AOTA Position Statement

Physical Agent, Mechanical, and Instrument-Assisted Modalities Within Occupational Therapy Practice

Introduction

The American Occupational Therapy Association (AOTA) asserts that physical agent, mechanical, and instrument-assisted modalities (PAMIMs) may be used by occupational therapy practitioners (i.e., occupational therapists and occupational therapy assistants) as part of a comprehensive plan of intervention designed to enhance engagement in occupation (AOTA, 2020c). Occupational therapy practitioners (OTPs) possess the foundational knowledge of basic sciences, understanding of relevant theory and evidence, and clinical reasoning to recommend and safely apply PAMIMs to support achievement of occupation-based client goals.

This Position Statement clarifies the context for the appropriate use of PAMIMs in occupation-based occupational therapy practice. As guided by the *Occupational Therapy Practice Framework: Domain and Process, 4th Edition* (*OTPF-4*) (AOTA, 2020c), exclusive or stand-alone use of PAMIMs without linking it to a client-centered, occupation-based intervention plan and outcomes is not occupational therapy. Consistent with the 2018-2019 Choosing Wisely initiative, AOTA recommends that practitioners "don't use [PAMIMs] without providing purposeful and occupation-based intervention activities" (Gillen et al., 2019). To ensure client-centered care, practitioners who choose to incorporate PAMIMs into their practice should evaluate the available evidence on the efficacy and effectiveness of each modality and its place in the treatment of a client's condition.

Definitions

The term *therapeutic modalities* refers to the systematic application of various forms of energy or force to effect therapeutic change in the physiology of tissues. *Physical agents* such as heat, cold, water, light, sound, and electricity may be applied to the body to affect client factors, including the neurophysiologic, musculoskeletal, integumentary, circulatory, or metabolic functions of the body. Physical agents may be used to reduce or modulate pain, reduce inflammation, increase tissue extensibility and range of motion, promote circulation, decrease edema, facilitate healing, stimulate muscle activity, and facilitate occupational performance (Bracciano, 2022).

Physical agent modalities may be categorized on the basis of their properties:

1. *Thermal modalities* are those physical agents that provide a change in tissue temperature by either heating or cooling the tissue. Thermal modalities can also be categorized into superficial thermal agents and deep thermal agents on the basis of the depth of energy penetration into the underlying tissue or body structure they are targeting. Thermal agents (heat or cold) facilitate the transfer of energy between two systems through conduction, convection, or conversion.
    a. *Superficial thermal agents*
        i. *Conduction:* Heat or cold is transferred from an object to the body with direct contact with the modality. Examples include, but are not limited to, hot packs, cold packs, and paraffin (Vargas e Silva et al., 2019).

        ii. *Convection:* Heat or cold is transferred between two objects where one is moving or flowing around the body part. Examples include, but are not limited to, whirlpool or hydrotherapy, which can be done with hot or cold water, and Fluidotherapy™ or dry whirlpool, which uses dry heat to circulate dry cellulose medium around the distal extremity (Kumar et al., 2015).
    b. *Deep thermal agents*
        i. *Conversion:* Energy from low-frequency sound waves is converted into heat. A common example is therapeutic ultrasound, where the mechanical waves in sound energy are converted to heat using an ultrasound machine. Therapeutic ultrasound can be used to penetrate deeper tissue structures. Deep thermal agents include, but are not limited to, therapeutic ultrasound and phonophoresis (Morishita et al., 2014).
2. *Electromagnetic modalities* use electromagnetic waves such as radio waves, microwaves, and light waves to transport electrical and magnetic energy through space to effect changes in body structures (Post & Nolan, 2016).
    a. *Diathermy:* Diathermy uses short-wave frequencies to affect healing tissue or higher frequencies that cause tissue heating.
    b. *Low-level laser (light) therapy (LLLT):* Low-intensity, nonthermal (cold) lasers use light energy to cause a photochemical reaction in body tissue that can influence tissue repair, inflammation, and pain (Baktir et al., 2018).
3. *Electrotherapy* uses electrotherapeutic currents and waveforms to influence physiological effects on client body structures (Bellew, 2016). Electrotherapy has many potential clinical uses and may be and may act upon tissues in the following ways:
    a. Influence physiologic change in tissues to increase circulation, facilitate tissue healing, modify edema, and modulate pain. An example includes, but is not limited to, high-voltage galvanic stimulation for tissue and wound repair. A specific electrotherapeutic agent, iontophoresis, uses direct electrical current to move ions of medication across skin into target tissues (Bracciano, 2022).
    b. Facilitate neuromuscular or sensory activity to improve muscle strength, reeducate muscle function, or modulate pain response. Examples include, but are not limited to, neuromuscular electrical stimulation (NMES), functional electrical stimulation (FES), transcutaneous electrical nerve stimulation (TENS), and interferential current (IFC) (Bracciano, 2022).
4. *Mechanical modalities* refers to the therapeutic use of mechanical devices to apply force, such as compression, distraction, vibration, or controlled mobilization, to modify biomechanical properties and functions of tissues. Effects of these mechanical modalities include increased circulation and lymphatic flow or increased tissue and joint mobility. Examples include, but are not limited to, mechanical traction, vasopneumatic devices, and continuous passive motion machines.
5. *Instrument-assisted modalities* (IM) refers to the therapeutic use of an instrument or tool that is manually applied by a trained practitioner to target specific tissues, like skin, fascia, and other connective tissues, or muscle. In contrast to a mechanical modality, the instrument or tool is skillfully and manually guided by a trained practitioner to effect change on the soft tissue. While the true physiologic mechanisms of such interventions are less known, IMs are theorized to achieve the following physiologic effects: mechanical deformation (e.g., stretch, movement of collagen fibers), localized inflammatory response (e.g., increased blood flow by vasodilation), and activation of the immune system (Altaş, Birlik, Şahin Onat et al, 2022; Baburao & Gurudut, 2023; Bitra & Sudhan, 2019). Through these mechanisms, the skilled practitioner seeks to achieve the ultimate therapeutic outcomes of pain reduction or analgesia, tissue healing, and improved functioning at the level of client factors (e.g., musculoskeletal functions, lymphatic flow, etc.) and occupational performance. Examples include, but are not limited to, thin filiform needles used in dry needling, stainless steel instruments applied to target tissue using a scraping technique, and suction instruments used in cupping therapy (Al-Bedah et al, 2018; Bush et al, 2020; Chyrs et al., 2023; Sánchez-Infante et al., 2021).

Occupational Therapy Practitioner Qualifications and Ethical Obligations

The Accreditation Council for Occupational Therapy Education (ACOTE®; 2018) requires that entry-level educational programs must prepare occupational therapists to *demonstrate* and occupational therapy assistants to *define* "the safe and effective application of superficial thermal agents, deep thermal agents, electrotherapeutic agents, and mechanical devices as a preparatory measure to improve occupational performance. This must include indications, contraindications, and precautions" for use (p. 31). Foundational knowledge such as human anatomy, physiology, and biomechanics is part of entry-level education for the occupational therapist and occupational therapy assistant.

Occupational therapy practitioners should also refer to the *Occupational Therapy Code of Ethics* (AOTA, 2020a) for relevant principles and the *Standards of Practice for Occupational Therapy* (AOTA, 2021) to guide their practice. Many states where occupational therapy practitioners practice have additional regulatory requirements for demonstrating competence beyond entry-level education and for specific types of therapeutic modalities. Occupational therapy practitioners must be aware of and comply with these state specific requirements, which may include, but are not limited to, continuing professional education, institution-specific procedures for ascertaining service competence, and supervised contact hours by a qualified practitioner in the respective state (AOTA, 2020a).

The efficacy of PAMIMs, including the use of new technology is routinely updated, revised, and developed on the basis of the most currently available evidence. Practitioners are responsible for evaluating the evidence and for maintaining their awareness of new developments, as well as maintaining their competency in the safe and effective application of these technologies.

Insurance coverage and billing policies for therapeutic modalities set forth by federal and state payers (e.g., Medicare, Veterans Administration, state Medicaid programs), and commercial payers may vary widely. Practitioners are responsible for checking their payer policies and state practice acts to learn of any restrictions in coverage and usage. As part of their ethical responsibility, occupational therapy practitioners should also be mindful of the client's ability to access services that include PAMIMs. In situations in which a practitioner has limited access to PAMIMs equipment or tools, they should apply clinical and professional reasoning skills to use low-tech substitutes to which the client has access and that have known therapeutic effects.

Occupational Therapy Process

The *OTPF–4* provides guidance to occupational therapy practitioners when evaluating the need for PAMIMs and incorporating their use as interventions to support occupations (AOTA, 2020c). Throughout the occupational therapy process, an occupational therapist and an occupational therapy assistant may collaborate and play distinct roles.

Evaluation

During the evaluation process, occupational therapists establish an occupational profile to identify client priorities, gain an appreciation of the client's health and well-being, and understand the contextual supports and barriers to performance. Therapists further analyze client performance in chosen occupations to identify the specific focus of the intervention, including impairments in client factors, deficits in performance skills, and overall limitations in occupational performance. The presence of impairments in body functions and body structures as barriers to occupational performance may facilitate clinical reasoning in choosing appropriate PAMIMs. Therapists consider the evidence, pragmatics, and benefits of PAMIMs as an integral component of the occupation-based intervention plan. Occupational therapy assistants may contribute to the evaluative process, especially in establishing the occupational profile of the client, as well as once competency is achieved in the administration of standardized and

nonstandardized assessments (ACOTE, 2018; AOTA, 2021).

Intervention

Occupational therapists may collaborate on the implementation of the intervention plan that involves the use of PAMIMs with occupational therapy assistants who demonstrate service competence (AOTA, 2020b). The occupational therapist has overall responsibility for providing supervision of the occupational therapy assistant and their safe use of PAMIMs with clients. The occupational therapy assistant is also responsible for understanding how the use of PAMIMs supports the client's occupational therapy goals (AOTA, 2020b). Both occupational therapists and occupational therapy assistants should monitor and appropriately document the outcome of interventions. Using PAMIMs as part of a comprehensive intervention plan can facilitate active engagement and participation in occupational tasks and improve occupational performance (see Table 1 for case examples).

As part of the intervention plan, the therapeutic use of PAMIMs may be categorized as follows:

1. *Interventions to support occupations*—Occupational therapy practitioners administer PAMIMs to address barriers to body functions and structures prior to engagement in occupation. For example, a practitioner may apply thermal modalities on a client's hands and wrists to increase tissue extensibility and alleviate pain prior to engaging in cooking activities.
2. *Concurrent to therapeutic occupation or purposeful activities*—Occupational therapy practitioners may administer PAMIMs to reduce the impact of impairment on body functions and structures while the client is engaged in occupation to improve performance. For example, a practitioner may apply FES on the client's affected wrist extensors and flexors during a morning grooming routine to facilitate grasp and release.
3. *As a necessary component of a person's occupational routine*—Occupational therapy practitioners may recommend and train a client to self-administer PAMIMs as part of their health management and maintenance. For example, a practitioner may teach a client how to perform manual lymph drainage massage, use an intermittent pneumatic compression device, and properly apply compression garments to abate the effects of lymphedema on occupational performance.

Outcomes

Outcomes are related to intervention implementation and are established during the evaluation process (AOTA, 2020c). An occupational therapy practitioner may choose to utilize PAMIMs as an intervention if it is thought to support occupational engagement. In collaboration with the client, occupational therapy practitioners determine the target outcomes and monitor the client's progress over time and the progress made as the result of PAMIMs and associated interventions. Under the supervision of the occupational therapist, an occupational therapy assistant may administer an outcome measure, which is then analyzed to determine the need for continuation or discontinuation of services or modification of the intervention plan.

Conclusion

The use of physical agent, mechanical, and instrument-assisted modalities may be an integral part of an occupational therapy intervention that supports or enhances a client's occupational performance, health and wellness, participation, and quality of life (AOTA, 2020c). While an entry-level preparation for occupational therapist and occupational therapy assistant indicates knowledge and practice preparation in the use of select therapeutic modalities (ACOTE, 2018), occupational therapy practitioners should strive to maintain their service competency in these modalities within the parameters of practice established by their state regulatory boards, payors, and institutional policies.

Table 1

Case Study 1: Certified Nursing Assistant with Adhesive Capsulitis

A 52-year-old certified nursing assistant (she/her/hers) has adhesive capsulitis, or frozen shoulder, after a fall 3 months ago. She works full-time and cares for her elderly mother at home.

Research Evidence and Related Resources Guiding Practice

- Post, R., & Nolan, T. P. (2016). Electromagnetic waves: Laser, diathermy, and pulsed electromagnetic fields. In J. W. Bellew, S. L. Michlovitz, & T. P. Nolan (Eds.), *Modalities for therapeutic intervention* (6th ed., pp. 167–210). Philadelphia: F. A. Davis.
- Sung, J.-H., Lee, J.-M., & Kim, J.-H. (2022). The effectiveness of ultrasound deep heat therapy for adhesive capsulitis: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, *19*(3), 1859. https://doi.org/10.3390/ijerph19031859

Evaluation and Goal Setting	Occupational Therapy Intervention	Outcomes
Evaluation summary: At evaluation in an outpatient occupational therapy clinic, the client presented significant shoulder pain and loss of shoulder ROM, which limits her ability to reach above her head (reaching into the linen closet at work or into cabinets at home) and behind her back (to don/doff her bra or toilet hygiene). She is able to lift and carry light objects over a limited range. Prolonged holding positions (e.g., holding a steering wheel, shaving under the involved arm, assisting with client bed mobility at work) are difficult to maintain and cause discomfort. The client's mother requires physical assistance for bathroom transfers, meal preparation and cleanup, dressing, and hair care. The client states that using the curling iron with her involved arm on her mother causes an increase in pain and discomfort.	*PAMIMs used as an intervention to support occupation:* Although the client's desire to continue to work full-time and keep her mother in the home are a strength, impairments in client factors (e.g., pain and limited ROM) impact her ability to achieve goals. The client wants to be independent to get dressed and prepare meals without pain. The OT assesses pain and limited ROM as barriers to occupational performance and establishes an intervention plan that incorporates therapeutic occupations and activities with the use of thermal modalities like moist heat, ultrasound, or diathermy to increase ROM while decreasing pain. The OTA can use these PAMIMs as interventions to support occupation prior to occupation-based and relevant functional activities that support the client's goals.	Through collaboration with the OT practitioners, the client learned adaptive strategies to improve her ability to get dressed and prepare meals. The client also learned self-management strategies and a home exercise program that includes the use of superficial heat to reduce her pain and maintain her ROM. The OT also discussed the client's progress with the referring physician for concurrent medical management for adhesive capsulitis. Given the protracted nature of the condition, the client initially began with modified duty at work and eventually was able to resume full duty as her symptoms improved.

Occupational Goals: The client desires to continue to work and care for herself and her mother in the home.		

Note. OT = occupational therapist; OTA = occupational therapy assistant; PAMIMs = physical agent, mechanical, and instrument-assisted modalities; ROM = range of motion.

Case Study 2: HVAC Technician With Bilateral Lateral Epicondylitis

A 47-year-old self-employed HVAC technician (she/her/hers) presented with bilateral arm pain that has progressively worsened since its onset 6 months ago. The client was diagnosed with bilateral lateral epicondylitis, was initially prescribed with forearm counterforce braces, and received cortisone injections on both sides.

Research Evidence and Related Resources Guiding Practice

- Chys, M., De Meulemeester, K., De Greef, I., Murillo, C., Kindt, W., Kouzouz, Y., Lescroart, B., & Cagnie, B. (2023). Clinical effectiveness of dry needling in patients with musculoskeletal pain—An umbrella review. *Journal of Clinical Medicine*, *12*(3), 1205. https://doi.org/10.3390/jcm12031205
- Sánchez-Infante, J., Navarro-Santana, M. J., Bravo-Sánchez, A., Jiménez-Diaz, F., & Abián-Vicén, J. (2021). Is dry needling applied by physical therapists effective for pain in musculoskeletal conditions? A Systematic review and meta-analysis. *Physical Therapy*, *101*(3), pzab070. https://doi.org/10.1093/ptj/pzab070
- Uygur, E., Aktaş, B., & Yilmazoglu, E. G. (2021). The use of dry needling vs. corticosteroid injection to treat lateral epicondylitis: A prospective, randomized, controlled study. *Journal of Shoulder and Elbow Surgery*, *30*(1), 134–139. https://doi.org/10.1016/j.jse.2020.08.044

Evaluation and Goal Setting	Occupational Therapy Intervention	Outcomes
Evaluation Summary: After experiencing initial relief with the cortisone injections and counterforce bracing, the client noted worsening of pain and sought outpatient occupational therapy services. At initial evaluation, there was notable weakness and pain with grip and persistent lateral elbow pain that was further magnified and	*PAMIMs used as an intervention to support occupation:* Based on the relative acuity of the client's condition, the occupational therapist (OT) approached the intervention process more conservatively, which included a focus on activity modification (e.g., reduce gripping, modify lifting technique, etc.), gentle stretching and exercises, compressive sleeves and soft hand orthoses, and superficial thermal modalities. The client noted gradual	With the introduction of dry needling to standard of care, the client experienced noticeable pain relief over the course of 3–4 weeks. Orthopedic screening tests indicate that the client still had a positive response, but the pain that is reproduced is substantially less intense. The OT initiated a progressive strengthening program for another 4 weeks that also included simulated work tasks and

reproduced using orthopedic screening tests. The client also has active signs of tissue irritation, as noted by intermittent swelling and myofascial trigger points around the area of inflammation. The client, who is self-employed, has not been able to take on new jobs and expressed concerns about her financial status. *Occupational Goals:* The client would like to have significant pain reduction, improve arm and grip strength, and resume work.	improvement in swelling, point tenderness, and movement, but while reduced, the pain continues to impede her ability to execute her occupational routine. The OT recommended the addition of dry needling with kinesiotaping to the intervention plan. The OT explained the benefits of using kinesiotape and instructed the client on how to self apply the tape. The OT explained the therapeutic mechanisms of dry needling and obtained an additional release secondary to the more invasive nature of the procedure.	an ongoing monitoring of acute exacerbation. The OT also collaborated with the client on a gradual return to work schedule.

Note. OT = occupational therapist; PAMIMs = physical agent, mechanical, and instrument-assisted modalities.

Case Study 3: Older Adult With Right-side Hemiparesis

A 61-year-old older adult (he/him/his) with right-sided hemiparesis presented to a community based occupational therapy clinic for uninsured clients with decreased arm function on his dominant side.

Research Evidence and Related Resources Guiding Practice

- Eraifej, J., Clark, W., France, B., Desando, S., & Moore, D. (2017). Effectiveness of upper limb functional electrical stimulation after stroke for the improvement of activities of daily living and motor function: A systematic review and meta-analysis. *Systematic Reviews*, *6*(1), 40. https://doi.org/10.1186/s13643-017-0435-5
- Knutson, J. S., Fu, M. J., Sheffler, L. R., & Chae, J. (2015). Neuromuscular electrical stimulation for motor restoration in hemiplegia. *Physical Medicine and Rehabilitation Clinics of North America*, *26*(4), 729–745. https://doi.org/10.1016/j.pmr.2015.06.002

Evaluation and Goal Setting	Occupational Therapy Intervention	Outcomes
Evaluation summary: The client's community based occupational therapy evaluation indicates weakness of the wrist and finger extension and grip, which makes grasping and releasing objects difficult. He is motivated to return to work and his daily activities that includes, yardwork and	*PAMIMs as an intervention to support occupation and purposeful activities:* The occupational therapist (OT) assessed that the client has potential to regain motor function with the help of task-oriented training combined with electrical stimulation to augment lack of motor activation of key muscle groups. The OT provided training and a home program to enable the client to be	After 10 weeks of participation in a home task-oriented intervention and weekly OT visits, the client demonstrated improvement in UE function, according to standardized measures. Although the client learned adaptive strategies that incorporated the use of both hands, he had hoped for greater fine motor control for more intricate tasks involved with

vegetable gardening. The client had a stroke approximately 2 months ago. He received acute care and 2 weeks of inpatient rehabilitation from his city's public hospital. He was referred to occupational therapy by his pro-bono community based primary physician. He was working full-time as a janitor when he had his stroke. *Occupational Goals:* The client would like to improve arm and hand function and return to work until he qualifies for Medicare.	able to reach and manipulate work tools and garden tools. Because of an unstable grip, the OT trialed the use of functional electrical stimulation (FES) to support the wrist extensors as the client attempts to sustain his grip with positive results. A home FES unit was given to the client by a family member and the OT set the device to the appropriate parameters. The unit was used to assist with hand opening during pre-grasp practice with various objects while at mid-reach. Subsequently, the OT recommended ongoing training with the use of a home FES unit along with a task-oriented training program.	gardening. In collaboration with the OT, the client was able to ease his way back into work with part-time status due to issues of fatigue. The OT advised that the client continue to engage in a home program with a battery of task-oriented activities to maximize hand use and maintain his functional gains. The OT assisted the client to coordinate a follow-up with the referring pro bono physician in 6 months and a subsequent OT re-evaluation to determine the need for continuing services and/or revision of the client's home program.

Note. FES = functional electrical stimulation; OT = occupational therapist; PAMIMs = physical agent, mechanical, and instrument-assisted modalities; UE = upper extremity.

Case Study 4: Computer Engineer With Elbow Fracture and Wrist Sprain

A 26-year-old computer engineer (they/them/theirs) presents with severe pain in their dominant upper extremity after a fall 4 months ago that resulted in an elbow fracture and wrist sprain. They have 9/10 pain with all grasping, lifting, and carrying and they have developed complex regional pain syndrome.

Research Evidence and Related Resources Guiding Practice

- Moretti, A., Gimigliano, F., Paoletta, M., Liguori, S., Toro, G., Aulicino, M., Iolascon, G., … (2021). Efficacy and effectiveness of physical agent modalities in complex regional pain syndrome type I: A scoping review. *Applied Sciences*, *11*(4), 1857. http://dx.doi.org/10.3390/app11041857
- Bellew, J. W. (2016). Foundations of clinical electrotherapy. In J. W. Bellew, S. L. Michlovitz, & T. P. Nolan (Eds.), *Michlovitz's modalities for therapeutic intervention* (6th ed.), pp. 253–285). Philadelphia: F. A. Davis.

Evaluation and Goal Setting	Occupational Therapy Intervention	Outcomes
Evaluation summary: The client has limited grip strength and therefore limited function. They work full-time and have a 1-year-old child at home. They are having difficulty with activities involving lifting and	*PAMIMs as a component of the client's occupational routine:* In collaboration with the client, the OT provided strategies to manage their CRPS through activity modifications and the use of TENS. Prior to recommending a TENS unit, the OT evaluated key areas	The client became independent in the use of TENS in the treatment of pain due to complex regional pain syndrome. The client required a few additional sessions to develop an occupational routine that they could incorporate stress-management

carrying, childcare, and meal preparation and reports that they have increased pain while typing on the computer for work-related tasks. *Occupational Goals:* The client would like to be able to better manage pain as they resume their usual occupations in the home and work setting.	of pain that may benefit from TENS and the client's level of tolerance to stimulation. The OT educated the client on proper application and scheduling of TENS use and then trialed and assessed their ability to use a home TENS unit to manage pain at work and at home during activity to decrease pain and support improved function. The OT used a time log to gain an understanding of the client's experience of pain linked to daily activities, and the use of the TENS unit was incorporated into their daily routine based on the information gleaned from the log. In addition to the modality, the OT educated the client on stress management techniques and self-monitoring of physiologic signs.	techniques, including mindfulness and low-impact aerobics.

Note. CRPS = complex regional pain syndrome; OT = occupational therapist; PAMIMs = physical agent, mechanical, and instrument-assisted modalities; TENS = transcutaneous electrical nerve stimulation.

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