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Examining gender differences in gig worker safety

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Abstract

A critical but often overlooked road safety concern is gender differences in road safety issues. The limited investigations have reported gender differences in road safety issues such as traffic accident rates and crash injuries. An emerging road safety issue is the safety of gig workers. Despite the exponential growth of the gig economy, little is known about road safety issues faced by gig workers, including gender-specific road safety issues. The present study aimed to investigate whether there are gender differences in gig workers' involvement in road safety incidents and the likelihood of reporting incidents when gig working. Gig workers who provide, or have provided, ride-hailing, courier, and food delivery services via digital platforms in Australia were invited to participate in an online survey on their involvement in road safety incidents and the likelihood that they would report road and personal safety incidents when gig working. Data from 71 gig workers (35 female gig workers; 36 male gig workers) were reported in the study. No gender differences were found in their involvement in road safety incidents and the likelihood of reporting road and personal safety incidents when gig working. Despite the lack of gender differences observed, findings from the study contributed to the research field and to closing the gender data gap. A research agenda is proposed for further data collection in gig work using a systems thinking approach to better our understanding of factors influencing the gendered participation in the gig workforce, and the health, safety, and wellbeing of gig workers.

KEYWORDS
digital platform, gender, gig economy, gig work, incident reporting, safety

1 | INTRODUCTION

Road safety issues concern everyone, not only researchers and policymakers. A critical but often overlooked road safety concern is gender differences in road safety issues. The existing research on road safety has revealed gender differences in several areas of road safety. For example, studies have reported that male drivers have a higher average accident rate compared to female drivers (Al-Balbissi, 2003) and male cyclists are more likely to sustain a fatal cycling injury compared to female cyclists (Prati et al., 2019). While the road safety of the general community has been well studied, an emerging road safety issue concerns the safety of gig workers; in particular, whether there are gender differences in their safety.

The gig economy—a labor market that depends heavily on temporary and precarious employment of independent contractors—is growing rapidly, and alongside this economic growth is an

increasing number of individuals who have participated as gig workers (Woodcock & Graham, 2019). Gig workers provide on-demand work or "gigs" mediated by digital platforms that connect gig workers to clients or consumers (Williams, McDonald, et al., 2021; Woodcock & Graham, 2019). With the rapid expansion of the gig economy, there is a need to consider and understand the workplace health and safety issues experienced by gig workers (e.g., Lachapelle et al., 2021; Papakostopoulos & Nathanael, 2021). Concerns regarding the health and safety of gig workers have started to gain traction amongst researchers and policymakers; largely due to the increase in reports of safety incidents that have occurred during gig work. In Australia, at least five delivery riders were killed when gig working in 2020 alone (New South Wales Parliament, 2020; Om et al., 2021; Zhou, 2021). Also, in Australia, more than 45% of food delivery riders (surveyed by the Transport Workers Union) reported having sustained an injury or knowing someone who had sustained an injury, when gig working (Bright & Fitzgerald, 2019). These trends were similarly observed globally. For example, in the United States of America, more than 50 gig workers have been killed when gig working since 2017 (Paul, 2022), and 35% of gig workers reported feeling unsafe when gig working (Anderson et al., 2021).

To better our understanding of gig worker safety, we need to consider a range of factors, including gender. Recently, there have been calls for more gender-specific workplace safety data (Cruz Rios et al., 2017), especially for workforces in which women are underrepresented. An example is the gig workforce, where women make up less than 10% of gig workers providing ride-hailing, courier or food delivery services (International Labor Organization, 2021). The present study contributes to closing this gender data gap by investigating gender differences in gig worker safety.

In the subsequent sections of Section 1, we summarize the current knowledge base on the gig economy and its workforce, the gendered participation in the gig workforce, and gig worker safety, and then detail the aim and hypotheses of the present study.

1.1 | The growing gig economy

From a public and policy perspective, there is increasing interest in the gig economy, with discussions emerging around the gig economy and its impact on the future of work (e.g., Ashford et al., 2018; Kuhn, 2016). The gig economy has existed since the mid-to-late 1800s (e.g., gig working for direct-selling companies such as Tupperware; Gleim et al., 2019) but has recently gained more attention. This is because globally, the gig economy and its workforce are growing exponentially, and a large factor contributing to this expansion is technological advances, which make it easier for individuals to participate. In Australia alone, the gig economy stimulated AUD$6.3 billion in consumer spending between 2015 and 2019, and the gig economy workforce grew from approximately 80,000 gig workers in 2015 to 250,000 gig workers in 2019 (Institute of Actuaries of Australia, 2020). Similar trends were observed elsewhere, including in the United States (Istrate & Harris, 2017) and the United Kingdom (Trades Union Congress, 2021). Participation in the gig workforce is thought to have increased further due to the coronavirus pandemic, where countries worldwide experienced economic lockdowns (e.g., Polkowska, 2020; Rani & Dhir, 2020).

Today, gig work, also synonymously referred to as on-demand work or platform work, is defined as temporary "gigs" mediated by digital platforms that connect gig workers to clients or consumers via a website or an app (Williams, McDonald, et al., 2021). There are two main types of gig work: (i) remote crowd work, where gig workers connect with consumers to perform desk-based tasks remotely via a digital platform (e.g., Amazon Mechanical Turk); and (ii) in-person platform-mediated work, where gig workers connect with consumers to provide a range of services, including local ride-hailing (e.g., Uber), courier or food delivery (e.g., Uber Eats, Deliveroo) services, and domestic caring (e.g., Mable, WHIZZ) services. Gig work can be distinguished from other traditional and nontraditional forms of employment in that gig work involves task-based compensation or "piece rate" payment (i.e., paid from task to task), is temporary in nature (i.e., no long-term commitment to the job), and affords a level of flexibility as to when, how, or where the work is performed (Watson et al., 2021).

1.2 | Gendered participation in the gig workforce

Participation in the gig workforce is enticing for many individuals, especially those seeking to either supplement or replace their traditional or nontraditional employment and for those who are unable to participate fully in the workforce (Benavides Rincón & Montes Martínez, 2020; Gleim et al., 2019; Harpur & Blanck, 2020). For example, the gig workforce enables working-aged students to earn an income while studying, or older adults to earn an income while in retirement. The gig economy also enables individuals who experience structural constraints in their workforce participation to earn an income—namely, women who cannot commit to traditional full-time working hours due to caring responsibilities (Churchill & Craig, 2019). For example, the gig workforce enables mothers or carers to work around childcare or school hours, especially because they are disproportionately represented as the ones who provide care for their children (e.g., Baxter, 2022 as cited in Australian Government Department of the Prime Minister and Cabinet, n.d.).

More broadly, overall workforce participation by women remains low, and this is true worldwide and within Australia. Women in the workforce are more likely than men to be employed on a part-time basis or in casual and temporary roles (International Labor Organization, 2017). Women are also less likely to be provided opportunities for career progression (but see literature on the "glass cliff" phenomenon; e.g., Ryan et al., 2016). The latest gender workplace statistics in Australia (Australian Government Workplace Gender Equality, 2022) indicate that women are underrepresented in full-time employment (38.4%) but over-represented in part-time employment (68.5%). Overall workforce participation by women (62.1%) is lower compared to men (70.4%). There is also a gender pay gap, with

women receiving 13.8% less full-time average weekly ordinary earnings compared with men. The gig economy workforce appears to provide an opportunity for women, and other individuals who are unable to participate fully in the workforce due to domestic and caring responsibilities, by affording more flexibility and autonomy over when, how, or where one works. Indeed, the recent surge in the gig economy and its workforce has prompted researchers and policymakers to shift their focus to the prevalence and trends in men and women participating in gig work (e.g., Williams, Mayes, et al., 2021).

Despite the seemingly equal entry into the gig workforce by women and men, findings from existing research have continued to reveal gender differences in gig workforce participation, and their motivation to participate in the gig workforce. For example, in terms of differences in gig workforce participation, women more frequently participate in gig work that involves digital tasks and domestic caring tasks whereas men more frequently participate in gig work that involves driving and delivery (Williams, Mayes, et al., 2021). Women were also found to participate more frequently in gig work that involves shopping (e.g., shoppers on Instacart in the United States; Milkman et al., 2021). In terms of motivation to participate in the gig workforce, women typically cited income-related reasons and the flexibility afforded by gig work, whereas men mainly cited income-related reasons (Churchill & Craig, 2019). The gender differences in motivation to participate in the gig workforce suggest that women, more likely than men, turn to the gig economy to relieve the constraints imposed by their nonwork schedules (i.e., caring responsibilities; Churchill & Craig, 2019). Further, studies have reported gender differences in wages from gig work, with findings indicating that women earn less than men from gig work (e.g., Williams, Mayes, et al., 2021). This gender wage gap is likely exacerbated by women working fewer hours than men, especially in the evenings when there is increased payment for gig work performed (e.g., Dokuka et al., 2022; Vyas, 2020).

1.3 | Gig worker safety

While gender differences in participation in the gig economy workforce is an important topic (e.g., Churchill & Craig, 2019; Galperin, 2019; Milkman et al., 2021; Vyas, 2020; Williams, Mayes, et al., 2021), gender also provides an important lens for considering gig worker safety.

Over a 5-year period from 2016 to 2020 across all workforces in Australia, 65% of fatalities (589 fatalities) that occurred at work involved vehicles, with a large proportion of these fatalities resulting from a vehicle collision (Safe Work Australia, 2020). More broadly, it has been estimated that in most high-income countries, a third of road fatalities occur when at work (Pratt & Williams, 2020). These current road safety data do not differentiate between road safety incidents that occurred when gig working and when undertaking other types of transport-based work. However, there are clear signs that gig workers conducting transport services are at risk of injury and death when on the road. In Australia, at least five delivery riders were killed when gig working in 2020 alone (New South Wales Parliament, 2020; Om et al., 2021; Zhou, 2021) and, notably, these fatalities generally involved gig workers who were on a temporary Australian visa—suggesting that some groups of workers may be more vulnerable to safety risks than others. In addition to these reported fatalities, more than 45% of food delivery riders (surveyed by the Transport Workers Union) reported sustaining an injury when gig working or knowing someone who had sustained an injury when gig working (Bright & Fitzgerald, 2019).

One of the few studies published on the topic of gig worker safety was conducted by Christie and Ward (2019), using a sample of gig workers and platform managers in the United Kingdom. Approximately 42% of their gig worker participants reported a collision where their vehicle had been damaged and 10% reported that they know someone (usually themselves) who had been injured when gig working. Gig worker participants reported that they often experience fatigue due to working long hours, having high physical and mental demands, traveling long distances, and working late at night. They also reported feeling pressured to make deliveries quickly, resulting in more risk-taking behaviors (e.g., speeding, going through red lights). Of the different modes of travel used by gig worker participants, those who make their deliveries via two-wheeled vehicles (e.g., powered two-wheelers, bicycles) were more likely to report being in a collision and admit to taking more risks than those who make their deliveries via cars or vans. Platform managers in the study also acknowledged that the platform company was more interested in "the life of the parcel" rather than the life of the gig worker. Similar safety risks were identified in a study by Gregory (2021), who interviewed gig workers in Edinburgh.

While the focus on safety risks associated with gig working has been on road safety, gig workers face other types of safety risks—namely, personal safety risks relating to theft, assault, and harassment. Gig workers in the study by Gregory (2021) reported that they were targets for hostile behavior from other road users due to their highly branded and identifiable clothing. One gig worker in their study shared their experience: "… it's kind of dangerous to wear this [branded gear], because you are being attacked, often." (p. 322). Gig workers who provide ride-hailing services also reported experiencing threats to their personal safety, in that they feel unsafe when passengers are under the influence of drugs or alcohol (Louzado-Feliciano et al., 2022). Other studies have reported that gig workers experience sexual assaults with female gig workers are more likely than male gig workers to experience sexual assault and be exposed to potentially dangerous situations when gig working (Tarife, 2019, as cited in Williams, Mayes, et al., 2021).

Currently, there is limited research conducted to investigate gig worker safety and across the few existing studies, there is a consensus that there are safety risks associated with gig working (e.g., Christie & Ward, 2019; Dong et al., 2021; Louzado-Feliciano et al., 2022; Morita et al., 2022; Tarife, 2019; Zhang et al., 2020). Given the limited research, it is an opportune time for more research and improved data to inform strategies to enhance the safety of gig

workers. Additionally, as an emerging area of research, there is scope to understand whether there are gender differences in gig worker safety and consequently, to prevent any gender data gap from arising. The present study contributes to the field, by investigating whether there are gender differences in the gig workers' involvement in road safety incidents and whether there are gender differences in gig workers' likelihood to report road and personal incidents, when gig working. Taking a gendered lens to this issue can enable the development of more holistic strategies to enhance the safety of gig workers. The study also responds to calls for more gender-specific workplace safety data (Cruz Rios et al., 2017).

1.4 | The present study

The present study aimed to investigate whether there are gender differences in gig worker safety. More specifically, the present study investigated whether there are gender differences in gig workers' involvement in road safety incidents and the likelihood of reporting incidents that occur when gig working. We conducted an online survey with female and male gig workers who provide ride-hailing, courier, and food delivery services in Australia. Given the paucity of gender-specific workplace safety data in gig work, we drew from the broader literature to generate hypotheses. In terms of gender differences in the involvement of road safety incidents when gig working, we hypothesized that male gig workers would be involved in more road safety incidents than female gig workers. This hypothesis is in line with the road safety literature, finding that men are more frequently involved in a road crash or fatality than women (e.g., Prati et al., 2019; Visby & Lundholt, 2018) and that men, especially young men, engage in risky road behaviors more frequently than women (e.g., Turner & McClure, 2003). In terms of gender differences in the likelihood of reporting safety incidents that occur when gig working, we hypothesized that female gig workers would be more likely to report safety incidents that occur when gig working than male gig workers. This hypothesis aligns with the literature on reporting intentions, finding that women have higher reporting incidences or reporting intentions than men (e.g., Edleson & Brygger, 1986; Kaplan et al., 2008). Additionally, this hypothesis is in line with the broader literature on gender differences in the acceptance of workplace health and safety issues, finding that men conform to normative expectations of masculinity and tend to suppress and neglect to report workplace incidents (e.g., Curtis Breslin et al., 2007; Stergiou-Kita et al., 2015). We acknowledge that gender is a complex and multifaceted construct, but following previous literature, only binary gender comparisons (i.e., female gig workers compared to male gig workers) were made in the present study.

2 | METHOD

Data reported in the present study was collected as part of a wider survey conducted by the research team aimed at the development of a tool that collects data on safety incidents that occur when gig working. Findings from the data not relevant to the present study aims will be reported in future research publications.

2.1 | Participants

We invited gig workers who provide, or have provided, ride-hailing, courier, and food delivery services via digital platforms in Australia, and who use a range of vehicles such as cars, vans, bicycles, scooters, or motorbikes when gig working to participate in a brief, online survey study. To be eligible for the study, the gig worker must have met the following criteria: (i) reside in Australia; (ii) be aged 18 years or older; (iii) be proficient in written English; (iv) work, or have worked in the last 12 months, as a gig worker who provides on-demand services via the road network; and (v) obtain work from any, but at least one, on-demand digital platform (e.g., Amazon, Uber, Uber Eats, Menulog, Go People). Gig workers were recruited through social media platforms (including paid advertising) and stakeholders. All participants were reimbursed for their time. Ethical approval was obtained from the University of the Sunshine Coast Human Research Ethics Committee (A211648).

In total, 107 individuals participated in the online survey study. Following participant exclusions, data from 71 participants were included in the analysis. The mean age of the sample was 33.54 years (SD = 9.30, range = 19–57). The majority of the sample resided in Queensland, Australia (36.71%); were born in Oceania (67.60%; 47 participants were born in Australia and 1 in New Zealand); reported English as their primary language (71.83%); have lived in Australia for more than 5 years (83.10%) and were Australian citizens (73.24%). Additionally, a large proportion of the sample reported that they used a car (92.96%) as their main mode of transport for gig work, and three other participants reported that in addition to using a car, they also used a bicycle (n = 1), electric car (n = 1), and motorcycle (n = 1) for gig work. The remaining participants reported that they used a scooter (n = 1) and a van (n = 1) for gig work.

In this sample, 35 gig workers self-reported to be female. Their mean age was 31.66 (SD = 8.46, range = 19–56). For female gig workers, the average number of months worked as a gig worker was 13.56 months (SD = 11.28, range = 0.50–48.00) and the average weekly hours of gig working was 17.29 h (SD = 8.54, range = 4.00–40.00). The remaining 36 gig workers in this sample self-reported to be male. Their mean age was 35.36 (SD = 9.81, range = 22–57). For male gig workers, the average number of months worked as a gig worker was 27.44 months (SD = 16.39, range = 2.00–60.00) and the average weekly hours of gig working was 26.86 h (SD = 16.41, range = 5.00–70.00). Further details on participant demographics are presented in Table 1.

2.2 | Materials: Online survey

The online survey included a brief set of questions relating to (i) the participants' demographic background; (ii) their history of road safety

TABLE 1 Participant demographics.

	All participants (*N* = 71)	Female gig workers only (*n* = 35)	Male gig workers only (*n* = 36)	*p*
Age[a]	33.54 (9.30), 19–57	31.66 (8.46), 19–56	35.36 (9.81), 22–57	.108
	Med = 32.00, IQR = 10.50	Med = 30.00, IQR = 7.00	Med = 34.50, IQR = 13.75	
State and territory[b]				.987
New South Wales	19 (26.76%)	9 (25.71%)	10 (27.78%)	
Northern Territory	1 (1.41%)	0 (0.00%)	1 (2.78%)	
Queensland	26 (36.62%)	14 (40.00%)	12 (33.33%)	
South Australia	8 (11.27%)	4 (11.43%)	4 (11.11%)	
Tasmania	1 (1.41%)	0 (0.00%)	1 (2.78%)	
Victoria	13 (18.31%)	6 (17.14%)	7 (19.44%)	
Western Australia	3 (4.23%)	2 (5.71%)	1 (2.78%)	
Country of birth[b,d,e]				.029*
Asia	16 (22.54%)	4 (11.43%)	12 (33.33%)	.180
Europe	5 (7.04%)	2 (5.71%)	3 (8.33%)	1.000
Oceania	48 (67.61%)	29 (82.86%)	19 (52.78%)	.042*
South America	2 (2.82%)	0 (0.00%)	2 (5.56%)	1.000
Primary language[c]				.027*
English	51 (71.83%)	30 (85.71%)	21 (58.33%)	.041*
Other	20 (28.17%)	5 (14.29%)	15 (41.67%)	.041*
Duration living in Australia[b]				.556
Less than 12 months	1 (1.41%)	0 (0.00%)	1 (2.78%)	
1–2 years	2 (2.82%)	0 (0.00%)	2 (5.56%)	
2–5 years	9 (12.68%)	5 (14.29%)	4 (11.11%)	
More than 5 years	59 (83.10%)	30 (85.71%)	29 (80.56%)	
Residency or visa status[b]				.421
Australian citizen	52 (73.24%)	29 (82.86%)	23 (63.89%)	
Australian permanent resident	6 (8.45%)	2 (5.71%)	4 (11.11%)	
Australian temporary resident	7 (9.86%)	3 (8.57%)	4 (11.11%)	
Australian partner or family visa	2 (2.82%)	1 (2.86%)	1 (2.78%)	
Australia student visa	2 (2.82%)	0 (0.00%)	2 (5.56%)	
New Zealand citizen	2 (2.82%)	0 (0.00%)	2 (5.56%)	
Experience as a gig worker (months)[ad]	20.71 (15.68), 0.50–60.00	13.56 (11.28), 0.50–48.00	27.44 (16.39), 2.00–60.00	.001***
	Med = 12.00, IQR = 12.00	Med = 12.00, IQR = 6.00	Med = 24.00, IQR = 27.00	
Average weekly hours of gig working[a]	22.14 (13.90), 4.00–70.00	17.29 (8.54), 4.00–40.00	26.86 (16.41), 5.00–70.00	.009**
	Med = 20.00, IQR = 15.25	Med = 15.00, IQR = 8.00	Med = 20.00, IQR = 21.25	
Number of on-demand platforms currently working[a]	2.23 (1.47), 1.00–7.00	1.74 (0.92), 1.00–5.00	2.69 (1.74), 1.00–7.00	.012*
	Med = 2.00, IQR = 2.00	Med = 2.00, IQR = 1.00	Med = 3.00, IQR = 2.00	
Number of on-demand platforms previously worked[a]	1.24 (1.63), 0.00–7.00	0.74 (1.09), 0.00–5.00	1.72 (1.91), 0.00–7.00	.009**
	Med = 1.00, IQR = 2.00	Med = 0.00, IQR = 1.00	Med = 1.00, IQR = 1.00	

(Continues)

TABLE 1 (Continued)

	All participants ($N = 71$)	Female gig workers only ($n = 35$)	Male gig workers only ($n = 36$)	p
Number of on-demand platforms working per shift[ad]	1.61 (0.83), 1.00–6.00 Med = 1.00, IQR = 2.00	1.36 (0.56),1.00–3.00 Med = 1.00, IQR = 1.00	1.86 (0.97), 1.00–6.00 Med = 2.00, IQR = 1.00	.008**
Number of vehicles used for gig working[a]	1.04 (0.20), 1.00–2.00 Med = 1.00, IQR = 1.00	1.03 (0.17), 1.00–2.00 Med = 1.00, IQR = 0.00	1.06 (0.23), 1.00–2.00 Med = 1.00, IQR = 0.00	.586

[a]Data were analyzed using the Mann-Whitney U test. Means, standard errors (in parentheses), range, median, and interquartile range are reported.
[b]Data were analyzed using Fisher's exact test. Counts and proportions (in parentheses) are reported.
[c]Data were analyzed using Pearson's χ^2 test. Counts and proportions (in parentheses) are reported.
[d]Variable contained missing data.
[e]We asked participants for their country of birth; however, for ease of summarizing and reporting this data, we categorized their country of birth by continent.
*$p < .05$; **$p < .01$; ***$p < .001$.

incidents when gig working; and (iii) the likelihood that they would report road and personal safety incidents that occur when gig working. A full list of questions can be found in Supporting Information: Appendix A.

2.2.1 | Participant demographic background

To obtain a profile of our gig worker participant sample, we asked participants a series of questions relating to their demographic background (e.g., age, gender, country of birth) and their gig working background (e.g., duration of gig working, digital platforms they work for, type of gig work).

2.2.2 | History of road safety incidents when gig working

To obtain a history of participants' road safety incidents when gig working, we asked participants to report whether they have ever been involved in (i) crashes where nobody was injured; (ii) crashes where somebody was injured; and (iii) near miss incidents, when gig working. If participants reported that they had been involved in either of the road safety incidents, we asked participants the number of road safety incidents that they had been involved in when gig working.

2.2.3 | Likelihood of reporting road and personal safety incidents when gig working

To examine participants' likelihood of reporting road and personal safety incidents when gig working, we asked participants to rate the likelihood, on a 7-point scale, that they would report an incident to their on-demand digital platform or other authorities (e.g., the police) in a hypothetical road or personal safety incident that occur when gig working. We asked participants to think about the following hypothetical incidents that occurred during gig work: (i) a crash where no one was injured; (ii) a crash where at least one person was injured; (iii) a near miss; (iv) harassment or verbal abuse; (v) physical harm or assault; and (vi) having had their property or equipment stolen or damaged.

2.3 | Procedure

Gig workers interested in participating in the study assessed the study information via a web link advertised on social media or distributed through stakeholder groups (e.g., platforms, unions). After being provided with information about the online survey study, they were asked to provide their written, informed consent to participate. Then, participants were asked to complete a set of questions assessing their eligibility for the study (refer to the eligibility criteria in Section 2.1). Eligible participants were then invited to complete the online survey. Participants had unlimited time to complete each question (i.e., responses were not timed). The survey was open for responses from January 14, 2022 to February 26, 2022.

2.4 | Data analysis

Data were analyzed using R (version 4.2.0; R Core Team, 2022). Participant characteristics (including demographic background) were analyzed to determine if there were gender differences. The majority of the participant demographic data (interval data and ordinal data) were analyzed using a nonparametric Wilcoxon rank sum test (also known as the Mann–Whitney U test). The Wilcoxon rank sum test was chosen because assumptions for the equivalent parametric test (i.e., independent-samples t-test) were not met—the data was not normally distributed and did not have homogeneous variance between gender (female or male gig workers). In this case, the Wilcoxon rank sum test was suitable as inspection of the data by

gender revealed identical distribution. Other participant characteristics data (nominal data) were analyzed using Pearson's χ^2 test (for variables with expected cell counts of five or more) or Fisher's exact test (for variables with 20% of cells having expected cell counts of less than five, or any expected cell count of less than one). Post-hoc tests were conducted with Bonferroni corrections following significant Pearson's χ^2 test or Fisher's exact test. All p values from Pearson's χ^2 test or Fisher's exact test were computed using Monte Carlo simulation with 2000 replicates. Invalid responses (e.g., the participant reported "rider, driver" in response to the number of years spent gig working) were treated as missing data and missing data were not replaced. There were very few missing data (0.005%; five out of 948 possible data points) across these variables.

The present study involved two broad primary outcome measures. The first outcome measure relates to the participants' involvement in road safety incidents when gig working—namely, the number of (i) crashes where nobody was injured; (ii) crashes where somebody was injured; and (iii) near miss incidents. Because the number of near miss incidents was highly variable, we chose to "bin" participants' number of near miss incidents into five categories: zero, one to three, four to six, seven to nine, 10 and above. These variables were analyzed to determine if there were gender differences in road safety incident involvement. Nominal data (i.e., "yes" or "no" responses to whether participants had ever been involved in a road safety incident) were first analyzed using Pearson's χ^2 test or Fisher's exact test. If Pearson's χ^2 test or Fisher's exact test revealed significant gender differences, post-hoc tests were then conducted to determine if there were gender differences in the *number* of road safety incidents. Pearson's χ^2 test or Fisher's exact test with Bonferroni corrections for nominal data, or Wilcoxon rank sum test for ratio data were conducted for post-hoc tests (as data were not normally distributed). There were no missing data across these variables.

The second broad primary outcome measure relates to the participants' likelihood of reporting road and personal safety incidents when gig working—namely, the likelihood that they would report (i) a crash where nobody was injured; (ii) a crash where at least one person was injured; (iii) a near miss; (iv) harassment or verbal abuse; (v) physical harm or assault; and (vi) had their property or equipment stolen or damaged. These variables were analyzed to determine if there were gender differences in the likelihood of reporting road and safety incidents when gig working. The data were analyzed using the Wilcoxon rank sum test, as the response options for the Likert scales used for this broad primary outcome measure should be treated as ordinal data (Wu & Leung, 2017) and upon inspection, the data were not normally distributed. There were no missing data across these variables.

3 | RESULTS

Participant demographics were analyzed to determine if there were gender differences (see Table 1). The results from the analyses indicate the presence of gender differences in age, country of birth (by continent), primary language, experience as a gig worker, average weekly hours of gig working, number of on-demand platforms currently working, number of on-demand platforms previously worked, and number of on-demand platforms working per shift.

3.1 | Involvement in road safety incidents when gig working

The results from the analyses indicated no gender differences in participants' involvement in road safety incidents when gig working.

Overall, only a few participants (n = 9 [12.68%]; two females and seven males) reported having ever been involved in crashes where nobody was injured. The average number of crashes they had been involved in where nobody was injured was 1.22 (SD = 0.44, range = 1–2). There were no gender differences in participants' involvement in crashes where nobody was injured, p = .151.

Even fewer participants (n = 2 [2.82%]; both males) reported having ever been in crashes where somebody was injured. The average number of crashes they had been involved in where somebody was injured was 1.50 (SD = 0.71, range = 1–2). There were no gender differences in participants' involvement in crashes where somebody was injured, p = .493.

Twenty-six participants (36.62%; 11 females and 15 males) reported having had near miss incidents. Most participants who had experienced near miss incidents reported being involved in one to three incidents (n = 16 [61.54%]; seven females and nine males), followed by 10 and more (n = 7 [26.92%]; two females and five males), then four to six (n = 3 [11.54%]; all female gig workers), and then seven to nine (n = 1 [3.85%]; one male). There were no gender differences in participants' involvement in near miss incidents, p = .456. Participants' involvement in road safety incidents is depicted in Figure 1.

3.2 | Likelihood of reporting road and personal safety incidents when gig working

The results from the analyses indicated no gender differences in the likelihood of reporting road and personal safety incidents to their on-demand digital platform or other authorities (e.g., the police) when gig working.

For road safety incidents when gig working, overall, 40.84% of participants reported that they were likely or very likely to report a crash where nobody was injured. There were no gender differences in the likelihood that gig workers would report this type of crash (p = .412; female: mean = 4.51, median = 5.00, IQR = 3.00; male: mean = 3.89, median = 4.00, IQR = 6.00). 73.24% of participants reported that they were likely or very likely to report a crash where at least one person was injured. There were no gender differences in the likelihood that gig workers would report this type of crash (p = .593, female: mean = 5.94, median = 7.00, IQR = 1.50; male: mean = 5.75, median = 7.00, IQR = 2.00). Only 15.49% of participants

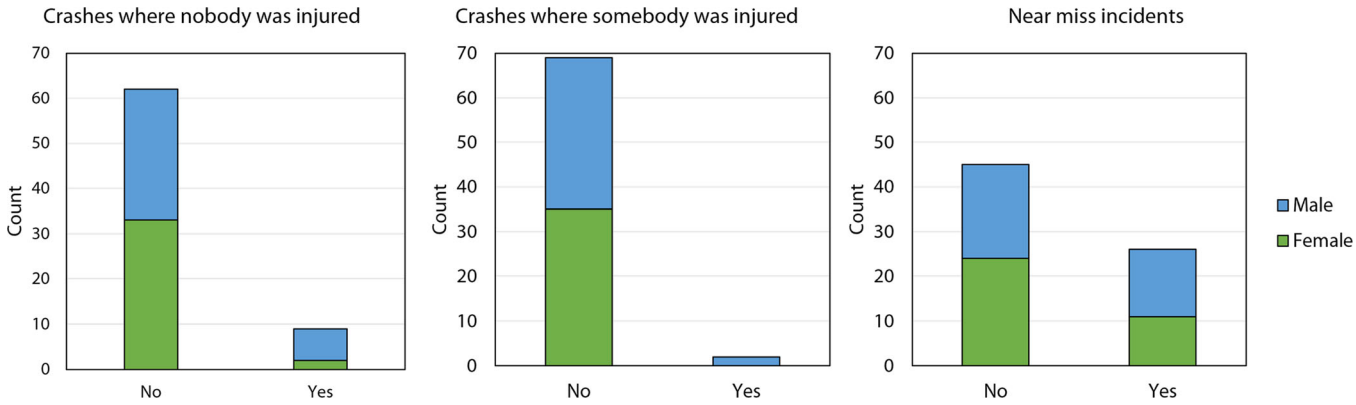

FIGURE 1 Participants' Involvement in road safety incidents by gender. The stacked histograms illustrate the participants' involvement in road safety incidents by gender (female gig workers in green, and male gig workers in blue).

reported that they were likely or very likely to report a near miss incident. There were no gender differences in the likelihood that gig workers would report a near miss incident, $p = .553$ (female: mean = 2.80, median = 2.00, IQR = 3.00; male: mean = 2.61, median = 1.00, IQR = 3.25).

As for personal safety incidents when gig working, overall, 49.30% of participants reported that they were likely or very likely to report harassment or verbal abuse. There were no gender differences in the likelihood that gig workers would report this type of incident, $p = .420$ (female: mean = 4.49, median = 5.00, IQR = 4.00; male: mean = 5.00, median = 6.00, IQR = 4.00). A total of 73.24% of participants reported that they were likely or very likely to report physical harm or assault. There were no gender differences in the likelihood that gig workers would report this type of incident, $p = .712$ (female: mean = 6.06, median = 7.00, IQR = 1.00; male: mean = 5.83, median = 7.00, IQR = 2.00). And finally, 77.46% of participants reported that they were likely or very likely to report their property or equipment being stolen or damaged. There were no gender differences in the likelihood of reporting this type of incident, $p = .716$ (female: mean = 6.09, median = 7.00, IQR = 1.50; male: mean = 6.14, median = 7.00, IQR = 1.00).

4 | DISCUSSION

Considering gender differences is a critical but often overlooked aspect of road safety research. As an emerging road safety issue, the safety behaviors of gig workers have been relatively under-investigated despite growing interest in the gig economy and its impact on the future of work. The present study aimed to investigate whether there are gender differences in gig workers' involvement in road safety incidents and the likelihood of reporting safety incidents, when gig working. No gender differences were found for participants' involvement in road safety incidents and the likelihood of reporting road and personal safety incidents when gig working. The present study contributed to the research field by providing more gender-specific workplace safety data in the gig workforce, where women providing ride-hailing, courier, and food delivery services are underrepresented.

In our study, male gig worker participants did not experience more crashes (where nobody was injured or where somebody was injured) or near miss incidents than female gig worker participants. However, existing data from SafeWork New South Wales—an Australian work health and safety regulator—suggest an over-representation of males in safety incidents when gig working, as 82% of food delivery gig workers involved in a safety incident were men (Convery et al., 2020; see also Sarkies et al., 2022). Beyond the literature on gig work, the study of gender differences in road safety incidents has been studied for decades internationally (e.g., Al-Balbissi, 2003; Prati et al., 2019; Russo et al., 2014; Santamariña-Rubio et al., 2014; Visby & Lundholt, 2018). These studies have reported that male drivers are involved in significantly more accidents compared to female drivers. For example, Al-Balbissi (2003) reported that over a 3-year average (years 1997–1999), male drivers had an average accident rate of 16.23 accidents per 1000 drivers compared to female drivers, who had an average accident rate of 4.74 accidents per 1000 drivers (irrespective of age). Prati et al. (2019) reported that the likelihood of sustaining a fatal cycling injury was 2.33 times higher among male cyclists compared to female cyclists (irrespective of age). It is important to note that the robustness of these gender differences may be dependent on other factors relating to road users (e.g., age, exposure) or physical environment (e.g., time of day, weather). A relevant road user factor for consideration in this study is exposure. Logically speaking, the longer the amount of time spent or distance traveled on the road, the greater exposure there is to the risk of road safety incidents. This was observed by Santamariña-Rubio et al. (2014), who reported that men spent more time traveling and have a higher annual road traffic injury rate compared to women. Data collected in our study indicated that female gig workers spend significantly less time gig working compared to male gig workers, yet there are no gender differences in their involvement in road safety incidents. This may reflect a limitation in our study, where exposure to risk was not controlled. It may be that gender differences in gig workers' involvement in road safety incidents would be apparent if

exposure to risk was matched across gender; that is, had our female and male gig worker participants been matched in the number of hours spent gig working. Another source of exposure may be the level of traffic congestion where gig workers perform gig work, such that the greater the traffic congestion, the greater exposure there is to the risk of road safety incidents. In this study, we were unable to estimate or account for the level of traffic congestion frequently experienced by participants when gig working because this information was not collected. Future research should investigate whether exposure to risk influences gender differences in gig workers' involvement in road safety incidents when gig working.

Additionally, in our study, female gig worker participants were not more likely than male gig worker participants to report safety incidents when gig working. There was no evidence of gender differences in gig workers' likelihood of reporting road and personal safety incidents; more specifically, a crash where nobody was injured, a crash where somebody was injured, a near miss incident, harassment or verbal abuse, physical harm or assault, or theft of or damage to their property or equipment. In a similar line of research, Convery et al. (2020) also measured gig workers' likelihood of reporting a safety incident to their platform, though they focused only on food delivery gig workers, and they did not assess different types of safety incidents or investigate gender differences. They reported that one in five food delivery gig workers would never report a safety incident to their platform, and only one in three food delivery gig workers would always report a safety incident to their platform. The evidence from our study and the study by Convery et al. highlights a significant concern in gig worker safety, and that is that reporting intentions are low. For example, in our study, only 15.49% of participants reported that they were likely or very likely to report a near miss incident. The hesitancy of gig workers to report safety incidents may be attributed to the lack of knowledge of how to report a safety incident and under what circumstances to report a safety incident. Additionally, it appears that gig workers perceive a lack of support from the digital platforms they work for (e.g., Almoqbel & Wohn, 2019). Regardless of the underlying reasons, this is a concerning issue and suggests that further efforts should be undertaken to emphasize the importance of reporting all safety incidents, including near miss incidents and those with no adverse outcomes. It is widely accepted within safety science that reporting near misses and minor incidents forms a critical component of effective safety management activities (Macrae, 2014; Reason, 1997; Thoroman et al., 2018). Minor and near miss incidents often share similar contributory factors with major incidents and thus, they provide *warning signs* for impending high-severity incidents (Heinrich, 1941; Thoroman et al., 2018, 2020). Research examining the efficacy of incident reporting and accident analysis methods has demonstrated that the learnings from minor severity incidents are useful for preventing future major severity incidents (McLean et al., 2021; Thoroman et al., 2020). A further point to make here concerns reporting notifiable incidents to the digital platform and workplace health and safety regulator. In this study, only slightly more than 70% of participants reported that they were likely or very likely to report a crash where at least one person was injured. Given that these types of road safety incidents are more severe (compared to other incidents such as near misses) and that these incidents are considered to be notifiable incidents, there should be a greater proportion of gig workers who would report these incidents when they occur. The relatively low proportion of participants who reported being likely or very likely to report crashes of such severity highlights the need to educate gig workers on incident reporting.

4.1 | Limitations

A limitation of the present study relates to the representativeness of the findings to the gig workforce. First, the gig workforce is growing and now encompasses a range of on-demand services. The present study focused on gig workers who provide ride-hailing, courier, and food delivery services. This means that the findings from this study may not generalize to the broader gig workforce, which also includes gig workers who provide other types of on-demand services (e.g., clerical, caring tasks). Different types of on-demand services are exposed to different types of health and safety risks. For example, gig workers who carry out caring tasks are exposed to unsafe working conditions as they carry out these tasks in consumers' own homes, and gig workers who carry out online tasks (e.g., clerical tasks) are exposed to physical hazards from long hours spent at ergonomically unsafe workstations. The exposure to different types of health and safety risks may influence gig workers' potential involvement in safety incidents and their likelihood to report safety incidents when gig working. Second, the present study primarily used social media for participant recruitment, though there may be some participants recruited through emails from stakeholders (e.g., platforms, unions). While gig workers rely on digital platforms for work, it cannot be assumed that they are also on social media platforms and, if they are, that they are active on these platforms. Our method of participant recruitment could have biased our participants towards those who are active on social media platforms. The characteristics of these gig workers may differ from those who are inactive or not on social media platforms. Third, the present study required participants to be proficient in written English—so as to ensure that they understand the questions being asked in the survey—and this may have inadvertently excluded an important subset of the gig workforce; more specifically, gig workers who have not resided in Australia for long and may not have a good understanding of Australian road rules or licensing requirements, and who may not have considered themselves as proficient in written English. These gig workers constitute a large component of the gig workforce (e.g., Convery et al., 2020). Future research should include interpretations of surveys in other languages to ensure that the gig workforce is better represented in research and policy. Fourth, the sample size included in this study is relatively small. It may be that gig workers are "hard-to-reach" participants due to the time pressures they experience; however, without a larger sample size, it is difficult to gain a more comprehensive understanding of their safety behaviors (e.g., the role

of exposure in gig worker safety). Future research should consider recruitment strategies that would be more successful in engaging more gig workers in research studies.

Another limitation relates to the data collected and reported in this study. The present study relied on self-reported data on gig workers' own involvement in road safety incidents and the likelihood of reporting safety incidents when gig working. Self-reported data is limited in that it requires participants to establish a criterion for reporting. For example, some participants may have lower risk perceptions and underestimate what is considered an incident and, thus, report that they have not been involved in an incident when they actually have been, or that they underestimate the likelihood that they would report safety incidents when gig working, when in reality, they would report these incidents. There is some research suggesting that certain populations (e.g., males) who are at high risk of safety incidents had lower risk perception (Sund et al., 2017). It is possible that gig workers, who are considered at high risk of safety incidents, have lower risk perceptions, in turn, influencing their incident reporting. Importantly, because the present study did not measure risk perception, we cannot rule out any gender differences in gig workers' risk perception; for example, male gig workers having lower risk perceptions than female gig workers. Finally, another limitation relates to the study design. The present study only took a quantitative approach to investigate gig workers' likelihood of reporting safety incidents. A more holistic understanding could be gleaned from participants' views through a qualitative approach. In existing studies on gig work, qualitative interviews and mixed-methods approaches have revealed important insights into health and safety risks and working conditions in this context (e.g., Christie & Ward, 2019).

4.2 | Future directions

Future research efforts to understand gig work and the experiences of gig workers are strongly encouraged, as the gig workforce continues to grow. Although, thus far, findings from studies that have investigated the health and safety of gig workers have painted a bleak picture, these findings present opportunities to remediate these issues. One opportunity is to refine existing crash data systems to enable targeted analyses of gig worker crashes. Current road crash reporting systems do not enable this and hence it is difficult to determine the proportion of road crashes that involve gig workers. Relating to this point, appropriate data collection methods should be implemented to better understand the kinds of incidents that compromise the safety of gig workers and the factors that contribute to these incidents. This could be facilitated through the development of a gig economy worker crash and near miss incident reporting system or through further survey studies. The collection of this data can greatly benefit policymaking and the development of strategies to enhance the safety of gig workers.

A gendered dimension must also be considered when collecting data on gig working. Previous studies have suggested that there are gender differences in the types of gig work engaged in (e.g., Williams, Mayes, et al., 2021), but it would be useful to collect more data about the reasons and motivations for women to engage, or not engage, in gig work or in the different types of gig work. Given that different types of gig work present different health and safety risks, a "one-size-fits-all" approach to enhancing the health and safety of gig work may be suboptimal. By addressing the health and safety issues faced specifically by women engaging in gig work, it could support more female participation in this workforce, providing more equal access to this sector, especially since this sector affords benefits such as worker flexibility.

Future research should also consider taking systems thinking approach to understand holistically the issues of gig work (e.g., Nilsen et al., 2022). Systems thinking approaches are applied within safety science to help understand and improve safety in complex systems; in this context, gig work within the road transport system. The core tenet of systems thinking is that behavior, safety, and accidents are emergent properties arising from nonlinear interactions between multiple components across sociotechnical systems (Leveson, 2004; Rasmussen, 1997). Systems thinking approaches have been effectively used to understand health and safety issues across several domains, including transport safety (e.g., Read et al., 2019, 2021; Salmon & Read, 2019; Salmon et al., 2019), in sport (e.g., Hulme et al., 2019), and in youth active recreation (e.g., Koorts et al., 2022). In the context of gig work and closing the gender data gap, systems thinking approaches can benefit our understanding of factors that influence the gendered participation in the gig workforce and, consequently, their health, safety, and well-being when gig working.

5 | CONCLUSION

The flexibility and unbiased entry of gig work makes participation in this workforce enticing for many individuals, but the precarity of gig work threatens the health and safety of gig workers. Further, little attention has been given to gender differences in the health and safety of gig workers. The present study found no gender differences in involvement in safety incidents or the likelihood of reporting safety incidents for gig workers involved in ride-hailing, courier, and food delivery services. While no gender differences were observed, the present study contributes to our understanding of gig worker safety and to closing the gender data gap by providing more gender-specific workplace safety data in the gig workforce.

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The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Research data are not shared.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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