

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

This AOTA Position Statement describes how 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.

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 possess the foundational knowledge of basic sciences, understanding of relevant theory and evidence, and clinical reasoning to recommend and safely apply PAMIMs to support the 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* (OTPF-4; AOTA, 2020c), the exclusive or stand-alone use of PAMIMs without linking them 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 through 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., 2019).
3. *Electrotherapy* uses electrotherapeutic currents and waveforms to influence physiological effects on the client's body structures (Bellew, 2016). Electrotherapy has many potential clinical uses and may act on tissues in the following ways:
 - a. To 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 a direct electrical current to move ions of medication across the skin and into target tissues (Bracciano, 2022).
 - b. To 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. The term *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. The 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. The term *instrument-assisted modalities* (IMs) refers to the therapeutic use of an instrument or tool that is

manually applied by a trained practitioner to target specific tissues, such as 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. Although the true physiologic mechanisms of such interventions are not well 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 means of vasodilation), and activation of the immune system (Altaş et al., 2022; Bitra & Sudhan, 2019; Jadhav & Gurudut, 2023). 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) 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., 2019; Bush et al., 2020; Chys 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 occupational therapists and occupational therapy assistants.

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 for 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 Affairs, 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.

The 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 of 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 client's occupational profile, once competency in the administration of standardized and nonstandardized assessments has been achieved (ACOTE, 2018; AOTA, 2021).

Intervention

Occupational therapists may collaborate on the implementation of an intervention plan that involves the use of PAMIMs with occupational therapy assistants who demonstrate service competence (AOTA, 2020b). The occupational therapist has the 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 the Appendix for 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 before engaging in occupation. For example, a practitioner may apply thermal modalities to a client's hands and wrists to increase tissue extensibility and alleviate pain before engaging in cooking activities.
2. *Concurrent to therapeutic occupation or purposeful activities.* To improve performance, occupational therapy practitioners may administer PAMIMs to reduce the impact of impairment on body functions and structures while the client is engaged in occupation. For example, a practitioner may apply FES to 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 use 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 PAMIMs 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). Although entry-level preparation for occupational therapists and occupational therapy assistants 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, payers, and institutional policies.

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Appendix. Case Studies

Case Study 1. 52-yr-old Certified Nursing Assistant with Adhesive Capsulitis

Occupational Therapy Process	Clinician's Findings
Client description	A 52-yr-old certified nursing assistant (she/her/hers) developed adhesive capsulitis, or frozen shoulder, after a fall 3 mo earlier. She works full time and cares for her mother at home.
Occupational therapy evaluation and goal setting	<i>Evaluation Summary:</i> During the evaluation in an outpatient OT clinic, the client presented with significant shoulder pain and loss of shoulder ROM that limit 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 perform toileting 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. <i>Occupational Goals:</i> The client desires to continue to work and care for herself and her mother in the home.
Occupational therapy interventions	<i>PAMIMs Used as an Intervention to Support Occupation:</i> 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) affect 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, such as moist heat, ultrasound, or diathermy, to increase ROM while decreasing pain. The OTA can use these PAMIMs as interventions to support occupation before engaging in occupation-based and relevant functional activities that support the client's goals.
Occupational therapy outcomes	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 began 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 of adhesive capsulitis. Given the protracted nature of the condition, the client initially began with modified duties at work and eventually was able to resume full duties as her symptoms improved.
Research evidence and related resources guiding practice	Post & Nolan (2016) , Sung et al. (2022)

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

Case Study 2. 47-yr-old Self-Employed HVAC Technician with Bilateral Lateral Epicondylitis

Occupational Therapy Process	Clinician's Findings
Client description	A 47-yr-old self-employed HVAC technician (she/her/hers) presented with bilateral arm pain that has progressively worsened since its onset 6 mo earlier. The client, who was diagnosed with bilateral lateral epicondylitis, was initially prescribed forearm counterforce braces and received cortisone injections on both sides.
Occupational therapy evaluation and goal setting	<i>Evaluation Summary:</i> After experiencing initial relief with the cortisone injections and counterforce bracing, the client noted worsening of pain and sought outpatient occupational therapy services. At the initial evaluation, there was notable weakness and pain with grip and persistent lateral elbow pain that was further magnified 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 has not been able to take on new jobs and expresses concerns about her financial status. <i>Occupational Goals:</i> The client would like to have significant pain reduction, improve her arm and grip strength, and resume work.
Occupational therapy interventions	<i>PAMIMs Used as an Intervention to Support Occupation:</i> On the basis of the relative acuity of the client's condition, the OT approached the intervention process conservatively, which included a focus on activity modification (e.g., reduce gripping, modify lifting technique), gentle stretching and exercises, compressive sleeves and soft hand orthoses, and superficial thermal modalities. The client noted gradual improvement in swelling, point tenderness, and movement, but the pain, although reduced, 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 kinesiology tape and instructed the client on how to self-apply the tape. The OT described the therapeutic mechanisms of dry needling and obtained an additional release secondary to the more invasive nature of the procedure.
Occupational therapy outcomes	With the introduction of dry needling to the standard of care, the client experienced noticeable pain relief over the course of 3–4 wk. Orthopedic screening tests indicated that the client still had a positive response, but the pain that was reproduced is substantially less intense. The OT initiated a progressive strengthening program for another 4 wk that also included simulated work tasks and an ongoing monitoring of acute exacerbation. The OT also collaborated with the client to develop a gradual return-to-work schedule.
Research evidence and related resources guiding practice	Chys et al. (2023) , Sánchez-Infante et al. (2021) , Uygur et al. (2021)

Note. HVAC = heating, ventilation, and air conditioning; OT = occupational therapy/therapist; OTA = occupational therapy assistant; PAMIMs = physical agent, mechanical, and instrument-assisted modalities.

Case Study 3. 61-yr-old Older Adult with Right-Sided Hemiparesis

Occupational Therapy Process	Clinician's Findings
Client description	A 61-yr-old older adult (he/him/his) with right-sided hemiparesis presented to a community-based OT clinic for uninsured clients with decreased arm function on his dominant side.
Occupational therapy evaluation and goal setting	<i>Evaluation Summary:</i> The client's community-based OT 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, which include yard work and vegetable gardening. The client had a stroke approximately 2 mo earlier. He received acute care and 2 wk of inpatient rehabilitation from his city's public hospital. He was referred to OT by his pro bono community-based primary physician. He was working full time as a janitor when he had his stroke. <i>Occupational Goals:</i> The client would like to improve arm and hand function and return to work until he qualifies for Medicare.
Occupational therapy interventions	<i>PAMIMs Used as an Intervention to Support Occupation:</i> The OT determined that the client has the potential to regain motor function with the help of task-oriented training combined with electrical stimulation to augment the lack of motor activation of key muscle groups. The OT provided training and a home program to enable the client to be able to reach and manipulate work tools and garden tools. Because of the client's unstable grip, the OT trialed the use of 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 pregrasp practice with various objects while at midreach. Subsequently, the OT recommended ongoing training with the use of a home FES unit along with a task-oriented training program.
Occupational therapy outcomes	After 10 wk 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 the more intricate tasks involved with gardening. In collaboration with the OT, the client was able to ease his way back into work, but with part-time status because of fatigue issues. The OT advised the client to 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 helped the client coordinate a follow-up with the referring pro bono physician in 6 mo and a subsequent OT reevaluation to determine the need for continuing services or revision of the client's home program.
Research evidence and related resources guiding practice	Eraifej et al. (2017) , Knutson et al. (2015)

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

Case Study 4. 26-yr-old Computer Engineer with Severe Pain in Their Dominant UE

Occupational Therapy Process	Clinician's Findings
Client description	A 26-yr-old computer engineer (they/them/theirs) presented with severe pain in their dominant UE after a fall 4 mo earlier that resulted in an elbow fracture and wrist sprain. They have a 9/10 pain level with all grasping, lifting, and carrying, and they have developed CRPS.
Occupational therapy evaluation and goal setting	<i>Evaluation Summary:</i> The client has limited grip strength and therefore limited function. They work full time and have a 1-yr-old child at home. They are having difficulty with activities involving lifting and carrying, childcare, and meal preparation and report that they have increased pain while typing on the computer for work-related tasks. <i>Occupational Goals:</i> The client would like to be able to better manage pain as they resume their usual occupations in the home and work settings.
Occupational therapy interventions	<i>PAMIMs Used as an Intervention to Support Occupation:</i> In collaboration with the client, the OT provided strategies to manage their CRPS through activity modifications and the use of TENS. Before recommending a TENS unit, the OT evaluated key areas 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 activities 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 on the basis of 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.
Occupational therapy outcomes	The client became independent in the use of TENS in the treatment of pain due to CRPS. They required a few additional sessions to develop an occupational routine into which they could incorporate stress management techniques, including mindfulness and low-impact aerobics.
Research evidence and related resources guiding practice	Bellew (2016) , Moretti et al. (2021)

Note. CRPS = complex regional pain syndrome; OT = occupational therapy/therapist; OTA = occupational therapy assistant; PAMIMs = physical agent, mechanical, and instrument-assisted modalities; TENS = transcutaneous electrical nerve stimulation; UE = upper extremity.