

# Occupational fatigue and other health and safety issues for young Australian workers: an exploratory mixed methods study

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**Abstract:** Youth are vulnerable to sleep loss and fatigue due to biological, social and psychological factors. However, there are few studies addressing the risk that sleep loss and fatigue pose for youth in the workplace. The aim of this study was to explore work health and safety (WHS) issues for young workers and develop strategies and solutions for improved WHS outcomes, with a focus on issues related to fatigue, using a mixed-method, multi-stage approach. Participants either completed a survey (n=212) or took part in focus groups (n=115) addressing WHS for young workers, or attended a Future Inquiry Workshop (n=29) where strategies for improving youth WHS were developed. Fatigue was identified as a significant problem by the majority of young workers and was associated with unpredictable working time arrangements, precarious employment, high workload, working overtime and limited ability to self-advocate. Participants identified six key areas for action to improve WHS outcomes for young workers; 1) develop expertise, 2) give young workers a voice, 3) improve education and training, 4) build stakeholder engagement, 5) increase employer awareness of WHS responsibilities and, 6) improve processes for employers to manage and monitor WHS outcomes. The application of these directives to fatigue is discussed.

**Key words:** Fatigue, Health, Safety, Adolescents, Young workers, Work

## Introduction

Fatigue may be defined as a ‘multidimensional state that entails a reduction in functional capacities due to the cumulative effects of physical and/or psychological effort expenditure in the absence of sufficient recovery time or rest’<sup>1</sup>. Fatigue has significant negative social and safety consequences, with fatigue-related accidents estimated to cost approximately USD\$50 billion per year<sup>2</sup>. Youth have

an increased likelihood of experiencing fatigue due to developmental and social factors<sup>3</sup>. Elevated likelihood of fatigue for youth is of concern given the known negative consequences of fatigue for performance in safety-critical situations. One safety-critical situation for which fatigue risk for youth is relatively well understood is driving<sup>4</sup>. Indeed, in an analysis of motor vehicle accidents in South Australia occurring in the period from 1998 to 2009, fatigue was the “most commonly identified physiological state found to impair drivers aged 16–24”<sup>5</sup>.

Youth are vulnerable to sleep loss and fatigue for a number of developmental reasons. As a result of ongoing cognitive and physical development, youth have an elevated sleep need<sup>6</sup> and thus need more time to achieve

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**Table 1.** Age and gender distribution of participants in the quantitative survey (n=212)

Age	Male	Female	Total
12–14 yr	2%	1%	3%
15–17 yr	13%	21%	34%
18–25 yr	26%	37%	63%
Total	41%	59%	100%

adequate sleep. However, youth often balance multiple commitments and are more likely to work long days, irregular hours and at night, both resulting in sleep curtailment<sup>3)</sup> and reducing time available for sleep. Youth also tend toward biologically delayed sleep schedules, which result in shorter sleep on weeknights and sleeping late on weekends to recover lost sleep<sup>7)</sup>. This pattern exacerbates delayed sleep schedules and results in cumulative increases in sleepiness<sup>7)</sup>. There is also evidence that youth are more vulnerable to daytime sleepiness<sup>8, 9)</sup> and have fewer mechanisms for coping with sleepiness and fatigue as a result of inexperience<sup>10)</sup>. Taken together, these factors all indicate increased fatigue risk for young workers. However, the extent to which fatigue impacts upon young workers is currently not well understood.

Young workers are more likely to be engaged in precarious employment. Indeed, young workers are overrepresented in the casual workforce<sup>11)</sup> and a majority (92%) of young workers in Australia are also students<sup>11)</sup>. Evidence from other youth populations indicates that work and study, combined with multiple other time pressures, results in sleep loss and negative health and safety outcomes for young workers<sup>3, 12)</sup>. Reporting fatigue in the workplace is often the only form of risk management for this work health and safety (WHS) hazard. However, evidence shows that workers in precarious employment are less likely to report accidents or injuries<sup>13)</sup> which suggests that the likelihood of reporting fatigue in these situations is slim. This may be further exacerbated in the case of young workers who often do not have well-developed self-advocacy skills. Risks associated with precarious employment are likely to interact with fatigue-related risk in a way that results in significantly increased likelihood of accident or injury for young workers.

Based on existing research it is evident that fatigue is a significant WHS risk and that young workers are at increased risk for fatigue. It may also be the case that young workers are less able to manage and report fatigue. However, fatigue risk for young workers is currently not well understood. The aim of this study was to explore WHS

issues for young workers and to develop strategies and solutions for improved WHS outcomes, with a particular focus on issues related to fatigue.

## Subjects and Methods

Ethics approval for this research was granted by the Central Queensland University's Human Research Ethics Committee. All participants gave informed consent prior to participation. The data presented in this paper were from a larger study of WHS issues for young workers, other key findings from the study are reported elsewhere.

### Participants

There were three stages of data collection included in this mixed-methods study; a quantitative survey, semi-structured group interviews and a Future Inquiry Workshop (FIW)<sup>14)</sup>. The quantitative survey was included in order to obtain data from a large, nation-wide sample of young workers. The survey instrument also allowed us to identify issues for further investigation in the semi-structured group interviews and the FIW. The semi-structured group interviews allowed us to gain an in-depth understanding of WHS issues for young workers and to explore these issues in detail. This stage of the research also allowed us to explore WHS issues for young workers with other stakeholders, for example teachers and WHS professionals. Finally, the FIW was used to design strategies to address the WHS issues identified in the survey and interview stages. All stakeholder groups were represented in this stage of the research. More detail on each stage can be found below. Each of the three study stages used an independent sample of participants. Overall, a sample of 356 participants took part in this study:

- 212 young people in the quantitative survey (demographics shown in Table 1).
- 115 participants in the semi-structured group interviews (nine interviews with young workers and students, n=92 [57M, 35F]; four interviews with stakeholders including teachers, WHS professionals and trade instructors, n=23 [11M, 12F]).
- 29 participants in one FIW, divided into six stakeholder groups described in detail below (youth=4, supporters =5, employers n=5, educators n=4, representatives n=4 and advocates n=7).

### Procedure

#### Quantitative survey

A quantitative survey of young people's knowledge and

experience of WHS was hosted online. A link to the online survey was advertised to participants via the project Facebook page. Upon clicking this link, participants were redirected to the survey. Participants were asked to indicate their age but were not asked for their name or any other identifying information, in order to ensure anonymity. In line with ethical requirements, participants under the age of 18 were required to gain permission from their parent or guardian and to indicate that permission had been given in order to continue with the survey. Participants were asked to indicate if they were working, studying or both and the nature of their work/study. Along with questions regarding perceptions of WHS, gaining information about WHS and reporting WHS issues, participants were asked to indicate what they perceived to be the most important WHS issues. Survey items were developed by the researchers in consultation with the project steering committee, SafeWork South Australia (SWSA) and user-tested with a young workers reference group.

#### Group interviews

Semi-structured group interviews with young people and key stakeholders including business representatives, teachers and WHS inspectors were conducted. A total of 13 interviews took place. Questions focussed on the key perceived features of WHS for young workers, the quality and availability of WHS information and education, barriers and enablers to reporting WHS issues and necessary improvements to WHS for young workers. Each interview lasted approximately 45–90 min.

#### Future Inquiry Workshop (FIW)

The FIW was conducted as stage three of the research. The FIW is a large, group participative design process that aims to have all stakeholders in a particular issue work towards a desired future. The FIW is used to develop action plans for interventions in organisations and the community. During the workshop participants discussed what has and has not worked in youth WHS in the past, the current nature of youth WHS, the ideal future for youth WHS and how that future could be achieved. Twenty-nine participants representing six stakeholder groups attended one workshop:

- Youth aged 12 yr to 25 yr, n=4
- Supporters such as parents, guardians, family and friends, n=5
- Employers of young people from small and large businesses, n=5
- Educators from secondary and tertiary training includ-

ing technical and further education institutions and universities, n=4

- Representatives from government departments of education, social welfare, safety and training, n=4
- Advocates such as service to youth organisations and unions, n=7

#### Statistical analyses

Data from the quantitative survey were analysed descriptively and using Repeated Measures Analysis of Variance (RM ANOVA). Data from focus groups and the FIW were analysed using a manual process of reviewing and tabulating notes and recordings to identify key themes and conceptual groupings<sup>15, 16</sup>. Themes and conceptual groupings were drawn from phrases, comments and features of the transcripts<sup>15</sup>. The initial findings of this inductive coding technique were then refined into overarching groupings and discussed and defined by the authors. Themes were clustered and contrasts and comparisons made between the groups<sup>15</sup>. The analysis of the focus groups and FIW were then examined, compared and integrated with survey data through the process of data triangulation, or a 'cross-data validity check', to determine consistency<sup>17</sup>.

The aim of this research was to investigate WHS issues for young workers. Given that fatigue emerged consistently across all stages of data collection, these findings were extracted and are presented as the foci of the present paper. In the FIW all WHS issues raised by participants were addressed and general strategies and areas for improvement were identified. In this manuscript, we discuss how these strategies and areas for improvement could be applied to the issue of fatigue. Findings related to other issues emerging in the data will be discussed in subsequent publications.

## Results

#### Quantitative survey

Participants were asked about their most important WHS issues, where and from whom they received WHS information and their reporting behaviour. Fatigue emerged as the fourth most selected WHS issue by young workers (behind not being adequately trained, stress at work and heavy lifting). Indeed, 75% of participants endorsed fatigue as a significant WHS issue, with 28% listing this within their top three WHS concerns and 11% of the sample saying that fatigue was their primary concern.

The majority (60%) of young people said they found out about WHS from training given at work, while 58%

and 49% said they found out from their employer or supervisor respectively. RM ANOVA revealed a significant main effect of reporting ( $F(2, 448) = 25.00, p < 0.001, \eta^2_L = 0.05$ ). Planned contrasts showed that participants were significantly more likely to report an injury at work ( $M = 8.34, SD = 2.50$ ) than they were to report something unsafe ( $M = 7.75, SD = 2.52$ ). Further, they were less likely to report something that might make them sick ( $M = 7.32, SD = 2.69$ ), than they were to report an injury or a hazard. This was independent of age and gender. Participants reported that they were 'likely' to report an injury compared to 'somewhat likely' to report a hazard. Participants were also slightly more likely to report a physical hazard than they were something that could make them sick. Data revealed that young workers may not report because they do not want to cause a problem (64%) and because they don't feel confident (61%). There was also an influence of age on the reasons participants gave for not reporting. In particular, participants 17 yr and under were likely to not report because they felt too scared, while this was not an issue for those aged 18–25 yr. In cases of reporting, participants were most likely to report to workmates and supervisors and least likely to report to a business association.

#### *Semi-structured group interviews*

Fatigue emerged as one of eight key themes for young workers in the focus group stage of the research (other themes included the psychosocial working environment; the physical work environment; precarious work and work/study/life balance; training and education of young workers; training and education of employers; the voice of young workers; and obstacles for employers, these themes will be discussed in subsequent publications). Young workers discussed fatigue in the context of unpredictable working time arrangements, precarious employment, high workload, working overtime and self-advocacy.

Fatigue was reportedly associated with unpredictable working time arrangements in the present study. As noted by one young worker, work shifts were sometimes changed via text message the day before the shift was supposed to occur. This worker felt they were expected to work despite short notice, placing strain on the tenuous balance between work, life and school. Similarly, many other young workers reported feeling pressured to agree to abrupt changes in shift start and finish times. Workers reported that declining the changed shift time could result in a stressful workplace and/or reduced hours being offered in the future.

Insecure work was reported as a reason for not reporting injuries and incidents related to fatigue in the workplace. This was also the case in terms of workload issues, with young workers reporting that they did not feel comfortable reporting issues related to workload because of the precarious nature of their employment. Many young workers felt that management asked 'too much' of them, and this was particularly true for young workers who were also students. Indeed as one WHS professional working with young people said, "*They (young workers) are already tired after a day at school and fatigue is a big issue*". However, it was also reported that some organisations have made the link between stress and poor service in their young workers and apply less pressure for this reason. For example, it was reported that some 'night fill' shifts in supermarkets are under review as fatigue was causing multiple errors, with organisations moving these shifts so that they occur during the day.

Fatigue issues related to overtime were also reported. For example, one teacher reported, "*I've had some students tell me that they have to clock off and then do two hours of cleaning that's unpaid overtime. I talk to them about this because they're not covered (by insurance) once they're clocked off, let alone that they're not being paid.*" Young workers reported feeling unable to self-advocate regarding fatigue. One young worker reported being pressured to work for two years without taking leave. Although they acknowledged that their efforts were recognized and appreciated, this young worker also felt pressured to, "*stay back and to work long hours to get it done.*" For young workers trying to balance work, study, social commitments and establish themselves in the workforce, fatigue is a major concern.

#### *Future inquiry workshop (FIW)*

The FIW was a facilitated discussion about actions that could be taken to improve WHS outcomes for young workers. These discussions centred around cultural and system-level issues, rather than on individual behaviour or specific incidents. As such, the findings of the workshop apply not only to fatigue, but also to other youth WHS issues. The general findings of the FIW are presented below. Strategies for applying these findings specifically to fatigue are presented in the Discussion.

Participants in the FIW collectively identified three key trends in the WHS environment that impact on the capacity for young workers to be healthy and safe at work. These were; inadequate WHS training in educational settings, insufficient or incomplete training in WHS

for young people and complex relationships regarding responsibility for WHS. Participants then discussed areas where improvements could be made. Ensuring that WHS education is simple, relevant, prevention-focussed, standardised and presented in context was one of the key improvements discussed. Also discussed was the need for working relationships between all stakeholders including, but not limited to, regulators, educators and employers. Participants identified six key areas for action; 1) develop expertise, 2) give young workers a voice, 3) improve education and training, 4) build stakeholder engagement, 5) increase employer awareness of WHS responsibilities and, 6) improve processes for employers to manage and monitor WHS outcomes. Strategies for applying these findings specifically to fatigue are presented in the Discussion.

## Discussion

The aim of this study was to explore WHS issues for young workers, with a particular focus on issues related to fatigue. Findings revealed that fatigue was considered a significant problem by the majority of young workers, and was associated with unpredictable working time arrangements, precarious employment, high workload, working overtime and limited ability to self-advocate. Inadequate, insufficient or incomplete WHS training for young workers and complex relationships regarding responsibility for WHS reportedly impacted on the capacity for young workers to be healthy and safe at work. A secondary aim of this study was to develop strategies and solutions for improved WHS outcomes. There were a number of areas for action to improve WHS outcomes for young workers that can be applied to the problem of fatigue, for example formal education in fatigue risk management for young workers and their employers.

An identified barrier to positive WHS outcomes was inadequate, insufficient or incomplete WHS training for young workers. Many of the identified areas for action for WHS improvements were in line with this, particularly developing expertise and improving education and training. Young workers reported that they primarily find out about WHS from training given on the job and from their employer or supervisor. As such, fatigue risk management education for both young workers and their employers may be critical in order to ensure positive WHS outcomes in relation to fatigue for young workers. Many organisations employ a fatigue risk management policy or system that provides guidelines for working time arrangements, recognising and reporting fatigue and managing fatigue

symptoms. This is particularly true in safety-critical industries and/or those employing non-traditional working time schedules<sup>18</sup>). Given that most young workers are employed in addition to study commitments<sup>11</sup>), they necessarily work long hours and non-traditional hours<sup>3</sup>). This, combined with a biological predisposition to fatigue<sup>6, 7</sup>), puts young workers at an increased risk of having a fatigue-related accident or incident. Indeed, data show that young shift workers in Australia have a substantially higher incidence of work-related injury than their non-shift working counterparts<sup>19</sup>). It is likely that fatigue is a significant contributor to this statistic given the evidence showing a link between shift work, fatigue and work injury in other populations<sup>20</sup>). The development, implementation and assessment of fatigue education programs for young workers and their employers should be the focus of future research.

Education and training in the area of fatigue management may be one way to minimise the substantial risk posed by this hazard for young workers. However, this also raises issues about ownership of responsibility. Findings of the present study revealed that complex relationships regarding responsibility for youth WHS impact on the capacity for young workers to be healthy and safe at work. Fatigue management is considered to be a shared responsibility between employer and employee<sup>21</sup>), however the responsibility is not equally shared. In Australian law, the employer has the primary duty of care to ensure, as far as reasonably practicable, the health and safety of workers, to provide a healthy and safe work place, and safe systems of work<sup>22</sup>). The duty of the worker is to obey the employer's reasonable instructions and protect his or her own and other's health and safety at work. Thus, even if a healthy and safe roster system is in place, there is still an onus on the worker to ensure they achieve adequate rest in order to be fit for duty and to report if they are impaired by fatigue. This is made complex by the multiple commitments young workers often balance and the potential for influence by parents and guardians. In a study of the attitudes and beliefs of parents of working adolescents, 48% of participating parents rated fatigue as their most prominent workplace safety concern for their children<sup>23</sup>). To address this, education and training in fatigue management should include a clear delineation of responsibilities for each stakeholder. For example, whilst it is the employer's responsibility to ensure well-designed roster systems that provide adequate rest breaks between shifts, it is the employee's responsibility to report if rest was not obtained and there is an increased likelihood of fatigue as a result. In turn, it is the employer's responsibility to provide a

system that makes such reporting possible and predictable.

A clear and informed understanding of their own and others' responsibility for fatigue management may also help young workers to enhance their skills and confidence in communicating about fatigue as a WHS hazard. This includes both reporting behaviour and self-advocacy. Findings of the present study revealed that young workers were more likely to report an injury at work than they were to report something unsafe or something that might make them sick. This may be because an injury is a more tangible and often visually apparent form of impairment. Fatigue, on the other hand, is largely subjective and may be less well understood in terms of its effect on performance and safety. However, there is a significant body of evidence demonstrating the short and long-term negative consequences of fatigue for health and safety<sup>24</sup>). Integrating this evidence into training and education for young workers, their employers and their advocates may facilitate a better understanding of fatigue as a significant WHS hazard and encourage reporting behaviour. This, combined with a clear understanding of each stakeholder's responsibility for fatigue management, may enhance the capacity for young workers to be healthy and safe at work.

Findings of the present study also revealed that young workers may not report a WHS issue because they do not want to cause a problem or because they do not feel confident. This was reportedly associated with the precarious nature of employment for most young workers and is consistent with previous research which has shown that workers in precarious employment are less likely to report accidents or injuries<sup>13</sup>). Young workers in the present study reported feeling unable to say no to extra shifts, split shifts, or shifts imposed on them at short notice, because they feared losing their job or losing hours and income. Enhanced job security for young workers is one way of minimising this particular risk factor associated with fatigue. Education and training about the rights and responsibilities of both young workers and employers in regards to WHS as it relates to fatigue management may also mitigate this risk. Given that young workers in Australia are overrepresented in the casual workforce<sup>11</sup>) this is a significant issue to be addressed in future research and policy.

There are a number of limitations of the present study that should be identified. The sample size, given the large number of young workers in the general population, is one such limitation. In addition, this research focused largely on the experience of young workers in South Australia. As such, these findings may be limited in their generaliz-

ability to workers in other geographic locations. The aim of the present study was to explore WHS issues for young workers and develop strategies and solutions for improved WHS outcomes, with a particular focus on issues related to fatigue. Many of the suggestions for intervention, while generated from the findings of the present study, are untested in this population. Designing and testing fatigue management interventions for young workers and their employers should be the focus of future research. Interventions should take into account all factors that can contribute to work-related fatigue including working time arrangements, psychosocial factors and, physical and mental work demands.

Fatigue was identified as a significant issue for the majority of young workers in the present study. Given the negative health and safety consequences of fatigue<sup>24–26</sup>), and the evidence that fatigue is associated with poor long-term health outcomes<sup>27</sup>), fatigue for young workers is a critical issue to address. The findings of this paper highlight the need for a concerted effort by all stakeholders to educate young workers about fatigue, assist them to manage fatigue, and to assist employers to avoid work practices and work organisation that increase fatigue. To date, there has been limited research addressing fatigue for young workers. This is in spite of their biological predisposition to fatigue, their competing demands and their over-representation in workplace injuries and accidents<sup>19</sup>). The present paper provides an understanding of the experience of fatigue for young workers as well as solutions for fatigue management and improved WHS outcomes generated by young workers and stakeholders themselves. These findings have been incorporated into the South Australian government's strategy for youth WHS<sup>28</sup>). The application of these findings may contribute to improved health and safety outcomes for young workers.

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