.

The potential mechanisms of how MP affects performance have been widely investigated. The ability of MP to help the formation and consolidation of mental representations of motor tasks has been linked to improved performance (18). Skillful coordination during a performance occurs when appropriate mental representations of the motor task and action goals are constructed. Faculty, as experienced practitioners, have already consolidated mental representations of the tasks and might not need MP for this

Table 1. Representative quotations for themes

Theme	Subtheme	Quotation
Cognitive strategies and problem solving	Checklist	"If I was thinking about the procedure, I would certainly go through a range of possibilities, I have a mental repertoire" (F3).
	Anticipation of problems	"Is it like Michael Jordan standing, imagining how you're going to perform and what it's going to look like and then you deliver that type of performance. I don't think I do it quite like that. I try to think what is going to be slightly tricky and what are my options?" (F6).
	Teaching	"I imagine them doing it to make sure that we haven't forgotten any equipment and to make sure there is nothing missing in the room. I as an observer, imagine I'm watching the person do it quickly to make sure everything is there" (when discussing MP and teaching a learner) (F2).
	Pathology identification	"I sort of see what the ideal situation would be through a simulator and that lets me, when I start to go do it, very much focus on my pathology" (MP of learned simulation images) (F9).

Table 1. *Continued.*

Theme	Subtheme	Quotation
Motor learning and performance	Readiness	"So I like to...kind of like athletes do...where they imagine a play, they imagine something from beginning to end. I do the same thing for intubation in terms of making sure that I know where all my equipment would be, I visually imagine how I would position myself. What I would try to do" (F2).
	Anatomy	"I visualise what I think is the internal structure, the anatomy, not necessarily the ultrasound. So, with a lumbar puncture, I visualise the spinal spinous processes and the angle that they're at, because then that reminds me that the insertion of the needle needs to follow the angle of the spinous processes and not necessarily at 90 degrees" (F5).
	Spatial awareness	"Visualisation is important because you know a lot of practical skills are about spatial awareness" (F5).
	Refresh skills	"...and I remember how to do it, which I suppose is useful in the reflection of trying to keep up with skills" (F6).
	Tactile	"You know when we talk about intubation. As we've talked about these things, I can feel myself doing them" (F4).
Motivation, self-confidence, and anxiety	Self-confidence	"I like to mentally think through the procedure from the beginning to the end of what I would do...because if you haven't done it in a while, it's important to make sure you remember the steps all the way to completion" (F2).
	Anxiety reduction	"When you have suffered a complication, sometimes those things stick with you longer....I'll give an example from one of my colleagues, the wire got stuck in the patient and...I remember for the next while being much more purposeful and mindful about making sure I always had control over the wire when I was putting in the line" (F11).

Definition of abbreviation: MP = mental practice.

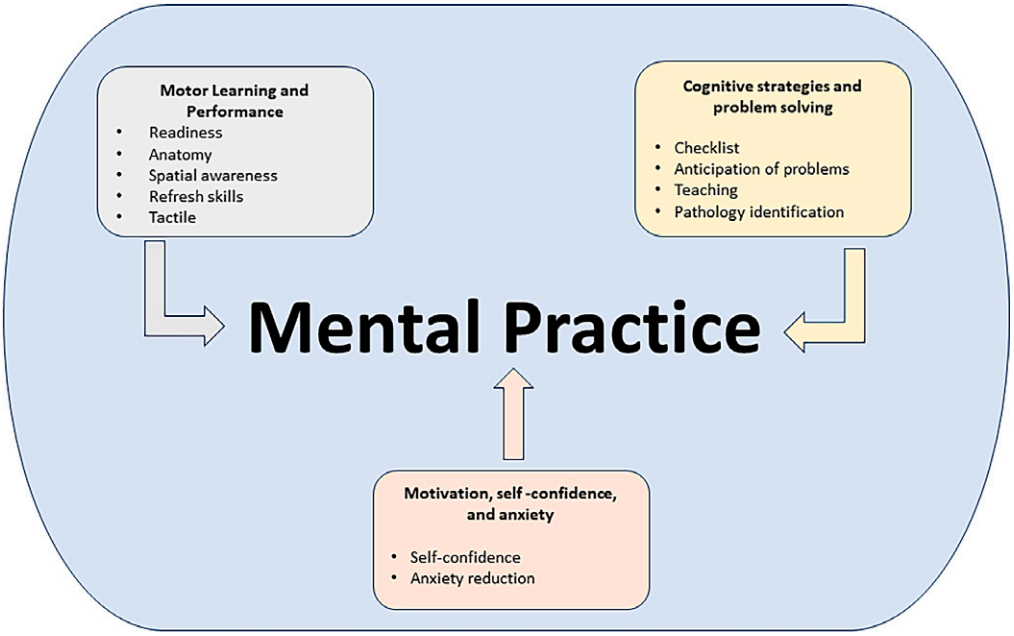

Figure 1. Model of mental practice use by faculty in pediatric critical care medicine to support procedural skills.

purpose. In addition, faculty are exposed to mental task representation during the supervision of trainees performing the procedure.

All faculty used MP for procedural preparation and problem solving. This entailed reviewing contextual factors such as team composition, patient factors, and potential complications. Faculty visualized the images of potential scenarios and formulated prospective solutions. These findings are in line with the results of experiments done with elite athletes and musicians (10, 19).

As with any concept, many definitions exist, and in this study, we applied the most inclusive one. This study has helped map out the use of MP by experienced physicians. The current landscape in PCCM is that of fewer overall procedures' being performed by intensivists. With this decreased availability, there is a need to maximize each opportunity. MP provides a technique to help improve performance and increase skill proficiency. Another benefit is the low resource commitment required to perform MP compared with other educational options such as simulation (20). The lack of need for additional ancillary equipment further promotes its flexibility. MP can be used at the patient's bedside or in the classroom. In addition, these processes can become more explicit and shared with more junior learners, who could benefit from being shown their usefulness.

The findings from this study at a pediatric tertiary-level center show that MP is used by staff pediatric intensivists in performing and maintaining procedural competency. These may aid the maintenance of procedural competency by improving motor performance of skills, improving the emotional state of readiness, and creating a platform with which to troubleshoot potential complications. The low-resource nature of MP could make it a useful adjunct when considering how to maintain procedural competency.

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