

***Understaffing: An Under-researched Phenomenon***

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**Keywords:** understaffing, staffing, occupational constraint, occupational stressor

**Objective:** Our current economic crisis and subsequent workforce downsizing has led to “lack of qualified staff” being a primary concern for today’s workers (e.g., Edwards & Burnard, 2003). This qualitative review of previous understaffing literature outlines our current understanding of the construct, its links with workplace outcomes (including worker well-being), and proposes directions for future research.

**Methods:** Potential articles were identified using PsycInfo and GoogleScholar. Reference lists from relevant articles were also examined for related studies. The initial pool of 92 articles resulted in only a dozen that directly measured or focused primarily on understaffing.

**Results:** Our review identified six understaffing forms—three exposures (acute, fluctuating, chronic) by two types (manpower, expertise). Most research examines only manpower and fails to include the exposure dimension. This lack of scrutiny may have contributed to existing contradictory evidence regarding understaffing—outcome relationships. Furthermore, recent research tends to study understaffing as only one of many organizational constraints or stressors, confuse it with similar constructs (e.g., workload), or simply seek staffing-related solutions regardless of the lack of conceptual clarity.

**Conclusion:** Systematic research on the conceptual underpinnings of understaffing is lacking. Future studies must begin with the basics, first outlining the concept, then determining the appropriate measurement strategies of all forms of understaffing. These studies should examine relationships with outcomes (e.g., employee well-being and performance), uncover moderators and mediators of the understaffing-outcomes relationship, and determine means for primary and secondary interventions.

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***Evaluation of Four Portable Cooling Vests for Workers Wearing Gas Extraction Coveralls in Hot Environments***

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**Keywords:** heat stress, microclimate, cooling device

**Objective:** This study evaluated the performance of four personal cooling systems for use with insulated protective clothing in warm-humid (35°C, 50% relative humidity) and hot-dry (40°C, 30% relative humidity) conditions.

**Methods:** On 10 separate occasions, 5 male volunteers walked on a treadmill to elicit a target metabolic rate of 300 watts, for 120 minutes, while wearing either a (a) liquid-cooled vest, (b) air-cooled vest, (c) frozen polymer vest (d) novel liquid CO<sub>2</sub> cooling vest, or (e) no cooling (control). A three-way mixed effects ANOVA was used to assess the results. Multiple t-tests were used to determine where the main differences occur. The level of significance was  $p < 0.05$ .

**Results:** There was no difference between no-cooling and liquid CO<sub>2</sub> for storage rate ( $28.24 \pm 3.8$  W;  $24.64 \pm 4.29$  W) as well as the other physiological metrics. The same was true for the frozen polymer, air, and liquid systems, which were not statistically different for heat storage rate ( $14.76 \pm 3.90$  W;  $12.58 \pm 3.98$  W;  $9.89 \pm 3.90$  W) or the physiological metrics. The frozen polymer system was not clearly differentiated from the liquid CO<sub>2</sub> system for storage rate or rate of rise of skin temperature.

**Conclusion:** To the extent that the gas extraction coverall is worn in environment between 30 and 45 °C and the rate of work is moderate, the air vest and water vest were shown to manage heat storage well, reducing storage rate by 55% in comparison to no-cooling. Although if being free of a tether is important, the frozen polymer is acceptable as it reduced heat storage rate to about 50% compared to no-cooling.

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