Background

- Heat-related illness (HRI) is an acknowledged occupational risk factor and one that is entirely preventable
- Currently, no federal regulations exist for the prevention of heat-related illness in the workplace, and research has remained fairly
- For outdoor workers, sustained exposure to extreme heat results in decreased productivity and increased fatigue, impairment of mental capacity, and diminished willingness to use personal protective equipment, all of which can increase vulnerability to accidents and injuries
- For employers, a single workplace heat-exhaustion event (from which an employee recovers) can cost a company upwards of $50k in direct and indirect costs, not accounting for lost work days that may delay a project
- Current heat indices used for recommending controls in workplace settings assume that most workers are well-hydrated, physically fit, inherently healthy, and heat acclimatized to their environment, but these assumptions do not adequately characterize the current physiological make-up of the population working in construction
- Most recent Centers for Disease Control and Prevention review of heat-related enforcement cases investigated by OSHA found that in all cases, heat illness prevention programs were incomplete or entirely absent
- For this research-to-practice project, evaluating construction employee hydration in relationship to environmental factors, task effort, hydration technology interventions, training programs, and personal characteristics will be a novel approach to assessing intervention effectiveness

Aims

1) Measure current hydration levels and drinking behaviors of outdoor construction workers in Atlanta
2) Explore differences in status and perceptions between ages, gender, trades, and work activity level
3) Assess the feasibility of an on-site hydration intervention for relative accuracy, cost, comfort, and ease of use

Methods

Study methods will include a comparative intervention study to measure effectiveness of each technique as a component of robust and localized management tool. Study participants will be monitored for baseline hydration status — using biological data parameters and qualitative surveys — and then subjected to an intervention that measures actual work-time hydration patterns. Collected data will be analyzed to provide a hydration profile for each participant with recommendations on improving or maintaining hydration status.

Hydration Data (daily; over course of 3 weeks):
- Hydrology vessel type
- Current study used by GTRI in study of hydration of older adults in the home environment
- Increased risk for development of exertional heat illness with an increased body mass index
- Increase in body weight ≥ 2.0% as indices of dehydration
- Measurement of participant upper-body activity using “Shimmer” sensors during work shift to be used as a measurement of overall performance (pictured left)
- Currently used by Georgia Tech Research Institute in study of worker performance in poultry plants

Biological Data (daily; over course of 3 weeks):
- Urine specific gravity (pre-shift, post-shift)
- Body mass-weight (pre-shift, post-shift)
- Increased risk for development of exertional heat illness with an increased body mass index
- Decrease in body weight ≥ 2.0% as indices of dehydration
- Measurement of participant upper-body activity using “Shimmer” sensors during work shift to be used as a measurement of overall performance (pictured left)
- Currently used by Georgia Tech Research Institute in study of worker performance in poultry plants

Environmental Data (daily, over course of 3 weeks):
- Wet-Bulb Globe Thermometer Readings (WBGT)
- Calculation of Heat Index (HI)
- Currently used by Georgia Tech Research Institute in study of hydration of workers

Qualitative Data (Questionnaires):
1) Pre-Intervention Survey
- Personal Health History
- Fluid Consumption
2) Daily Food and Beverage Log
- Rating of thirst level prior to shift/end of shift
- Consumption Patterns
- Urine Monitoring
3) Knowledge, Attitudes, and Behaviors Survey
- Hazard Identification
- Heat Illness Awareness
- Hydration Management
4) Post-Intervention Survey
- Ease of Use
- Hydration Perceptions
- Influence of Reporting

Implications and Discussion

The outcome will provide hydration management guidance for industry on how to most effectively pre-plan for HRI prevention on the construction site. Good hydration is essential for temperature regulation, and regular monitoring could prevent heat stroke, dehydration, or less severe symptoms such as dizziness or headache, which can result in loss of productivity in the workplace. With a hydration profile for outdoor construction workers—broken out by age, gender, work activity, and work activity level—future training interventions for personnel can be better tailored to convey risk levels and result in decreased risk exposure. A summary report with aggregated data will be provided to all contractors enrolled in the study with recommendations, if any.

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