

Use of the Person-Environment-Occupation Model as an Analytic Tool for Audiology, Occupational Therapy, and Workplaces in Generating Solutions to Support Workers with Hearing Loss Succeed at Work

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The stigma associated with hearing loss is a major barrier for workers. For many older workers with hearing loss, the default option due to stigma has unfortunately been early withdrawal from work^{1,2} rather than the pursuit of solutions. For others with hearing loss, staying at work is often made possible through the process of self-accommodation.³⁻⁶ These researchers and clinicians⁷⁻¹⁴ from a variety of disciplines, including occupational therapy, occupational science, audiology, speech-language pathology, and rehabilitation science have been working to change the status quo and to advance more inclusive practices for workers with hearing loss at work.

Developing the capacity of workers, workplaces and health care professionals to work together is necessary to improve approaches that support success and flourishing at work.¹⁵ The authors of this paper believe that using an ecological approach to understand the needs of persons with hearing loss in the workplace enhances the potential for finding solutions for succeeding at work. In addition, the authors of this paper value the importance of collaboration from interprofessional and worker/workplace driven perspectives to further the identification of the technological interventions, environmental design changes and assistive devices that can support optimal performance at work. Optimal performance at work is one step in the path to achieving human potential through work. The need for increased awareness and opportunities for interprofessional collaboration in work-based practice has been espoused as a means to achieve improved results for workers with hearing loss.^{4,8,10,13,15}

In 2008, Jennings and Shaw identified the need for greater understanding between audiologists and occupational therapists of how they can contribute to finding solutions to complex problems of hearing in everyday occupations.² There are several models and approaches that can support interprofessional practice in analyzing and enhancing work performance such as *The Person-Environment-Occupation Model (PEO)*¹⁶ and in analyzing and identifying assistive technology professionals can use the Human Activity Assistive Technology (HAAT) model.¹⁷ These models also support client centred approaches that are used both in occupational therapy¹⁸ and audiology.¹⁹⁻²¹ In this article, we introduce readers to the key components of the PEO model and

use one case scenario to demonstrate how focusing on the PEO relationships can be used by audiologists working with occupational therapists, and workplaces to support workers with hearing loss achieve goals of ‘return to work’, ‘stay at work’ and/or ‘succeed at work’! The case scenario is presented followed with how therapists and workplaces can use the PEO model as an analytic tool to identify issues, as part of analyzing the source of problems (minimal fit or congruence in PEO interactions and relationships) and then generating solutions to improve performance for workers with hearing loss in the workplace.

PEO Model as Analytic Tool

The PEO model¹⁶ is focused on the relationships and congruence of three dimensions: (1) person, (2) environment, and (3) occupation.

Occupation refers to any type of daily occupation such as self-care activities, (e.g., meal preparation, shopping), leisure activities, (e.g., going to the movies or swimming), learning activities (e.g., elementary student or graduate student), and work activities (e.g., bus driver or nurse). Performance of occupations or activities important to the person are optimal when the aspects of the person, the environment and the occupation are aligned and interact to support human occupation. There are an array of dimensions and complexities that are considered in understanding occupational performance. Occupational performance characterizes how people function in activities or the roles that people have in everyday life such as at school, at work, at home and in the community. Occupational performance is fluid and dynamic and is a subjective experience and not prescriptive. Underlying assumptions about occupational performance are that the relationships among P-E-O are continuous across time (past, current, and future) and space and they are fluid and dynamic. PEO relationships and interactions can change to improve performance and they are highly contextualized. As such individuals perceive their performance subjectively and experientially. The more there is crossover and overlap between the three dimensions the more the occupational performance is optimized. This is also referred to as the maximizing of congruence or fit across dimensions.

In this article, we will be focused on productive work occupations. Occupational performance in work settings can be minimized or maximized based on the changes to the *person*, the *environment* (e.g., attitudes, workplace or work station or equipment), or the job demands (e.g., physical, cognitive, sensory, emotional) and processes of the productive work *occupation* (see Figure 1). Areas for optimizing occupational performance may be between all three dimensions or they may be across two dimensions of the *person and the occupation* (e.g., worker has the knowledge, skills that align with the job requirements and equipment provided), or the *person and environment* (e.g., worker has access to supports such as training and/or lunchroom), or between the *occupation and the environment* (e.g., work that is safety sensitive is supported by a culture of trust and accountability). Each person’s occupational performance and experience is different and thus solutions are tailored. Generating solutions for optimizing occupational performance at work can include but are not limited to addressing stigma, identifying changes to work processes and interactions with co-workers, environmental adaptations, and/or application of technology and assistive devices.

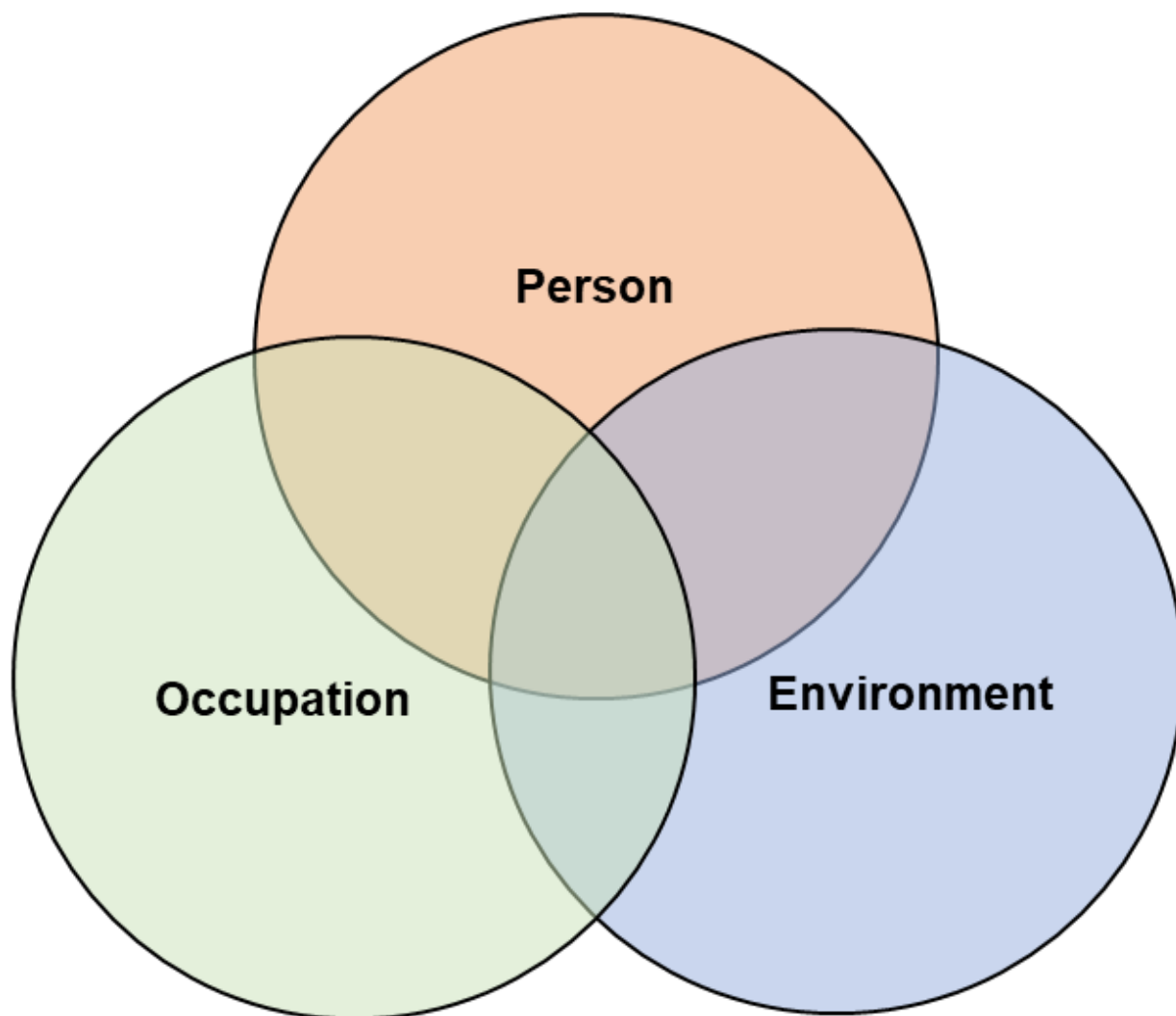


Figure 1. Maximizing occupational performance in productive work with input from audiologists, occupational therapists, worker, and employers. Adapted from Law et al.¹⁶

Analyzing and Optimizing Occupational Performance using PEO

The following case scenario was developed by one of the authors (MM) in partnership with a worker who gave permission to use this case for the purposes of demonstrating the use of the PEO. The following case highlights typical considerations for how audiologists and occupational therapists can work collaboratively with workplaces to identify and reflect on occupational performance issues needed to generate collaborative solutions using the PEO model. Table 1 outlines the specific relationships across the PEO dimensions that can be maximized to improve or enable the occupational performance of workers with hearing loss.

Case Scenario

This case entails the work of an Aircraft Maintenance Engineer:

“An Aircraft Maintenance Engineer (AME) is responsible for performing maintenance and repair tasks on an aircraft to establish an airworthy condition. Job demands are completed in an aircraft garage, in or on any part of the aircraft. The work shift is typically 12 hours with a 30-minute lunch, 15-minute dinner and two 10-minute breaks. Examples of the type of job demands can involve the following:

- In the aircraft interior removal of large compartment sections, galley kitchen, garment and jump-seat storage), seats, flooring, side panels, overhead bins – essentially stripping the entire interior

of the aircraft including the flight deck.

- Unscrewing and removing the leading edge of the wing.
- Working with a co-worker to remove the edge as it is sealed and requires force to pull it and break the seal.
- Perform inspections and replacement of parts that include heavy lifting of an engine, batteries and other components in a confined space.³²²

This role is performed in a fast-paced, highly regulated airport environment. The tasks are fulfilled by federally licensed engineers operating in a noisy and busy airport hangar space. To be successful in this type of role, individuals must be able to collaborate in a team environment relying on frequent communication and consultation to solve a variety of problems as they emerge. Such communications can occur within awkward contexts, ranging from conversation between a worker situated on the wing speaking to a colleague on the ground, to co-workers sharing information while in confined spaces inhibiting eye contact. For instance, the confined spaces are narrow and do not permit two persons to work side by side. Often - the workers will call out their requests/communications to a person out of range of sight. They would keep their eyes forward and assume the person out of sight would still hear them.

An additional monitoring is that of physical sounds of workers to be oriented to noises as a signal for risks in the workplace. A beeping alarm is activated during a hydraulic lifting process, a loud grinding noise is heard from various handheld power tools, and so on.

The AME worker who was hired has bilateral, severe sensorineural, congenital hearing loss. Prior to commencing employment, the worker had employed various corrective strategies to meet their needs, including binaural hearing aids. In the classroom setting, they used sign language interpreters and an FM system.

The occupational performance issues were identified that required further assessment and the generation of potential solutions to maximize the workers' occupational performance (see Table 1).

Table 1. Examples of Identifying and Addressing Occupational Performance Issues

PEO Relationships	Identify PEO occupational performance issue(s) Examine incongruences or a lack of fit	Maximize fit / worker occupational performance Audiologist input –AD Occupational Therapy input – OT Worker/Workplace input - WP
Person Environment	Perception of co-workers (environment) towards the worker (person) with hearing loss. Examples: -Perception that individual (person) with hearing loss will be unable to orient to risks in noisy hangar (environment) causing safety concerns. - Potential of the workplace/co-workers to have systemic/attitudinal/cultural barriers towards those with hearing loss.	OT&AD - educational training/workshop for staff on hearing loss to address these cultural barriers, equity and safety issues. WP - training/orientation for team members to realign practices with needs of the individual with hearing loss. Coaching on visual communication techniques rather than relying exclusively on call-out cuing. -Deferred sign language. -Communication strategies developed in place and include eye contact.
Environment Occupation	Detailed analysis of communication demands (occupation) in this role required in the context of performing the work with co-workers and when working in isolation (environment) Example: -Repair of aircraft components with multiple workers coordinating tasks concurrently; requires situational awareness and ad hoc communication to orient each other to dangers at any given moment	OT - Consider visual alarms to supplement process adjustments. OT & AD - Conduct analysis of Communication Demands using the C-Com D Tool. ³ -Identify demands requiring solutions to match worker, workplace strategies and use of technology or communication strategies to maximize performance.

<p>Person Occupation</p>	<p>Identify worker's (person) past self-accommodation strategies and gaps and align new strategies to support safe functioning with the AME job (occupation).</p>	<p>OT&WP&AD -Collect information about what strategies work well. Identify the procedural and process strategies needed to support communication. Identify and trial adaptations and adjustment to work practices and processes to support communication. OT&WP&AD - ensure match of the technology with job demands and work within the space and with co-worker interactions to align for quality and safety of communications. AD- Assess current aids and accessories to ensure in good working order and recommend HA technology to match communication needs of the individual in current workplace.</p>
<p>Person</p>	<p>Worker (person) has history of using assistive devices. -Confidence, fit, and ease of use of these devices need to be considered.</p>	<p>AD- Conduct communication/technology needs assessment where worker uses both sign language and hearing aids with accessories. Assess with worker when interpreter is needed, if worker can use voice and if can be understood verbally by staff. AD - recommend HA technology to match communication needs of the individual.</p>
<p>Occupation</p>	<p>Detailed analysis of communication demands and safety in this role (occupation) required. Examples: In the AME tasks, several key areas require hearing and communication: - Environmental awareness (alertness to hazards from moving objects and machinery) - Communications between workers - Testing radio communications used by aircrews during flight activity - Relaying/receiving directives via radio communications (directional info for taxiing aircraft, gathering details from flight crew about potential malfunction in equipment) - Worker awareness of hearing conservation principles with regards to safety (hearing protection versus hearing aids depending on noise levels) - Evaluate the use of safety equipment combined with communication technologies/behaviours</p>	<p>WP- implement visual alerting systems to complement auditory cuing for environmental hazards (e.g., strobe lights, flashing red lights, flag system). Mirrors can improve line of sight which may change throughout day if alerting flashing lights/flag system are being used and are fixed. Mirrors can also be used to augment speech reading especially if back turned to co-workers. WP – communication can be augmented with DM/FM systems to complement the worker's use of HA technology. The crew chief or supervisor can use the microphone as needed. Optimize use in job interactions and settings such as during staff meetings, meetings with manager, or over lunch time to aid in socializing with staff. WP - radio communications could be wired directly to the worker's HA technology via Bluetooth connectivity. WP – Consider use of other forms of communication such as: - Text messaging platform (using the workplace's iPad system). - Vibration as an alerting device (e.g., use of the Bellman and Symfon doorbell transmitter to vibrate to a recording of machine noise which then vibrates a paging device worn on the hip). - Typing devices such as the UBIDuo can improve communication for longer dialogues. - Captioning apps on phones (e.g., AVA) for group discussions might be considered depending on noise levels in room. - A communication board to point to for common situations at work in noise (especially if reading/writing skills are not high).</p>
<p>Environment</p>	<p>The (environment) itself, namely background noise and distance, may pose limitations to performance. Evaluate opportunities to address background noise and distance in different settings where the worker performs tasks. Examples: The constraints in a hangar environment are due to sheer size of aircraft, distance is not modifiable. The noise elements are controlled to the point that hearing protection is required only when operating certain hand tools and airside.</p>	<p>OT&AD&WP -Evaluate opportunities to address background noise in different settings where the worker performs tasks. (e.g., constraints in a hangar environment are due to sheer size of aircraft, distance is not modifiable. The noise elements are controlled to the point that hearing protection is required only when operating certain hand tools and airside). WP- Getting rid of unnecessary background noise would be essential, modifying equipment to be less noisy if possible, getting worker and workers in closer proximity if communication is needed (with line of sight for speech reading if possible). This would also include meetings rooms. If training videos need to have closed captions. WP = implementation of visual alerting system as described earlier.</p>

<p>Environment</p>	<p>The culture (environment) of the workplace itself can influence the inclusion of others. Example: An overly rigid emphasis on safety (culture/environment) as an aircraft maintenance engineer may trigger resistance to supporting a co-worker with hearing loss.</p>	<p>WP –Understand safety culture and identify opportunities to support optimization of occupation performance that exist in the workplace (e.g., safety in the aviation sector is a critical feature of corporate culture). This principle can support engagement of all workers to adopt safety strategies that demonstrate the potential for removing resistance and offer an inclusive perspective and a more welcoming approach.</p>
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Current Strategies Used in this Case to Maximize Occupational Performance

Several factors contributed to the successful outcomes in this case. First, the employer has a longstanding history of diversity and inclusivity in the workplace.²⁴ This commitment coupled with a firm but not rigid focus on safety created a receptivity to exploring the options when presented with the opportunity to employ this candidate. Meanwhile, the sheer enthusiasm for the work and the dedication to the trade from the candidate bolstered her willingness to engage in transparent disclosure of the workers needs. The candidate was willing to educate their supervisors and peers on effective communication techniques. A specific example was a change in protocol when an aircraft is elevated using a hydraulic system. Previously, a worker would issue a simple shout to alert fellows to step away from the aircraft while it was being raised. With an employee with hearing loss, this was an inappropriate system. In response, the team adopted an eye contact, thumbs-up signalling ritual, relaying from worker to worker around the large aircraft. This resulted in all workers reporting a greater sense of security and safety during the lifting procedure. Other crews in the hangar have since adopted the ritual, even without the candidate with a hearing loss on the crew. From a technology perspective, the success of the worker was facilitated by the issuance of iPads to each team member as a replacement for manuals and centralized laptops. The tablets were deployed to allow on the spot inventory requests and research, rather than stopping the task, ambulating to a central computer station, and checking software. A by-product of the iPad was its ability to accept real-time texting between coworkers. Largely, the candidate functions well with close range conversations and has managed the expectations of their peers with respect to longer range interactions.

Achieving Inclusion in the Workplace for Workers with Hearing Loss

Currently, employers are confronted with several significant pressures to expand their approach to recruitment and retention of skilled talent. First, they are faced with a tough labour market²⁵; many employers are experiencing job vacancies for more than three months at a time. Second, Canadian employers are expected to fulfill a duty to accommodate to the point of undue hardship when approached by an employee living with a disability.²⁶ Efforts to support inclusion are also consistent with emerging legislation on principles of Accessibility.²⁷ Canadian employers have a legal obligation and need to embrace new ways of fulfilling production targets and business objectives. Finally, disability insurance costs are projected to rise as the economy continues to grow, inspiring employers to seek ways to control costs.²⁸ These three elements are shaping the need for greater receptivity of creative solutions for both common and complex inclusion challenges. The authors of this paper contend that given the current context more and more employers will turn to healthcare professionals for support. Professionals who can offer an interprofessional approach are needed who can respond to workplace needs.

For employers the value of the PEO Model is that it explicitly acknowledges the context and the

tasks being done. The multidimensional nature of this model for use in workplaces supports collaboration that includes the employer's expertise and insights about the work being done. Further, this approach firmly requires employer input to support inclusion and engages them in finding solutions.

The PEO Model offers a valuable framework for addressing the consequences of hearing loss for individuals aspiring to enter, remain, or return to the workplace. This case offers an example of areas for collaboration of professionals needed to address inclusion and high-quality performance of workers with hearing loss. By considering the domains and the intersections across time and space in the daily work practices of workers the dimensions of the PEO Model can be used by professionals and workplaces to more fully explore the nuances of the lived experience of the individual with hearing loss and uncover tangible solutions that allow workers to succeed at work and achieve the best possible outcomes.

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