A message from our director

Today’s poster day highlights the endeavors of our fifteen summer interns over the past 2 months and provides a glimpse of the variety of ongoing projects at the Oregon Institute of Occupational Health Sciences. Judging from the abstracts, today is sure to be an educational feast for all attendees. It is also an important educational experience for our interns themselves as they endeavor to distill a wide variety of activities performed over the past two months into a cohesive scientific presentation. The importance of the research is often judged by the outcome – what answers emerge and what implications there are for improving the safety and well-being of Oregon’s workforce. That is our Institute’s mission and the internships certainly help towards that goal. But in this case, perhaps more important than the research itself, is the educational experience for the interns. Thus, actually, we hope that the interns have been challenged by many problems along the way and have had the opportunity to grapple with varied solutions. This is how science works, and if a short project comes to a meaningful answer, then that is just the icing on the cake. The attendees today can help with this education – by engaging with the interns and asking probing questions as the interns practice succinctly communicating complex ideas to experts and novices alike.

Every intern should feel a strong sense of achievement because of what they have learned and because of how they have helped our mission. I hope that some interns will have been fascinated and excited by the science and will be inspired to continue to strive to make significant contributions to human safety, health and wellbeing.

I would like to thank all the people who managed the program, especially Ryan Olson, PhD (Summer Intern Program Director), Alisa Mukai, BA (Administrative Coordinator); Dan Austin, MS (Senior Technology Analyst), and our devoted faculty members and their research teams who hosted interns in their laboratories.

Sincerely,

Steven A. Shea, Ph.D.
Director and Professor, Oregon Institute of Occupational Health Sciences
Vascular function in obstructive sleep apnea
Georgeann C. Booth1,2, Saurabh S. Thosar1, Alec M. Berman1, Sally A. Roberts1, Maya X. Herzig1, Noal A. Clemens1, Miki Morimoto1, Matthew P. Butler1, Jonathan E. Emens1,3, Steven A. Shea1
1Oregon Health & Science University, Portland, OR, 2Oregon State University, Corvallis, OR, 3Portland Veteran Affairs Hospital, Portland, OR

Introduction
Obstructive sleep apnea (OSA) is associated with an increased risk of cardiovascular disease. Vascular endothelial function (VEF) is a classic marker of cardiovascular disease, and is impaired in patients with OSA. Flow-mediated dilation (FMD) is a method commonly used to assess VEF, it is primarily mediated by nitric oxide. Low-flow-mediated constriction (L-FMC) is a novel technique that has been proposed as another measure of VEF. It is believed to be mediated by endothelin-1. Endothelin-1 is elevated in OSA. Thus, we aim to compare L-FMC response in participants with untreated OSA compared to healthy controls.

Methods
Measurements were made in 10 healthy and 7 OSA participants matched for age, sex, and body mass index. Immediately after waking from an 8 hour sleep period under fasting conditions, brachial artery diameter and blood velocity were measured at rest and during low-flow using non-invasive ultrasound.

Results
These results from the first 17 participants represent a preliminary interim analysis. 40 participants are expected to complete the full study. Vascular function, measured as L-FMC, was relatively impaired in patients with OSA compared to healthy controls (-4.6 ± 2.1% vs. -3.3 ± 3.4% [mean ± SD] respectively).

Discussion
These preliminary data suggest that low-flow-mediated arterial constriction is greater in patients with OSA compared to healthy controls. This is consistent with the increased cardiovascular disease risk profile of patients with OSA. We await results from the full study, including endothelin-1 measurements, to confirm or deny these preliminary results.
Kathleen Daly-Jensen
Whitman College
Mitch Turker Lab

Measuring Cytogenetic Aberrations Induced by Accelerated Helium Ions
Kathleen Daly-Jensen1, 2, Juanito Terribias1, 3, Furaha Rwatambuga1, Dmytro Grygoryev1 and Mitchell Turker1, 3 Oregon Institute of Occupational Health Sciences; 2 Whitman College, Walla Walla, WA; 3 Franklin High School, Portland, OR

Introduction:
Our experiment is intended to identify the effect of environmental exposures in space, with a focus on DNA damage revealed by the presence of cytogenetic aberrations, biomarkers for cancer. It is important to understand the effects of galactic cosmic radiation (GCR) to reduce the risk of cancer for astronauts assigned to long-term missions. Our lab is analyzing the effects of helium radiation on the epithelial cells of intact mouse kidneys at 0cG (centigrays), 21cG, 42cG, and 168cG. The amount of aberrations is expected to increase as the dose increases.

Methods:
The kidneys of irradiated mice were harvested, chopped, digested, and plated in media to grow primary cultures. Each flask was incubated for five days before harvesting. Once harvested, cells were washed with Versene and trypsinized until cells had rounded. The cells were spun down in KCL and a 3:1 fix (Methanol: Acetic Acid). The cells were resuspended in 4:1 fix to be kept in a -20C freezer. The cell solution was dropped onto clean slides and dried overnight. The slides were soaked in a trypsin/PBS solution for 15 seconds, followed by an FBS/PBS solution and then PBS alone and then stained for G-banding. The slides were then screened for metaphases.

Results:
The difference in percent of cells with aberrations in the 0cG and the 168cG cells was found to be statistically significant by the Fisher’s Exact Test. A significant difference was also found between the average aberration per cell and average chromosome break per cell at 0cG and 168cG.

Discussion:
These results confirm that a higher dose of helium ion radiation increases chromosomal aberrations within the cells.

Todd Carroll
University of Portland
Ryan Olson Lab

Preparing a toolbox talk mobile marketing campaign for residential construction workers
Todd Carroll1, 2; Katrina Bettencourt1; Ilia Gilbert-Jones1; Ryan Olson1, 2 Oregon Institute of Occupational Health Sciences, Oregon Health & Science University, Portland, OR; 2 University of Portland, Portland, OR

Introduction:
The Oregon construction fatality rate is 9 per 100,000 workers compared to 3.5 for all industries. Many deaths occur in residential construction where research participation is low. Regular safety meetings are an established component of effective construction safety programs. OR-FACE developed evidence-based toolbox talks that make it easier for construction supervisors to hold safety meetings. These brief, scripted documents reduce supervisor preparation times and increase crewmember discussion. However, paper/website dissemination is unlikely to reach most construction supervisors. Therefore, OR-FACE planned a study to test the hypothesis that mobile phone delivery of toolbox talks will increase the proportion of residential construction supervisors who meet Oregon OSHA’s safety meeting frequency standard. The purpose of the current project was to prepare and test materials, program technology, and begin recruitment.

Methods:
To supplement pdf talks, video toolbox talks were created using iMovie by narrating over moving toolbox talk images. Surveys developed measured safety meeting frequency and safety climate (Griffen & Neal, 2000). Using Trumpia, a mass-messaging system, talks and poll questions were piloted with 13 lab personnel and modified based on feedback and system performance.

Results:
Nine toolbox talks were produced (PDFs and videos). Pre and post surveys (English and Spanish) were created with help from SAIF Corporation. A mobile message schedule was programmed and tested successfully among 13 personnel. With aid from the Oregon Home Builder’s Association, 14 supervisors have been recruited to date.

Discussion:
Baseline data are forthcoming; however, interest among initial supervisors is high. After the 3-month intervention, a post survey will evaluate changes in meeting frequency and safety climate among supervisors and crews.
Cannabinoid signaling and astrocytes in synchrony and entrainment of the SCN
Authors: Ali Gunesch¹,², Lauren Hablitz Ph.D.¹, Charles Allen Ph.D.¹
¹Oregon Institute of Occupational Health Science, Oregon Health & Science University, Portland, OR; ²Brown University, Providence, RI

Introduction: Circadian rhythms are the 24-hour oscillations in physiological and behavioral processes controlled by the suprachiasmatic nucleus (SCN). The SCN responds to a variety of external cues including environmental light to entrain circadian rhythms. Endocannabinoids are known to mediate neuron-neuron and neuron-astrocyte communication and preliminary data from our lab indicates that astrocyte signaling is necessary for the endocannabinoids's actions in the SCN. Here, we test the hypothesis that disrupting cannabinoid or astrocyte signaling will lead to a disruption of neuronal synchrony and changes in circadian timing.

Methods: A Lumicycle was used to detect bioluminescence from C57/BL6-Per2::Luc slices, which were treated with the endocannabinoid agonist mAEA or vehicle (EtOH) at CT time 4-6. Single cell fluorescence from Per1-Venus slices was imaged every 20 minutes for 5 days and treated with AM251 or vehicle (DMSO).

Results: Per2::Luc slices displayed a phase shift of 0.55 hours after treatment with mAEA and -0.56 hours after vehicle. Per1-Venus slices had an average synchrony index of 0.621 pretreatment, 0.436 after vehicle treatment, and 0.428 after AM251 treatment.

Discussion: These results demonstrate that disruption of cannabinoid signaling can disrupt synchrony of molecular clock rhythms in the SCN, and normal signaling may therefore be necessary for maintaining normal behavioral rhythms. We also saw that cannabinoids can affect period and phase shifting in the molecular clock. These results are important first steps towards understanding neuronal-astrocyte communication and entrainment to environmental cues. Given the rise of recreational marijuana use, understanding how cannabinoid signaling can disrupt biological and behavioral rhythms also warrants continued research.

Gender and Reports of Injury Among Nurses
Alejandra Garfias¹,², David Hurtado¹, Anjali Rameshbabu¹, Rachel Matsumoto¹, Leslie B. Hammer¹,²
¹Oregon Health & Sciences University, Portland State University

Nursing is a high-risk profession for developing musculoskeletal disorders (MSD) as a result of lifting patients. Intervention studies have addressed safe patient handling (SPH) but have not fully examined the role gender may play. This study aims to describe differences in reports of MSD related injuries and SPH practices between men and women. It was expected that male nurses would report higher instances of injuries possibly due to gender differences in accessing SPH peer support (i.e., nominating peers as a source of SPH expertise).

Methods:
Participants (n=41) at Samaritan Lebanon Community Hospital completed surveys as part of a larger study. The study included items related SPH. Self-reported rates of injuries and peer nominations for consulting on SPH practices were gathered from nurses for the purposes of the current project.

Results:
Counter to hypotheses, there were no injuries among male nurses (N=5) but amongst female nurses (N=36) there were 8 reports of injury. Additionally, female nurses nominated in average 9 peers as sources of SPH help, whereas males in average nominated 22 peers. A logistical regression was used to examine the relationship between injury and the number of peer nominations nurses made. Results indicated that nurses who did not nominate a peer were 2.5 times more likely to be injured than nurses who nominated at least one peer. In fact, results indicated that nurses who nominate between 6 and 10 peers are 78% less likely to be injured.

Discussion:
There were gender differences in accessing SPH peer. Further examination of this phenomenon is crucial to improving the health and safety of the workforce. It would also be useful to explore associated factors such as tenure, age, and leadership.
Exploring Swiss Cheese function and its effect on Ca²⁺ homeostasis
Krahn, S.; Sunderhaus, E.; Kretzschmar, D.
1Oregon Institute of Occupational Health Sciences, Oregon Health & Science University, Portland, OR; 2George Fox University, Newberg, OR

**Introduction**
Mutations of Neuropathy Target Esterase (NTE), a phospholipase, are associated with several neurodegenerative diseases characterized by locomotor defects and progressive neurodegeneration. However, the molecular mechanism of neurodegeneration is unknown and being explored through the use of its ortholog, Swiss cheese (SWS), in the drosophila m. model. Sws¹, a null mutation, exhibits locomotor defects, age-dependent neurodegeneration, and increased levels of phosphatidylcholine (PC). It has been shown that high levels of PC inhibit the ER Ca²⁺ channeling protein, Sarco/Endoplasmic Reticulum Ca²⁺ ATPase (SERCA) thereby disrupting Ca²⁺ homeostasis. The objective of this study was to manipulate ER Ca²⁺ levels by changing the expression of ER Ca²⁺ releasing channel, Stim1 interaction molecule (STIM), to assess the hypothesis that loss of NTE/SWS impacts Ca²⁺ homeostasis and SERCA.

**Methods**
The pan-neuronal GAL4/UAS system was used to drive the overexpression (annotated as STIM) and knockdown (annotated as TRIP-STIM) of STIM. These were done with a ssw¹ background using the promoter, β amyloid precursor like (Appl). Locomotor defects were assessed using negative geotaxis, neurodegeneration was observed through fluorescent microscopy, and amounts of SERCA were observed using western blotting.

**Results and Discussion**
In comparison to ssw¹ flies, locomotor defects of STIM and TRIP-STIM flies were improved, but amounts of neurodegeneration in the central brain were not significantly different. There were also large amounts of SERCA in the brains. A possible explanation is that central brain neurons and motor neurons had different responses to the manipulation of STIM and SERCA amounts could be increased to compensate for Ca²⁺ imbalances. A future direction is to assess the role of SWS and STIM in motor neurons.

Validity of Accelerometer and Single-Channel EEG for Measuring Sleep in Team Truck Drivers
Khoury, Julia; Parker, Kelsey; Bettencourt, Katrina; Olson, Ryan
1Oregon Institute of Occupational Health Sciences, OHSU, Portland, OR; 2Oregon State University, Corvallis, OR

**Introduction**
Team truck drivers experience about twice as many awakenings as single drivers because they sleep in moving trucks. The purpose of this research was to assess two accelerometers and a portable EEG device for measuring total sleep time with team drivers.

**Methods**
Sleep time was measured with diaries, accelerometers (Actiwatch Spectrum; Actigraph wGT3X-BT), and a portable EEG device (Sleep Profiler). Experiment 1 evaluated accelerometer data from a medical manikin lying on mattresses in a moving RV. Experiment 2 compared accelerometer and sleep diary data from a team driver. Experiment 3 collected accelerometer and EEG data from the last author lying in a moving and stationary car. Experiment 4 collected all data forms with two team truck drivers.

**Results**
In Experiment 1 during 96 minutes of testing with the manikin, Actiwatch scored 11 sleep minutes and Actigraph scored 92 sleep minutes. For Experiment 2, in a moving truck Actiwatch scored substantially less sleep time (4.63 hrs) than self-report (9 hrs), while Actigraph recorded 8 hrs of sleep. Both devices performed similarly in a stationary truck. In Experiment 3, the moving vehicle significantly affected EEG data (p<0.05). In Experiment 4, Actigraph was closer to self-report than any other device.

**Discussion**
Actigraph’s sleep algorithm and filter for vibrations outside typical human movements (0.25 to 2.5 Hz) may be the most robust to truck vibrations. Although the Sleep Profiler algorithm underestimated sleep in a moving truck, manual scoring could provide useful objective sleep data for further Actigraph validation research with teams.

**Support**
Washington Department of Labor and Industries and National Institute of Occupational Safety and Health (U19OH010154).
Experience or beliefs? Correlates of Self-reported Veteran Supportive Supervisor Behaviors in the Civilian Workplace

Luke Mahoney1,2, Wylie Wan Ph.D.1, Leslie Hammer Ph.D.1,2, Krista Brockwood Ph.D.1

1Oregon Institute of Occupational Health Science, Oregon Health and Science University, Portland OR
2Portland State University, Portland OR

Introduction
Supervisors play a vital role in fostering a healthy work-life balance, which is important for employee physical and psychological health, engagement and productivity. This study aimed to improve the health, well-being, work-life balance, and retention of veterans in the workforce by training supervisors to better support their returning service members for whom they were responsible at work. This poster highlights some of the findings from the supervisor baseline survey data to better understand the characteristics of a supervisor that are related to Veteran Supportive Supervisor Behaviors, or VSSBs.

Method
Supervisors were asked to complete a survey which included items that pertained to their military experience, their views on veterans in the workforce, the type of organization that they worked for (public vs private), their Veteran Supportive Supervisor Behaviors (VSSB; adapted from the Family-Supportive Supervisor Behavior scale, Hammer et al., 2013), as well as demographics such as age and gender, marital status and education.

Results/Discussion
Linear regression demonstrated a significant positive relationship between views of military members in the workplace VSSB, and that working for a private organization was associated with higher VSSB. However, military experience was not significantly related to VSSB. It may be that military experience did not translate into supportive supervisor behaviors. Future analysis of the data collected from the SERVe study should link these relationships to veteran reports of VSSB. Research will also examine the relationship between these veteran reports of VSSB and the effectiveness of the training and related outcomes.

Pedal Stands in Sedentary Occupations: Feasibility and Measurement Validation

Eleanor Lagnion1,2, Brad Wipfli1, Kelsey Parker1

1Oregon Institute of Occupational Health Sciences at Oregon Health & Science University, Portland, OR; 2Washington State University, Pullman, WA

Introduction
Sedentary work is associated with an increased risk of obesity and other detrimental outcomes. Stationary pedal stands have the potential to reduce sedentary behavior but have not been widely studied. The objectives of this study are to validate the ability of a thigh worn ActiGraph GT3X+ at distinguishing between sitting, seated pedaling, and stepping, and to examine the feasibility of adding pedal stands and a team pedaling competition to a sedentary work environment.

Methods
Study 1: Participants (n=19) wore ActiGraphs on their thighs and either completed 90 minutes of observed, structured activity, or used pedal stands freely for two workdays while self recording activity. Study 2: Sedentary workers (n=9) at a local business participated in a two-week pedaling competition with regular feedback reports. Some participants were given a personal pedal stand, while others shared.

Results
Study 1: In the structured group, 100% of pedaling time was classified as sitting, and an algorithm achieved 100% sensitivity and 88.1% specificity for identifying pedaling time. In the unstructured group 92.6% of pedaling was classified as sitting, and the algorithm achieved 71.2% sensitivity and 94.6% specificity. Study 2: After one week, teams averaged 84.61 miles and 80.73 miles of pedaling (adjusted for team size). Participants with shared pedal stands averaged 579.83 minutes of light/moderate activity at work, compared to 566 minutes for those with their own pedal stand (p=.953).

Discussion
The thigh worn ActiGraph GT3X+ accurately distinguishes pedaling from stepping and standing. In a controlled setting, the device can also accurately assess pedaling time, but in an uncontrolled setting slow, inconsistent pedaling and participant error in self-recording limited the sensitivity for identifying pedaling time. Sharing a pedal stand, in comparison to having a personal pedal stand, does not appear to influence the amount of pedaling individuals complete.
Maximizing the Effectiveness of Computer-Based Training in Commercial Drivers

Natalie Ploof
Santa Clara University
Brad Wipfli Lab

Introduction: Commercial drivers experience long periods of sedentary behavior which are associated with increased risk of obesity and related health complications, including heart disease and sleep apnea. Following success with truck drivers, we are adapting the SHIFT intervention for weight gain prevention among mass transit bus operators. The purpose of this phase is to improve computer-based training materials by: 1) analyzing training and weight loss data from the previous SHIFT study, and 2) testing the effectiveness of a variety of training delivery schedules.

Methods: Between-group comparisons determined the results of engagement patterns on weight loss and the effects of incentives on training completion. Correlational analyses measured the relationships between early completion, knowledge gains, and weight loss. To evaluate the effectiveness of training delivery schedules, we designed a pilot test that includes three conditions (1) single session; (2) shorter sessions spaced over multiple weeks; and (3) single session with repetition over multiple weeks. Knowledge retention will be measured through two follow-up tests spaced one month apart.

Results: Between-group comparisons showed that training completion resulted in significantly greater weight loss (p < 0.01). In addition, the number of units completed in the first 6 weeks was positively correlated with weight loss results (r = 0.19, p < 0.05). Incentives and knowledge gains had no significant relationship to training completion or weight loss. Data for the pilot study are forthcoming, but we expect that spaced training and repetition will result in greater long-term knowledge retention.

Discussion: Results provide significant insight into participant interactions with training material. These results, combined with data from the spaced versus massed pilot study, will inform future delivery methods for SHIFT computer-based training.

Support: This study was partially funded by the Oregon Institute of Occupational Health Sciences and National Heart, Lung, and Blood Institute (R01HL105495).
Reproductive Consequences of Nonsynchronous Circadian Clocks
Shivam Swamy1,2, Ayaka Kukino2; Matthew P. Butler2,3; 1College of Arts and Sciences, University of Portland, Portland, OR; 2Oregon Institute of Occupational Health Sciences and 3Department of Behavioral Neuroscience, Oregon Health and Science University, Portland, OR.

Introduction:
Shift work is associated with impaired reproductive health, including irregular menstrual cycles, endometriosis, reduced fertility, increased miscarriage, and low birth weight. A potential mechanism is the disruption of the endogenous circadian clock. We recently found that eating at the wrong time compromises reproductive success in mice. The goal of the current study was to determine when and where circadian disruption may adversely impact the reproductive system.

Methods:
Circadian disruption was induced by feeding male and female Per2::Luc mice only during their rest phase, similar to night-eating that is common among shift workers. Control mice were fed in the active phase. After acclimation to this schedule, estrus cycle stability was measured in females by daily vaginal cytology. They were then paired with males, and successful mating behavior was inferred from the presence of copulatory plugs. Circadian clock disruption was assessed by measuring clock phase in the submandibular gland, liver, ovary, and uterus, either by in vivo imaging of the Per2::Luc bioluminescence or by qPCR.

Results:
Circadian disruption reduced copulatory success compared to control pairs. Mis-timed feeding also had dramatic effects on circadian clock phase. Food timing synchronizes clocks in the uterus and ovary and uncouples these clocks from the central clock in the brain. In ongoing work, we are assessing the estrus stability, pregnancy maintenance, and potential clock disruption in the brain circuits that mediate ovulation.

Magpi® Software for Data Collection on Sleep Deprivation from Multiple Populations Simultaneously
Austen Suits1,3; Valerie Palmer2; Peter Spencer1,2; Oregon Institute of Occupational Health Sciences and 2Department of Neurology, School of Medicine, Oregon Health & Science University, Portland, OR; 3University of Washington, Seattle, WA

Introduction
Cellular technology is a rapidly expanding phenomenon that provides the ability to connect across the world with the click of a button. What if we could use this technology to collect health-related data simultaneously from multiple geolocated locations? Such information would have immense value for the early detection and spatial-temporal tracking of illness or injury. Magpi® is a data collection software program designed to integrate electronic information received from hundreds of reporters. This software generates a customized survey that can be sent to any mobile device in >170 different countries. Magpi® Interactive SMS feature initiates a conversation with the participant, guiding them through the sequence of survey questions. This study tests Magpi® software as a means of integrating data on sleep behavior received from multiple students and locations.

Methods
Pacific Northwest students in Portland, OR and Seattle, WA provided informed consent and were enrolled for each of 2 trials (n=6 students/population/trial). Each participant used a dedicated inexpensive cell phone to answer a survey on sleep-related behaviors deployed daily through Magpi® over a consecutive 14-day span. Data were analyzed using Magpi® and Microsoft Excel to assess sleeping patterns across the 14-day period and the ability of individuals to electronically report their own health-related data in a usable form.

Results
Respondents completed a mean of 10.7 of the 14 daily surveys administered in the completed trial (1), for a 77% completion rate. The Portland population responded to 8% more surveys than the Seattle population. The sleep time of respondents averaged 7.5 hr/nignt, but they felt well rested for only 53% of days. One fifth used melatonin and/or other sleep aids.

Discussion
Participants felt well rested for only half the study period despite an average sleep period approaching the commonly recommended time of 8 hours. A surprisingly large percentage employed sleep aids, the long-term effects of which merit exploration. Magpi® proved to be an effective instrument for real-time remote data collection and analysis. Magpi® can be used to build a real-time topography of health data that could be used to detect and track health trends at home and abroad.

Funded by the Oregon Institute for Occupational Health Sciences (AS)
Features for Peer-based Programs to promote Workplace Health and Safety
Vivienne Voisin¹, Sam Greenspan¹, Cynthia Rodriguez¹, David Hurtado¹
¹Oregon Institute of Occupational Health Sciences, Oregon Health and Sciences University, ²College of Liberal Arts and Sciences, Portland State University

Background:
Social support among workplace peers has been linked with well-being, however, less is known about strategies to cultivate social support among coworkers as a basis for programs that improve occupational health and safety. Peer-based programs (PBP) are designed so that peers assist each other in providing emotional, informational and instrumental social support in the workplace. PBP can be either directive (e.g. technical training) or non-directive (e.g. emotional support). The aims of the poster presentation are to 1) provide an overview of the theories and evidence related to PBP, 2) to extract and compile principles to design PBP, 3) provide relevant examples of on-going PBP, and 4) to discuss possible applications and limitations.

Methods:
We reviewed a total of 67 articles using keywords related to PBP (e.g. “peer-based training”), classified as directive or non-directive.

Results:
Evidence highlights five key principles: 1) setting specific goals and roles, 2) applicable and participatory, 3) providing modeling and instant feedback, 4) providing informal and formal rewards, and 5) securing privacy and confidentiality. This poster presents the fundamental elements of two PBP projects; a non-directive peer-mentoring mental health program among probation parole officers, and a directive, safe patient handling program at a community hospital instituting champions.

Discussion:
These principles hope to inform occupation health and wellbeing programs and initiatives in multiple settings. Even though evidence supports that PBP can be useful in the workplace, some risks involve omitting professional, expert training when needed, scapegoating, social loafing, and diffusion of responsibility. Despite these limitations, PBP can serve as useful strategies to promote occupational health and safety.