



# Working smart: An exploration of council workers' experiences and perceptions of heat in Adelaide, South Australia



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## ABSTRACT

Excessive workplace heat exposures are presenting an increasing challenge in terms of occupational injuries and heat-related illnesses. Although heat safety guidelines exist in many industries, the extent to which heat exposure is perceived to impact on workers is yet to be fully explored. In this case study, a qualitative approach was used to investigate outdoor council workers' experiences and perceptions of heat impacts in the workplace. Thirty-two male workers participated in 5 focus groups. Proceedings were audio-recorded, transcribed and data coded using thematic analysis. Findings indicated that although existing heat policies are in place, hot weather continues to impact workers' health and well-being, work practices and productivity. The results showed the importance of workplace management and training, and an understanding of the need for workers to be able to self-pace during hot weather. The impacts of these factors on the behavioral adaptation of workers are discussed along with implications of the research for the management of heat-related risks in workplaces.

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## 1. Introduction

It is well known that extremely hot weather contributes to an increase in morbidity and mortality (Bi et al., 2011). In Australia, heatwaves (often defined as temperature  $\geq 35$  °C on 3 or more consecutive days) (Nitschke et al., 2011) are common in the summer months. During such a heat event in 2009, Adelaide, South Australia, experienced a 13-day heatwave with maximum temperatures reaching 45.7 °C, with the intensity and length of the heat event contributing to an increase in mortality, particularly in those of working age (15–64 years) (Nitschke et al., 2011). Similarly, in the Australian state of New South Wales in 2011, there was an increase in all-cause mortality and ambulance call outs of 13% and 14% respectively during an exceptional heatwave (Schaffer et al., 2012). Other studies in South Australia (SA) have shown an increased burden on hospital and ambulance services during heatwaves (Hansen et al., 2008; Nitschke et al., 2007; Williams et al., 2012) and in some of Adelaide's industrial suburbs work-related ambulance callouts during heatwaves have reportedly increased more than threefold during heatwaves (Hansen et al., 2011). This is likely to be due to the fact that people working in physically demanding jobs in high temperatures are at increased risk of heat-related illnesses and injuries (Kjellstrom et al., 2009a; Sahu

et al., 2013; Singh et al., 2015) when preventive measures are not adequately adopted (Crowe et al., 2009, 2013; Hanna et al., 2011; Kjellstrom et al., 2009b; Maeda et al., 2006; Mirabelli et al., 2010). Recent studies have found that manual workers at risk include farmers, construction workers, fire-fighters, miners, soldiers, and manufacturing workers whose work involves working near process-generated heat (Xiang et al., 2014a). Serious health impacts including heat stroke and deaths can also occur (Kjellstrom et al., 2009a) and studies have shown that outdoor workers can have a 20-fold increased rate of heat-related death compared with people in other forms of employment (Centers for Disease Control and Prevention (CDC), 2008).

Australia's mean surface air temperature has increased by 0.9 °C since 1910 and projections suggest global temperatures will continue to rise (CSIRO and Bureau of Meteorology, 2014). Australians are likely to be faced with more extremely hot days, and for SA in particular, climate change poses a major problem in terms of rising temperatures (Government of South Australia, 2014) and the impacts on population health. Risks to workers may increase as shown by a Western Australia study which showed that with higher predicted temperatures outdoor workers could be at risk from occupational heat exposure on 15–26 days per year by 2070 compared to 1 day per year at present (Maloney and Forbes, 2011). Thus, relevant adaptation and preventive measures are required to address occupational exposure to high ambient temperatures.

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There are no specific legal requirements for heat stress prevention in Australia (Xiang, 2014) although Safe Work Australia's national 'Model Work Health and Safety Regulations' (Part 3.2) states that "A person conducting a business or undertaking at a workplace must ensure, so far as is reasonable practicable, the following:" ... "workers carrying out work in extremes of heat or cold are able to carry out work without risk to health and safety" (Safe Work Australia, 2014, p. 72). In the absence of formal standards for the management of heat stress, documentation has been produced as a guide for industries and occupational health practitioners (Di Corleto et al., 2013) and some workplaces have effective measures such as hot weather policies which allow the cessation of work when the ambient temperature becomes extreme (Xiang et al., 2014c). Nevertheless, heat can pose a health and safety risk for those doing physical work outdoors well before temperatures become extreme. An Adelaide study which analysed occupational surveillance data of workers compensation claims found that the overall risk of work-related injuries was positively associated with daily maximum temperature up to 37.7 °C. Above this threshold temperature claim numbers declined, likely due to health protection policies in place allowing the cessation of work (Xiang et al., 2014c).

Within this broader safety culture framework, there is limited research about the experiences and perceptions of workers faced with excessive heat exposure (Jay and Kenny, 2010; Singh et al., 2015) even though heat policies may apply in workplaces. Although qualitative studies on this topic have been conducted in India (Balakrishnan et al., 2010) and China (Zhou et al., 2014), there have been limited studies describing people's experiences of working during the extreme heat of Australian summers (Singh et al., 2015). To support any required changes to current practices, qualitative and quantitative epidemiological evidence from industry and at-risk worksites is needed.

The aim of this study is to investigate outdoor workers' perceptions of risks associated with working in hot weather and the practices in use to manage work and health during extreme heat. The findings add to the current body of knowledge on climate change adaptation and may inform future modifications to guidelines and health protection policies to manage occupational heat stress.

## 2. Methods

Local government areas in Adelaide, SA can serve populations of over 100,000 people and have a range of employees in positions involving outdoor work (e.g. road work, engineering, maintenance, construction, horticulture, etc.). A council in the suburbs of Adelaide was approached and agreed to participate in the study, allowing access to their employees. A qualitative study design was chosen to incorporate open-ended discussions with key informants. The topic guide was formulated based on a review of the literature and background information from the Council. Questions focused on experiences of work on hot days; risk perception of occupational heat exposure; experiences of heat-related illnesses and injuries; the sense-making practices that individuals adopt to manage extreme heat; facilitators and barriers to protective behaviour; and recommendations for interventions.

### 2.1. Sampling and recruitment

Purposive sampling of key informants was undertaken, enabling recruitment of participants who would potentially provide information-rich perspectives related to the research question (Patton, 2002). In order to gather different perceptions and experiences, a diversity of outdoor workers from five different work loca-

tions within the Council area were voluntarily recruited for the focus groups with the help of supervisory staff at the council.

### 2.2. Data collection

During July 2014, five semi-structured focus groups were conducted on-site, enabling the participants to feel comfortable in their work environment (Liamputtong, 2013). Focus groups with 5–10 participants per group were facilitated by the first author who was accompanied by another member of the research team and/or a Council representative. Information sheets were distributed and the interviewer ensured the participants understood the study, its aim and the role of the researchers. Informed consent was provided before sessions began. Participants were encouraged to freely explore their own ideas or expand on the topic areas using the interview questions as a guide. Sessions lasted up to 25 min and were audio-recorded. Later, careful field notes were taken (Mulhall, 2003) which were useful in reducing the influence of researchers' presuppositions and preconceptions on the results (Liamputtong, 2013).

### 2.3. Data analysis

The data collected were transcribed by the first author incorporating Vienna-Oxford International Corpus of English (VOICE) conventions (Vienna Oxford International Corpus of English, 2007) to capture emphasis and tone. The transcribed data and recordings were checked several times to ensure transcription accuracy.

Data analysis was undertaken using thematic analysis and Interpretative Phenomenological Analysis (IPA) (Lester, 1999), an in-depth qualitative approach that is chiefly concerned with how people make sense of their world and the kinds of practices they consequently employ (Smith, 2004). Codes that were pertinent to the research question were identified following the phases of thematic analysis (Braun and Clarke, 2006) with initial coding and theme generation performed manually by highlighting texts and making notes. A constant comparative analysis (Boeije, 2002) helped to maximise data familiarisation. The NVivo 10 software program (QSR International) was then used to revise the coding framework where additional themes emerged from the data. To increase rigour, another member of the research team also generated a separate set of codes and both researchers compared their results for cohesion and uniformity. Most of the themes and codes generated were similar and researchers further discussed the results until agreement was reached. The codes, themes and sub-themes were constantly referred back to the data, the topic guide, field notes and transcripts to ensure that they accurately reflected the data as a whole.

### 2.4. Ethics

Ethics approval for this study was sought and granted by the University of Adelaide Human Research Ethics Committee (H-2014-063).

## 3. Results

Five focus groups were conducted with a total of 32 male workers (28 outdoor and 4 indoor workers) with 5–10 participants per group. There was a spread of ages within the focus groups with ages being approximately mid-20s to mid-60s. The diverse work activities of the participants included: construction, roadwork, parks and gardens maintenance, load driving, labouring, concreting, excavating, horticulture, drainage work and irrigation. The four indoor workers were employed as welders and mechanics.

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