Preparation and Use of Physical Agent Modalities Among U.S. Occupational Therapists: A Mixed-Methods, Exploratory-Descriptive Study

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Abstract

Background: Physical agent modalities (PAMs) are used by occupational therapists to prepare for or facilitate participation in purposeful activities. However, little has been published in the last quarter century regarding how U.S. occupational therapists use and are prepared to use of PAMs in contemporary clinical practice. In this study, U.S.-based occupational therapists were surveyed regarding their use of PAMs, preparation for use, and perceptions of that preparation.

Methods: Survey data was collected from a purposive sample of 141 U.S.-based occupational therapists and occupational therapy assistants as part of this exploratory-descriptive, mixed-methods study. Thematic and descriptive statistical analyses were completed using quantitative and qualitative data.

Results: Quantitative data provided a current profile of types, frequency, and settings in which PAMs are used, along with sources and perceptions of training. Qualitative data yielded three themes, including (a) benefit of experiential learning, (b) benefit of continuing education, and (c) relative adequacy of entry-level training.

Conclusions: Findings from this study serve as an initial step in understanding contemporary use of PAMs in clinical occupational therapy practice. Further study is needed to expand the knowledge base in the profession and support an evidence-informed approach to care.

Comments
The authors declare that they have no competing financial, professional, or personal interest that might have influenced the performance or presentation of the work described in this manuscript.

Keywords
Occupational therapist, occupational therapy assistant, physical agent modalities, PAMs, preparation, perceptions

Credentials Display
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The use of physical agent modalities (PAMs) by occupational therapists in the United States (US) has been a topic of discourse in the profession for over 40 years (AOTA, 1992a, 1992b; Bondoc & Feretti, 2018; Bracciano, 2022; Horan, 1982; West, 1984; West & Weimer, 1991). PAMs refer to the application of forces or energies, such as thermal, electrical, sonic, magnetic, and photic (Bondoc & Feretti, 2018). Examples of PAMs used in contemporary occupational therapy practice may include hot and cold packs, paraffin, Fluidotherapy, contrast baths, ice massage, ultrasound, laser and light therapies, diathermy, and various forms of electrical stimulation, among others (Bracciano, 2022). In the context of occupational therapy, PAMs are typically applied in preparation for, concurrent with, or as a component of purposeful and occupation-based treatment interventions (Bondoc & Feretti, 2018).

In the profession, the 1980s and 1990s were marked by debate over the role of PAMs in occupational therapy practice (AOTA, 1992a, 1992b; Hamlin, 1992; Horan, 1982; West, 1984; West & Weimer, 1991). The 1990s also saw an expansion of scholarly peer-reviewed research detailing occupational therapist’s perceptions of PAMs, their use in clinical practice (including types of modalities used, frequency of use, settings in which modalities were used, etc.), the preparation for use (Cornish-Painter et al., 1996; Glauner et al., 1997; Nelson et al., 1990; Taylor & Humphrey, 1991; Vogel, 1991). By 2002, PAMs had entered the Occupational Therapy Practice Framework: Domain and Process (OTFP; AOTA, 2002), and shortly thereafter, the Accreditation Council for Occupational Therapy Education (ACOTE) introduced PAM-related educational standards for occupational therapy (2007a) and occupational therapy assistant (2007b) programs across the US. Today, at the national level, PAMs are represented in the OTPF (AOTA, 2020), the 2018 ACOTE standards for occupational therapy education (AOTA, 2018), and the AOTA position paper entitled Physical Agents and Mechanical Modalities (Bondoc & Feretti, 2018). Further, state-regulated certifications are now required to use PAMs in 19 states (NBCOT, 2019).

External to the profession, broad and sweeping changes have been noted in the larger sphere of health care, including the rising costs of care (Dieleman et al., 2020; Telesford et al., 2023) and changes in health care funding and delivery, as reported by the American Medical Association (2023), the Centers for Medicare and Medicaid Services (2022, 2023a, 2023b), and AOTA (2022a-c, 2023a). Further, there has been an expansion of efficacy and outcomes-based research relating to PAMs and continued evolution of new and existing PAMs and related products (Bracciano, 2022). These changes over the past quarter century, both internal and external to the profession, may shape U.S.-based occupational therapy providers’ preparation and use of PAMs. However, in the quarter century following the burgeoning research of the 1990s, little scholarly peer-reviewed research exists regarding U.S.-based occupational therapists’ use of PAMs, preparation for use, and their perceptions of that preparation. Therefore, the purpose of this exploratory-descriptive, mixed methods study was to describe (a) the use of PAMs, (b) preparation for use, and (c) perceptions of that preparation among U.S.-based occupational therapists.

**Method**

**Design**

An exploratory-descriptive, mixed-methods design was chosen for this study. This design was selected given (a) the lack of current peer-reviewed literature on this topic and (b) the nature of the research questions, which sought to explore and describe the current use of PAMs in occupational therapy practice, preparation for use, and perceptions of that preparation (Aggarwal & Ranganathan, 2019; Hunter et al., 2019). Further, the adoption of a mixed-methods approach allowed for the collection of rich qualitative
data to contextualize quantitative data received from study participants (Creswell, 2021; Dawadi et al., 2021; Vebrianto et al., 2020).

**Population and Sample**

A purposive sample of 141 participants was drawn from the larger population of practicing occupational therapists in the US. A purposive sampling strategy was selected by the lead authors as the most appropriate option for both the identified research question and the design of the study as it allowed for the selection of participants who met identified inclusion criteria and were therefore uniquely qualified to provide first-hand accounts and perceptions regarding their use of PAMs in clinical practice (Campbell et al., 2020). Inclusion criteria required that participants (a) be licensed occupational therapists or occupational therapy assistants, (b) use or have used PAMs in their clinical practice, (c) currently practice, and (d) currently practice in the US. A power analysis for sample size was not performed because of the exploratory nature of the study’s design.

To enhance opportunities for diverse geographic representation at a national level, we posted a promotional flier to CommunOT (Gentry, 2023), along with other profession-specific online forums, including the Department of Occupational Therapy’s Facebook page(s) for the authors’ home universities.

Three hundred and thirteen occupational therapists responded to the survey. Of those who initiated participation, 141 completed the survey, resulting in a completion rate of 45%. Incomplete submissions were not included in the final sample. In the sample, representation was noted for (a) both provider types (occupational therapist, occupational therapy assistant), (b) all occupational therapy degree categories, and (c) all U.S. geographic regions. Refer to Table 1 for a summary of sample demographics alongside relevant comparison data.

**Research Instrument and Data Collection**

In the absence of an existing survey tool with established psychometrics designed for this population and topic, a survey was developed by the research team to address the identified research questions with the population of interest. This survey was designed using the Qualtrics XM platform to collect participant demographics, along with responses to both quantitative and qualitative survey items. An iterative, peer-review method (Hissong et al., 2015; Patten & Newhart, 2018; Tumin & Tobias, 2019) was adopted in the development of the survey in which a collaborative and sequential approach was used to design, evaluate, and revise the survey items with the research team. Subsequently, this peer-review process was extended beyond the research team through the inclusion of external doctorally-trained peer reviewers knowledgeable in both research methods and the content area under consideration. This process continued until all substantive recommendations were considered and addressed.

Potential participants accessed the free survey using the link or QR code posted on the promotional flier. Upon accessing the survey’s landing page and before enrolling, the participants were provided with detailed information pertaining to informed consent, including Institutional Review Board (IRB) approval. Once consent was obtained, the participants were permitted to proceed with the survey.

No personally identifiable information was collected as part of this survey, ensuring that participant confidentiality was maintained. At the conclusion of the survey, the participants were provided the option of using a separate link to enter a drawing for one of four e-gift cards being offered as a token monetary incentive for participation. An email address was required to contact participants selected during the drawing; however, this contact information was entered using a separate link (used only for the drawing), which could not be connected to the participants’ survey responses, thereby maintaining participant anonymity when completing the survey. Further, measures were implemented to enhance the
protection of participant data, including the use of alphanumerical and/or biometric access for hardware and software resources used in this study.

**Data Analysis**

Initial data analysis and visualization were performed in Qualtrics XM. Subsequently, quantitative data were exported to Microsoft Excel for descriptive statistical analysis, including counts, percentages, measures of central tendency (e.g., mean), measures of dispersion (e.g., standard deviation), and graphical representation of data. The selection of descriptive statistics was in keeping with the descriptive nature of both the purpose and design of the study (Vetter, 2017).

Qualitative data were analyzed using a thematic analysis approach, in which the participants’ responses were coded, codes were categorized, and themes were identified from categorized codes (Campbell et al., 2021; Lochmiller, 2021). Thematic analysis was completed using Dedoose, version 9.0.107 (SocioCultural Research Consultants, 2023), a commercially available qualitative data analysis software (QDAS) program. Thematic analysis was performed collaboratively between lead investigators. Subsequently, external reviewers were incorporated as a peer review of the analysis process and to establish inter-rater reliability. Inter-rater reliability was calculated using the arithmetic mean of kappa for three or more raters (Davies & Fleiss, 1982; Hallgren, 2012; Light, 1971). Agreement between raters was found to be high at $P(e) = .89$ (Cicchetti, 1994; Landis & Koch, 1977).

As noted in preceding sections, the rigor of quantitative data analysis was ensured through the selection and application of statistical methods that were (a) consistent with the study design and type(s) of data collected, (b) grounded in scholarly literature, and (c) involved peer-review of the findings. Similarly, the trustworthiness of the qualitative data was ensured through established methods for credibility, transferability, dependability, and confirmability (Bradshaw et al., 2017; Creswell & Poth, 2018; Krefting, 1991; Lincoln & Guba, 1985; Luciani et al., 2019). Credibility was ensured through iterative, prolonged immersion in data, triangulation of quantitative and qualitative data sources, peer review of methodology, survey tool, and data analysis by clinical and academic researchers external to the study, member self-checking (via participants entering and reviewing their own qualitative data), qualifications of lead researchers (doctorally-trained, with a combined 50 years of experience in the identified area of inquiry), and through subsequent presentation of findings. In addition, transferability was ensured through a thick description of the sample alongside comparative reference data. Further, dependability was ensured through a description of methods, the use of accepted methods of qualitative data analysis, and inter-rater reliability. Finally, confirmability was ensured through reflexive analysis of process-related journaling, peer review, and triangulation of participant data sources (Luciani et al., 2019).

**Results**

**Demographics of Sample**

Refer to Table 1 for a detailed description of the sample ($n = 141$), including relevant comparison data obtained from AOTA’s *Workforce and Salary Survey* (2023b) and the US Census Bureau (2022). Comparison data were provided to demonstrate the relative representativeness of the current sample to known demographics of the larger population of occupational therapists.
Table 1  
Sample Demographics and Comparison Data

<table>
<thead>
<tr>
<th>Sample Population Demographics</th>
<th>Relevant Comparison Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provider Type</td>
<td>% of Sample ( (n = 141) )</td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>87.23% ( (n = 123) )</td>
</tr>
<tr>
<td>Occupational therapy assistant</td>
<td>12.77% ( (n = 18) )</td>
</tr>
<tr>
<td>Mean years in clinical practice</td>
<td>15.59 yrs.</td>
</tr>
</tbody>
</table>

Highest degree obtained (in OT)  

| Associates          | 11.35%*          | n/a          |
| Bachelors           | 24.82%           | 20.61%       |
| Masters             | 48.94%           | 58.10%       |
| Entry-level clinical doctorate | 5.67% | 10.99% |
| Post professional clinical doctorate | 7.09% | 6.62% |
| Research doctorate  | 2.13%            | 2.79%        |

Percentage of sample by geographic region  

<table>
<thead>
<tr>
<th>Percentage of Participants Reporting Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of PAMs</td>
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</table>

Figure 1  
Types of PAMs Used in Clinical Practice

Use of PAMs

In describing the use of PAMs, the participants reported on the type(s) used, their frequency of use, and the settings in which they are applied. When asked to identify which types of PAMs were used as part of their current clinical practice, the participants reported the use of superficial thermal modalities (e.g., cold pack, hot pack, paraffin, Fluidotherapy, contrast bath, etc.), electrical stimulation (e.g., TENS, NMES, FES, etc.), ultrasound, and other non-listed modalities including diathermy, laser, infrared, and iontophoresis as summarized in Figure 1.

Beyond identifying types of modalities used in clinical practice, the participants also reported how their overall usage of PAMs was divided between the four types of modalities listed. The participants reported that superficial thermal modalities represented 41.27% of their total usage of PAMs, followed by electrical stimulation (28.31%), ultrasound (22.95%), and other unlisted modalities (7.47%). On average, occupational therapists in the sample (who, by virtue of the stated inclusion criteria, either use or have
used PAMs), reported the use of PAMs during 46.35% of treatment sessions. Settings in which the participants reported using (or having used) PAMs are summarized in Figure 2.

**Figure 2**
*Percentage of Participants Reporting Use of PAMs by Setting*

<table>
<thead>
<tr>
<th>Practice Settings</th>
<th>Percentage of Participants Reporting Use of PAMs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute in-patient rehab</td>
<td>52.48</td>
</tr>
<tr>
<td>Skilled Nursing Facility</td>
<td>43.26</td>
</tr>
<tr>
<td>Out-patient</td>
<td>41.84</td>
</tr>
<tr>
<td>Long term care</td>
<td>39.71</td>
</tr>
<tr>
<td>Independent &amp; Assisted-Living Facilities</td>
<td>31.91</td>
</tr>
<tr>
<td>Acute care/hospital</td>
<td>27.66</td>
</tr>
<tr>
<td>Home health</td>
<td>14.18</td>
</tr>
<tr>
<td>Other</td>
<td>1.42</td>
</tr>
</tbody>
</table>

**Certification, Additional Training, and Demonstration of Competency**

Seventy-nine percent of the participants reported that they live or have lived in a state that required certification to use PAMs in clinical practice. Similarly, 77.30% reported that they work (or have worked) in a facility that required either additional training (64%) or demonstration of competency (36%) for the use of PAMs. Among the participants who reported a facility-based requirement (vs. state-required certification) for additional training, instructional methods included in-service (50.52%) and independent/self-study (49.48%). The frequency of facility-based training requirements was reported as either a single occurrence (35%) or annual (65%). With respect to the duration of training per occurrence, 5% of the participants reported 1 hr or less, 65% reported 2 to 3 hr, 25% reported 4 to 5 hr, and 5% reported 6 hrs or more. Of those who reported facility-required demonstration(s) of competency, the participants most frequently reported annual requirements (66.67%), followed in frequency by “one time only” (33.33%). Further, when asked how many applications (demonstrations) of each modality were required per episode, 35.56% reported one to three applications per modality, 48.89% reported four to six, 8.89% reported seven to nine, and 6.67% reported 10 or more.

**Sources, Descriptions, and Perceptions of PAMs-Related Training Received by Participants**

Sixty-nine percent of the participants reported receiving PAMs-related training through participation in formal continuing education coursework, 43.26% from entry-level professional degree training, 42.55% through on-the-job training and/or mentorship, and 41.13% from informal, self-directed learning. Further, when asked which of these training types was most beneficial, 31.93% of the participants reported formal continuing education to be most useful, followed by on-the-job training and mentorship (26.74%), entry-level professional degree (college/university) training (21.63%), and informal, self-directed learning (19.72%).

Of those who reported PAMs-related training in their entry-level degree coursework, the participants reported that training was composed of 57.89% didactic instruction and 42.11% experiential
learning opportunities. Further, when asked to consider instructional methods for each modality category individually, findings were similar for superficial thermal modalities (55.06% didactic/44.94% experiential), electrical stimulation (50.30% didactic/49.70% experiential), and ultrasound (51.27% didactic/48.73% experiential).

However, based on their unique educational experience(s) in their professional degree programs, 85.25% of the participants expressed a perceived need for additional PAMs-related training in their entry-level coursework. Further, in this group, 26.53% reported a perceived need for additional training with superficial thermal modalities, 24.69% for ultrasound, and 38.78% for electrical stimulation.

Qualitative Findings

The participants reflected on factors that impacted their learning in relation to PAMs. Following the thematic analysis, three themes were identified: relative adequacy of entry-level training, the benefit of experiential learning, and the benefit of continuing education.

Relative Adequacy of Entry-Level Training

The participants reported perceptions of limited PAMs-related training during their entry-level occupational therapist and occupational therapy assistant coursework. However, of the training provided, the participants noted perceptions of effectiveness in addressing an occupation-based approach to the use of PAMs. When speaking about perceived limitations in training, Participant 107 (P107) noted,

In school, we had one 2- to 3-hr lab where 35 students shared three e-stim/ultrasound machines. Due to this, we did not really get time to practice the skills. On my fieldwork rotations, I did not have an opportunity to use modalities. This caused me to be really anxious when implementing modalities in practice.

Similarly, other participants noted, “I did not get much training in school; we might have spent a day on it” (P71), and “I would have loved to see more PAMs in my experience as a student” (P79). Further, in speaking to the effect of perceived limitations in training, P106 reported,

As someone who trains others at my place of work in the use of many PAMs, I have seen clinicians who have recently come into the field who avoid using PAMs because of a lack of confidence in their knowledge. This leaves gaps in the progress their patients can make because of inexperience.

However, of training received, the participants noted perceptions of efficacy in addressing an occupation-focused approach to the use of PAMs. The participants reported, “[school] provided OT theory and rationalization for PAMs with occupation-based interventions” (P68), and “school-based learning was, of course, the most focused on occupation-based outcomes, so we would use practice questions at the end of our PAMs unit to simulate what PAM we would use and always pair it with an occupation-based intervention” (P125).

Benefits of Experiential Learning

In this theme, three sub-themes were identified, including (a) kinesthetic/hands-on learning, (b) learning through observation, and (c) on-the-job training and/or mentorship. When speaking to the experiential benefits of kinesthetic, hands-on learning, the participants noted that “practice labs to learn and understand the feeling and effects of modalities yourself and on other learners was most helpful during entry-level training” (P33) and “training in my facility on the equipment that I would be using with patients was helpful; more practice made me more comfortable” (P103). Further, the participants noted that the
“number of practice sessions” (P83) with “hands-on learning and applications” (P119) were beneficial, especially when hands-on experience was paired with “supervision” (P4) and “feedback” (P133).

The participants also reported on learning through observation. In speaking to this, the participants reported perceived benefit(s) from “watching and learning” (P65), “seeing it in action” (P120), and “being able to observe application to patients” (P139). Similarly, another participant reported, “I felt very uncomfortable with PAMS until given the opportunity to see them in practice and see other therapists use them safely” (P30). Finally, in speaking to the perceived benefits of on-the-job training and/or mentorship, Participants 61 and 102 reported, “I had an OT do on-the-job training with me; it helped me build my confidence with using modalities” (P61), and “the support of experienced clinicians has allowed me to feel confident in my ability to use PAMS” (P102). Further, the other participants reported a connection between on-the-job training (and/or mentorship) and the use of PAMs in meaningful, occupation-based interventions. In speaking to this connection, the participants noted that “in school, they teach you to make sure that using modalities leads to improved performance with occupation, with on the job training, you see it actually applied” (P114), “working with other clinicians in my setting made the information more applicable to functional treatments” (P59), and training on the job “was more focused on how to incorporate [PAMs] into occupation-based treatments” (P24).

Benefits of Continuing Education

When exploring the benefits of continuing education, the participants reported on the role of both formal continuing education courses as well as informal educational opportunities (e.g., vendor inservices). When speaking to the perceived benefits of formal continuing education, the participants reported, “continued formal training taught more in-depth use of PAMs and their specific parameters that went beyond basic level knowledge from entry-level education courses” (P66), and “a formal PAMs course taught me how to incorporate each modality as a preparatory method or during occupation-based tasks to ensure the session is highly skilled” (P128). Similarly, the participants noted that formal continuing education “allowed me to expand on my practice and get more comfortable using different settings beyond basic measures taught in school” (P124) and provided “more detailed [information] about the reasoning behind it, depth of frequencies, when to use which type, and the settings that go along with that” (P131).

In addition, the participants reported on the benefit of continuing education provided by vendors of PAMs-related technologies and products. The participants noted that “continuing education through vendor inservicing was helpful” (P87), and “as new technologies have come out, I have benefitted from the specific training provided by the salespeople of the equipment” (P57). Further, Participant 98 noted that “training from the company providing the equipment was in depth, included limitations, contraindications, how to use the equipment, and opportunities to practice.”

Discussion

Representativeness of Sample

While generalization may not be the aim of a descriptive-exploratory study, understanding the demographics of the current sample may aid the reader in determining applicability to their practice setting. Of note are three sample characteristics, including provider type, highest degree obtained in the profession, and percentage of sample by geographic region of the US (see Table 1). When considering provider type, the percentage of occupational therapists and occupational therapy assistants in the sample mirrored those reported in the 2023 Workforce and Salary Survey (AOTA, 2023b). Similarly, when considering the highest degree obtained, rank order of degree type was congruent between this sample
and statistics reported in the AOTA (2023b) survey. In addition, all U.S. geographic regions are represented in the sample. Further, the percentage of sample by each of the U.S. geographic regions matched the rank order of regions by population count, as reported by the U.S. Census Bureau (2023).

**Use of PAMs**

Though dated, comparative reference points were found in scholarly, peer-reviewed with respect to U.S.-based occupational therapists’ and occupational therapy assistants’ percentage of use by modality type and clinical settings in which PAMs are used. By combining and averaging usage rates by modality type (i.e., superficial thermal, electrical stimulation, ultrasound), the authors of this study have formulated a conversion for findings originally published by Taylor and Humphrey (1991), resulting in reported usage rates of 44% for superficial thermal modalities, 30.5% for electrical stimulation, and 19% for ultrasound. Using the same conversion approach, in which individual modalities in each modality category and type were combined and averaged, results from Cornish-Painter et al. (1996) yielded similar findings, with 50.8% of the participants reporting use of superficial thermal modalities, 28.5% electrical stimulation, and 23% ultrasound. From a historical perspective, these numbers stand in contrast to findings from the current study, in which 73.8% of the respondents reported using superficial thermal modalities, 68.8% electrical stimulation, and 39.0% ultrasound. Taken collectively, the findings from the current study would suggest a marked increase in the percentage of occupational therapists reporting use of PAMs when compared with previous findings.

Further, in considering clinical practice settings in which occupational therapists use PAMs, Taylor and Humphrey (1991) reported PAMs usage in out-patient hand therapy (23.23) to be nearly double that of acute care (13.60), short-term rehabilitation (12.60), and long-term rehabilitation (11.31). While the unit of measurement in this previous study was reported as an average use score and does not directly translate to a “percentage of use,” it does provide a relative rank order for use by setting. In contrast to the current study, the percentage of the participants who reported use (or prior use) of PAMs by setting (see Figure 2) differed in rank order, with acute in-patient rehab (IPR) being most frequently cited (52.48%), followed by skilled nursing facilities (43.26%), out-patient (41.84%), long-term care (39.71%), independent and/or assisted living (31.91%), acute care/hospital (27.66%), and home health (14.18%). This change in distribution is in keeping with current workforce/practice setting trends for occupational therapists working with adults in physical disability settings, as reported in the AOTA 2023 Workforce and Salary Survey (2023b), in which hospitals (including IPR) represented the place of employment for 22.11% of the therapists, followed by out-patient (20.85%) and skilled nursing (8.75%).

**Training for Use of PAMs**

Three previous studies from the 1990s provided insights regarding how U.S.-based occupational therapists received training in the use of PAMs (Cornish-Painter et al., 1997; Glauner et al., 1997; Taylor & Humphrey, 1991). Using data originally reported by Taylor and Humphrey (1991), it was noted that on average (combining all modality types), the participants received approximately 36.50% through on-the-job-training, 13.63% of PAMs-related training through entry-level academic training (including fieldwork), 7.38% through continuing education, and 2.13% through other means, while 40.25% reported no training of any type. Similarly, Glauner et al. (1997) reported that, on average (across modality types), 74.89% reported training through on-the-job-training, 49.44% through in-services, 17.19% through formal post-graduate continuing education courses (average of multiple types in this category), and 12.83% reported training through entry-level education (including Level II Fieldwork), while 11.67% of the participants reported no PAMs-related education. Further, Cornish-Painter et al. (1997) reported that
42% gained PAMs-related knowledge and skills through on-the-job-training (inclusive of peer observation), 19% through in-services, 15% reported training through independent study, 13% through continuing education courses, and 8% through entry-level occupational therapy education.

In comparison, the results from the current study indicate that 68.79% of the participants received PAMs-related training through formal, post professional continuing education coursework, 43.26% through their entry-level professional degree program, 42.55% through on-the-job-training, and 41.13% through informal, self-directed learning. Taken collectively, findings from the current study suggest that the percentage of PAMs-related training has increased in the areas of entry-level academic training and formal, post professional continuing education over previous reports (Corninsh-Painter, 1997; Glauner et al., 1997; Taylor & Humphrey, 1991). Further, qualitative data from the current study supports the participants’ valuation of both experiential learning (as part of entry-level training and on-the-job-training/mentorship) and continuing education.

However, despite this increase in PAMs-related entry-level academic training, 85.25% of the participants in the current study reported a perceived need for additional training (across all three listed modality categories) as part of their entry-level degree coursework. The magnitude of this perceived need may prompt further consideration regarding the potential implications for the enhancement of PAMs-related content in entry-level occupational therapy curricula. This finding was supported by qualitative data in the current study, in which the participants reflected on the relative adequacy of entry-level training.

**Qualitative Insights**

While qualitative data allowed for triangulation in preceding sections with respect to both valuation of training (and training types) and relative adequacy of training, qualitative data also served to contextualize the participant responses on quantitative measures. Beyond a binary validation of the value of education and training, the participants provided unique and nuanced insights regarding their preparation for the use of PAMs. Specifically, the participant responses suggested that while their entry-level degree programs did offer PAMS-related content, instruction was focused on foundational and theoretical knowledge, resulting in a perceived relative lack of opportunities for experiential learning through hands-on application. By extension, the participants reported that experiential learning methods, including (a) kinesthetic/hands-on learning, (b) learning through observation, and (c) on-the-job training and mentorship, were perceived to be most beneficial in their learning with respect to the clinical application of PAMs. Further, the participants noted that both formal and informal continuing education was beneficial for ongoing learning beyond training received through their entry-level degree program.

Beyond the quantitative-descriptive demographics of current PAMs use by occupational therapists and occupational therapy assistants, the confluence of quantitative and qualitative data has shed light on not only the perceived need for additional preparation as part of entry-level training but has also provided a guidepost for approaches to learning that were perceived by the participants to be of greatest value in their acquisition of foundational knowledge and skills. Consideration of these approaches to learning may serve to guide future inquiry and discussion regarding preparation for the use of PAMs in both academic and clinical settings.

**Limitations and Recommendations for Future Research**

Potential limitations of the current study may include sample size, sampling strategy, inclusion criteria, and survey items. While appropriate to the exploratory-descriptive nature of the study, the current sample ($n = 141$) is relatively small in comparison with previous studies from the 1990s (Glauner et al.,...
In this context, the sample size of the current study may limit the ability of the reader to broadly generalize findings. However, as previously discussed, the relative representativeness of the current sample may serve to offset this limitation to generalizability.

The stated inclusion criteria and purposive sampling strategy used may collectively represent another potential limitation. By using a purposive sample of U.S.-based occupational therapists and occupational therapy assistants who use (or have used) PAMs in clinical practice, the scope of the study is decidedly shifted away from the larger population, both in geography and in use of PAMs. Geographically, the current study focused exclusively on the experiences of U.S.-based therapists. While this narrowed focus was both intentional and necessary to address the identified gap and purpose of the study, the findings may not translate to the global occupational therapy community. Similarly, while limiting inclusion to occupational therapists who use (or have used) PAMs was both intentional and necessary to meet the objectives of the current study; the subsequent results may not reflect the experiences of the larger body of occupational therapists, some of whom may not use PAMs in their clinical practice.

Finally, while the survey items addressed the purpose of the current study, they did not address all possible aspects of PAMs use, preparation for use, and perceptions of that preparation. Future studies may benefit from larger sample sizes, representation of a wider range of PAMs-related experience, greater global diversity, and exploration of an expanded range of topics.

Conclusion

Following an expansion of research in the 1990s, little scholarly, peer-reviewed research has been published in the subsequent quarter century regarding the use of PAMs by U.S.-based occupational therapists. Therefore, the purpose of this exploratory-descriptive mixed-methods study was to explore the use of PAMs, the preparation for use, and perceptions of that preparation among a group of occupational therapists and occupational therapy assistants practicing in the US. Findings from this study denote significant changes over previous studies from the 1990s, including (a) an increased use of PAMs among occupational therapists; (b) changes in prevalence of PAMs use among clinicians in various practice settings; (c) requirements for certification, additional training, and/or demonstration(s) of competency; and (d) sources (and proportion per source type) of PAMs-related training. While the current study represents an initial step toward describing preparation for and use of PAMs in contemporary clinical occupational therapy practice, further study is needed to expand the knowledge base in the profession, thereby supporting an evidence-informed approach to client care.

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