

Relationship between occupational injury and gig work experience in Japanese workers during the COVID-19 pandemic: a cross-sectional internet survey

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Abstract: This study evaluated the relationship between occupational injury risk and gig work, which included the exchange of labor for money between individuals or companies via digital platforms. As Japan has experienced a severe economic decline during the coronavirus disease 2019 (COVID-19) pandemic, an increasing number of individuals have engaged in gig work. While few studies have evaluated occupational risks in gig work, several traffic accidents associated with food delivery gig work have been reported in the mass media. In this study, 18,317 individuals completed an internet survey that collected information pertaining to their involvement in gig work and experience of related occupational injuries; data regarding several confounding factors were also recorded. Multiple logistic regression analysis showed that workers involved in gig work had a greater risk of any minor occupational injuries (odds ratio, 3.68; 95% confidence interval, 3.02–4.49) and activity-limiting injuries (odds ratio, 9.11; 95% confidence interval, 7.03–11.8) than those not involved in gig work, after adjusting for age, sex, household income, lifestyle factors, and work-related factors. The results of this study indicate that gig workers are exposed to greater occupational hazards during the COVID-19 pandemic. Additional studies are warranted to clarify the causal mechanism for this relationship.

Key words: COVID-19, Gig work, Gig economy, Occupational injury, Work-related injury, Survey

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Introduction

The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was first identified in December 2019. Since then, the coronavirus 2019 disease (COVID-19) pandemic has spread across the globe. As a result, many countries have introduced a wide range of restrictions to control the infection, including social isolation, international travel bans, and suspension of non-essential activities. The Japanese government has specifically requested its citizens to maintain physical distancing and refrain from performing non-essential activities, which have been effective in reducing the incidence of COVID-19. However, such measures have also restricted economic activities¹⁻³. Thus, similarly to other countries, Japan has experienced a severe economic decline during the COVID-19 pandemic⁴. A previous study reported that individuals who do not work from home or have jobs with high physical proximity (e.g., food services) have been particularly affected by this economic downturn².

Rapid advances in digital technology since the beginning of the 21st century have led to a substantial growth in the number of jobs mediated through digital online platforms. The “gig economy” emerged as a key theme in a recent independent review of modern employment practices. The term “gig” has traditionally referred to short-term employment arrangements for musical events⁵. The Department for Business, Energy and Industrial Strategy (BEIS) currently defines gig workers as those who engage in a “gig economy,” which involves the “exchange of labor for money between individuals or companies via digital platforms (e.g., Uber, TaskRabbit, PeoplePerHour) that actively facilitate matching between providers and customers, on a short-term and payment by task basis⁶.” Gig workers can include individuals who are employed as delivery personnel, personal assistants, drivers, handymen, cleaners, cooks, dog-sitters, and babysitters. The Chartered Institute of Personnel and Development estimates that there are currently approximately 1.3 million people (4% of all employed individuals) working in the gig economy in the United Kingdom; the most frequently cited reason for engaging in gig work is to generate additional income⁷. While it appears that the number of gig workers has also increased in Japan during the COVID-19 pandemic, the overall contribution of gig work to the total economy in Japan remains unclear.

A previous study reported that temporary workers had a greater risk of injury due to lower levels of work experience and knowledge of workplace hazards⁸. Moreover, gig

workers do not have their own employer (multiple employers through platform companies); while temporary workers have their employers. Health and safety risks are often presumed to be worse with gig work due to the lack of security and facilitation inherent to official workplaces⁹. However, to the best of our knowledge, no prior studies have investigated this issue.

The objective of this internet survey was to investigate the characteristics of Japanese gig workers and to determine whether gig workers have a greater risk of occupational injury.

Subjects and Methods

Participants

The Japan COVID-19 and Society Internet Survey (JACSIS) was a cross-sectional, web-based, self-reported questionnaire that was launched in 2020 to investigate how social issues such as health, medical care, work style, and economy have changed during the COVID-19 pandemic. The survey panel comprised approximately 2.2 million nationally representative respondents from diverse socioeconomic backgrounds (in terms of educational level, household income, number of household members, and marital status) at a Japanese internet research company (Rakuten Insight, Inc.). Several studies using data from the JACSIS study have been previously published¹⁰⁻¹³.

We analyzed data from the second JACSIS questionnaire conducted in 2021. From September 27, 2021, to October 29, 2021, this questionnaire was distributed to 33,081 candidates who had previously completed the JACSIS questionnaire in 2020; the response rate was 69% (n = 22,838). The questionnaire was then distributed to new panelists from the same research company until the target sample size of 31,000 respondents was reached. All respondents completed a web-based informed consent form at the time of registration. The study protocol was approved by the ethics committee of the Osaka International Cancer Institute (approval number: 20084-6).

We first excluded 2,825 respondents who had provided invalid responses in the questionnaire (i.e., those deemed to have not read the questions before providing responses). These invalid responses¹¹ were categorized as follows: 1) failure to select the second item from the bottom of the list in the dummy question (n=2,705); 2) selection of all items in the list of seven substances (alcohol, sleeping medications, opioids, sniffing paint thinner, legal psychoactive drugs, marijuana, and cocaine/heroin) (n=97); and 3) selection of all items in the list of 16 diseases (n=62). A total of

28,175 respondents (age range, 16–81 yr; 49.2% male) remained after these exclusions. We subsequently excluded an additional 9,858 respondents who were unemployed, full-time homemakers, retirees, or students. Thus, 18,317 respondents (age range, 16–80; 56.8% male) were included in the final analysis.

Gig work

Experience in gig work was assessed with the following question: “Have you worked on a task-based job via digital platforms (e.g., Uber eats, Lancers) in the previous 1-yr period?” Respondents were able to select either “yes” or “no.” This question was based on the aforementioned BEIS definition of a gig economy⁶.

Incidence of injury during work or the commute to work

The incidence of injury was assessed via the following two questions: 1) “Have you ever been injured (including scratches and cuts) during your work or commute to work in the previous 1-yr period?”¹⁴; and 2) “Have you ever experienced injuries that limited your usual ability to work during work or while commuting to work in the previous 1-yr period?”¹⁵ Respondents were prompted to select either “yes” or “no.”

Potential confounding variables

Several risk factors for occupational injury have been reported^{8, 16–20}. We collected data on potential confounders such as age, sex, main occupation (based on the Japan Standard Occupational Classification²¹), household income in 2020 (categorized as <2,999 yen, 3,000–5,999 yen, >6,000 yen, “do not want to answer,” or “do not know”¹¹), employment status (standard employment, non-standard employment, self-employed, or freelancer), working hours per week (including both the main job and second job), smoking status (current smoker, past smoker, or non-smoker), amount of alcohol consumption, and self-rated health. Self-rated health was assessed by the following question: “What is your current health status?” (excellent, good, fair, poor, or bad). This question was used in the Comprehensive Survey of Living Conditions (CSLC), which was conducted by the Ministry of Health, Labour and Welfare of the Japanese government^{22–25}.

Statistical analysis

Previous studies have suggested that adjusted estimates using inverse probability weighting obtained from a propensity score (from an internet-based convenience sample) provide similar parameter estimates, or at least reduced dif-

ferences arising from selection bias, compared to population-based estimates^{26, 27}. To correct for the selectivity of internet-based samples, we used a population-based sample from the CSLC that was representative of the Japanese population. The full details of the methods used can be found in a previous study that used JACSIS data¹³.

Intergroup comparisons of categorical variables were analyzed using the chi-square test. Residual analysis was performed to identify the specific difference when the chi-square test yielded a significant difference among the groups²⁸. Multivariable logistic regression analysis²⁹ was applied to evaluate the association between gig work experience and injury during work or the commute to work. The experience of any minor injury or that of activity-limiting injury (yes or no), which were outcomes of our study, inputted logistic regression analysis as a dependent variable, separately. We put the gig work experiment as an independent variable. We also put covariates as an independent variable: sex, age, household income, working hours, main occupation, self-rated health, smoking status, and amount of drinking. Some occupation types were combined in the multiple logistic regression analysis, due to the small numbers of workers in each occupation. We combined security or transportation with “Else” occupation. We also categorized construction with occupations involving carrying, cleaning, and packaging.

Results

Gig work was associated with younger age, male sex, lower household income, freelancing, fewer working hours, reduced income, and job loss (Table 1). Employees in the sales and service sectors were more likely to be engaged in gig work compared to those employed in the following occupations: clerical work, security, manufacturing, construction, mining, and carrying, cleaning, and packaging (Table 2).

The incidence rates of occupational injury in no gig work respondents were 9.2% and 2.0% for any minor injury and activity-limiting injury, respectively. Occupational injury incidence varied according to main occupation type. The incidence rates of minor and activity-limiting injuries were higher among respondents who had experience in gig work (27.8% and 17.1%, respectively) than in those with no experience (9.2% and 2.0%, respectively). Respondents with gig work experience had a greater risk of injury during work or the commute to work in almost every occupation type. Gig workers also had a greater risk of activity-limiting injury, despite its absence in some occupations (Table

Table 1. The characteristics of worker with gig work experience in the last year

				Gig work experience in the last year				<i>p</i> Value ^{a)}
				Yes		No		
				591	3.3%	17,366	96.7%	
Age (year)	–19	313	1.7%	23	7.3% ▲	290	92.7% ▽	<0.001
	20–29	2,968	16.5%	187	6.3% ▲	2,781	93.7% ▽	
	30–39	3,458	19.3%	126	3.6%	3,332	96.4%	
	40–49	4,493	25.0%	120	2.7% ▽	4,373	97.3% ▲	
	50–59	3,682	20.5%	85	2.3% ▽	3,597	97.7% ▲	
	60–69	2,248	12.5%	26	1.2% ▽	2,222	98.8% ▲	
	70–79	795	4.4%	24	3.0%	771	97.0%	
Sex	Men	10,279	57.2%	382	3.7%	9,897	96.3%	<0.001
	Women	7,678	42.8%	208	2.7%	7,470	97.3%	
Household income in 2020 (1,000yen)	–2,999	2,304	12.8%	103	4.5% ▲	2,201	95.5% ▽	<0.001
	3,000–5,999	5,425	30.2%	179	3.3%	5,246	96.7%	
	6,000+	6,527	36.3%	196	3.0%	6,331	97.0%	
	Do not want to answer	1,803	10.0%	51	2.8%	1,752	97.2%	
	Do not know	1,896	10.6%	60	3.2%	1,836	96.8%	
Employment status	Regular employment	10,158	56.6%	292	2.9% ▽	9,866	97.1% ▲	<0.001
	Non-regular employment	5,872	32.7%	173	2.9%	5,699	97.1%	
	Self-employed	1,451	8.1%	55	3.8%	1,396	96.2%	
	Freelance	475	2.6%	69	14.5% ▲	406	85.5% ▽	
Duration of work (hours/week)	–20	2,570	14.3%	114	4.4% ▲	2,456	95.6% ▽	<0.001
	20–29	2,221	12.4%	100	4.5% ▲	2,121	95.5% ▽	
	30–39	3,417	19.0%	104	3.0%	3,313	97.0%	
	40–49	7,418	41.3%	211	2.8% ▽	7,207	97.2% ▲	
	50–59	1,284	7.2%	31	2.4%	1,253	97.6%	
	60+	1,046	5.8%	30	2.9%	1,016	97.1%	
Household income reduction	Yes	6,507	36.2%	325	5.0%	6,182	95.0%	<0.001
	No	11,449	63.8%	265	2.3%	11,184	97.7%	
Work reduction	Yes	5,288	29.4%	331	6.3%	4,957	93.7%	<0.001
	No	12,667	70.5%	258	2.0%	12,409	98.0%	

Table 1. Continued

				Gig work experience in the last year				<i>p</i> Value ^{a)}
				Yes		No		
				591	3.3%	17,366	96.7%	
Job loss	Yes	1,230	6.8%	134	10.9%	1,096	89.1%	<0.001
	No	16,726	93.1%	456	2.7%	16,270	97.3%	
Self-rated health	Excellent	3,813	21.2%	149	3.9% ▲	3,664	96.1% ▽	0.013
	Good	3,649	20.3%	121	3.3%	3,528	96.7%	
	Fair	8,743	48.7%	256	2.9% ▽	8,487	97.1% ▲	
	Poor	1,571	8.7%	52	3.3%	1,519	96.7%	
	Bad	180	1.0%	11	6.1% ▲	169	93.9% ▽	
Smoking status	Non smoker	8,801	49.0%	276	3.1%	8,525	96.9%	0.009
	Past smoker	4,283	23.9%	122	2.8%	4,161	97.2%	
	Current smoker	4,871	27.1%	191	3.9% ▲	4,680	96.1% ▽	
Amount of drinking (alcohol g/day)	Non drinker	6,856	38.2%	232	3.4%	6,624	96.6%	0.280
	–19.9	4,290	23.9%	144	3.4%	4,146	96.6%	
	20–39.9	3,500	19.5%	97	2.8%	3,403	97.2%	
	40.0–	3,310	18.4%	117	3.5%	3,193	96.5%	
Main occupation	Professional and engineering	3,196	17.8%	108	18.3%	3,088	17.8%	<0.001
	Clerk	3,944	22.0%	107	18.1% ▽	3,837	22.1% ▲	
	Shop and market sale	2,214	12.3%	88	14.9% ▲	2,126	12.2% ▽	
	Service	1,552	8.6%	69	11.7% ▲	1,483	8.5% ▽	
	Security	258	1.4%	2	0.3% ▽	256	1.5% ▲	
	Manufacturing process	1,649	9.2%	38	6.4% ▽	1,611	9.3% ▲	
	Transport and machine operation	403	2.2%	15	2.5%	388	2.2%	
	Construction and mining	375	2.1%	5	0.8% ▽	370	2.1% ▲	
	Carrying, cleaning, packaging	677	3.8%	13	2.2% ▽	664	3.8% ▲	
	Else	3,689	20.5%	144	24.4% ▲	3,545	20.4% ▽	

The numbers on this Table were adjusted using inverse probability weighting.

a) Chi-square test, ▽: statistically significant lower than expected value by residual analysis,

▲: statistically significant higher than expected value by residual analysis

Table 2. The relationship between gig work experience and occupational injury according to main occupation

Main occupation	Gig work experience in the last year						No gig work experience					
	Number of workers		Any minor injury		Activity-limiting injury		Number of workers		Any minor injury		Activity-limiting injury	
	n	incidence*	n	incidence*	n	incidence*	n	incidence*	n	incidence*	n	incidence*
Professional and engineering	108	24	22.2	12	11.1	3,088	256	8.3	53	1.7		
Clerk	107	31	29.0	20	18.7	3,837	196	5.1	57	1.5		
Shop and market sale	88	23	26.1	15	17.0	2,126	165	7.8	31	1.5		
Service	69	31	44.9	25	36.2	1,483	189	12.7	33	2.2		
Security	2	0	0.0	0	0.0	256	23	9.0	7	2.7		
Manufacturing process	38	10	26.3	6	15.8	1,611	209	13.0	29	1.8		
Transport and machine operation	15	6	40.0	0	0.0	388	37	9.5	9	2.3		
Construction and mining	5	4	80.0	0	0.0	370	76	20.5	15	4.1		
Carrying, cleaning, packaging	14	5	35.7	1	7.1	664	124	18.7	32	4.8		
Else	144	30	20.8	22	15.3	3,545	328	9.3	83	2.3		
Total	590	164	27.8	101	17.1	17,368	1,603	9.2	349	2.0		

* Incidence rate of injury in each main occupation per 100 person

The prevalence of main occupations were significantly different between worker with and without gig work experience ($p < 0.001$, Chi-square test).

▽ : statistically significant lower than expected value by residual analysis

▲ : statistically significant higher than expected value by residual analysis

The numbers on this Table were adjusted using inverse probability weighting.

2).

The results of the multivariate logistic regression analysis indicated that gig workers had a significantly higher risk of injury after adjustments for covariates (Table 3). The odds ratios of any minor injury and activity-limiting injury were 3.40 (95% confidence interval, 2.81–4.11) and 8.37 (95% confidence interval, 6.47–10.82), respectively. Younger age, lower income, longer working hours, non-standard employment, and self-employment were associated with a significantly higher risk of injury. Occupation involving carrying, cleaning, and packaging had the highest occupational injury risk.

Discussion

This study investigated the characteristics of gig workers and the relationship between gig work and occupational injury. Our results showed that 3.3% of Japanese workers had experience in gig work. Involvement in gig work was associated with younger age, male sex, lower income, freelancing, work reduction, and prior job loss. Gig workers had a much higher incidence rate of occupational injury (27.8% for any minor injury and 17.1% for activity-limiting injury) than those who did not have gig work experience (9.2% and 2.0%, respectively). Multiple regression analysis indicated that gig workers had a three times greater risk of any minor occupational injury and an eight times greater risk of activity-limiting injury, after adjustment for potential confounders.

Previous surveys have suggested that 8%, 4%, and 7.1% of respondents in the United States (2016)³⁰, United Kingdom (2017⁷, 2018⁶), and Australia (2019)³¹ engaged in gig work, respectively. These studies reported that gig workers were more likely to be younger, male, and have a lower annual income. The most common motives for participating in gig economy platforms were additional income and work flexibility. These findings are consistent with our results.

In the present study, respondents in the marketing, sales, and service sectors were more likely to engage in the gig economy for additional income. These respondents were more likely to have experienced a reduction in the amount of available work and job loss due to COVID-19 social distancing policies⁴. Furthermore, freelancers appeared to have the greatest amount of experience in gig work during the COVID-19 pandemic. This was not unexpected, as the characteristics of gig work are similar to those of freelancing, where work availability is intermittent, and payment is provided for specific tasks.

The rate of activity-limiting injury in no gig workers (2.0%) was larger than Japanese workers' accident rate (0.23%) in 2020 reported by Japan Industrial Safety & Health Association (JISHA)³². This discrepancy may be attributed to the differences in defining 'accident', where JISHA considers fatalities and injuries requiring absence of 4 days or more, while our definition of accident includes less than 4 days of absence owing to injury. Our results of activity-limiting injury rate (2.0%) were consistent with a previous Japanese study which reported 3.35% of occupational injury from an organizations' records³³ regardless of the number of absentee days or other previous studies in the US or Europe which reported an occupational injury rate of 3–5% for those with paid sick leave^{20, 34}, and 5–10% for those with any restriction of activity^{18, 35}. In contrast, the incidence rate of any minor injury in our study (9.2% in no gig workers and 27.8% in gig workers) was lower than rates of 30–40% reported by previous studies^{14, 36, 37}. This discrepancy may be attributed to differences in the way in which the questions were phrased, as well as differences in the respondents' occupation types.

To the best of our knowledge, the present study is the first to report the risk of occupational injury among gig workers. The elevated risk of occupational injury among gig workers may be explained by a lack of experience with the jobs offered in the gig economy. A previous study found that workers who were employed in temporary agencies had higher overall injury rates than permanently employed workers; this was attributed to lower levels of work experience and knowledge of workplace hazards among temporary workers⁸. Another study reported that prior work experience was associated with a lower rate of injury³⁸.

The type of gig work should also be considered. Courier and food delivery services account for more than 60% of the gig economy⁶. Moreover, most Japanese gig workers deliver foods using their bicycles or scooters because of legal restrictions. The traffic accident risk could thus be higher. We suspect that the 8.5-fold increase in activity-limiting injuries (17.1%) among gig workers may be largely due to traffic accidents during food deliveries. Our results were consistent with previous results in a Greece study which reported that 25.3% of food delivery riders were involved in serious accidents³⁹. In the present study, we found that such work (e.g., carrying) posed a high risk of injury (Tables 2 and 3). These jobs are often hazardous even for permanent employees with a high level of experience⁴⁰. The risk of injury may be further exacerbated by a low decision latitude among these gig workers, as well as the progressive saturation of the food delivery market

Table 3. Relationship between gig work experience and occupational injury

		Any minor injury			Activity-limiting injury		
		OR	95% CI		OR	95% CI	
Gig work experience in the last year	No	1.00	(reference)		1.00	(reference)	
	Yes	3.68	3.02	4.49	9.11	7.03	11.8
Age (year)	–19	2.17	1.54	3.07	1.48	0.70	3.09
	20–29	1.85	1.58	2.16	2.17	1.64	2.89
	30–39	1.00	(reference)		1.00	(reference)	
	40–49	0.85	0.72	0.99	0.68	0.50	0.94
	50–59	0.69	0.58	0.82	0.66	0.47	0.93
	60–69	0.79	0.65	0.97	0.89	0.61	1.29
	70–79	0.72	0.54	0.97	0.51	0.27	0.94
Sex	Female	1.00	(reference)		1.00	(reference)	
	Male	0.97	0.86	1.10	0.92	0.73	1.16
Household income in 2020 (1,000yen)	6,000+	1.00	(reference)		1.00	(reference)	
	3,000–5,999	1.38	1.21	1.57	1.02	0.80	1.30
	–2,999	1.52	1.29	1.79	1.14	0.84	1.54
	Do not want to answer	1.04	0.85	1.28	0.67	0.44	1.02
	Do not know	1.23	1.02	1.47	0.87	0.61	1.24
Employment status	Standard employment	1.00	(reference)		1.00	(reference)	
	Non-standard employment	1.44	1.25	1.67	0.67	0.50	0.90
	Self employed	1.44	1.19	1.75	2.09	1.52	2.88
	Freelance	0.68	0.46	1.00	0.73	0.40	1.31
Duration of work (hours/week)	–20	1.00	(reference)		1.00	(reference)	
	20–29	1.30	1.07	1.59	1.28	0.88	1.85
	30–39	1.47	1.21	1.79	1.06	0.73	1.54
	40–49	1.77	1.46	2.14	1.14	0.80	1.64
	50–59	1.91	1.48	2.46	0.85	0.51	1.42
	60+	1.94	1.50	2.52	1.10	0.67	1.80
Main occupation ^{a)}	Clerk	1.00	(reference)		1.00	(reference)	
	Professional and engineering	1.58	1.31	1.91	0.97	0.68	1.37
	Shop and market sale	1.36	1.11	1.68	0.87	0.59	1.28
	Service	2.11	1.72	2.60	1.47	1.01	2.14
	Manufacturing process	2.25	1.83	2.75	1.04	0.68	1.58
	Carrying, cleaning, packaging	3.58	2.89	4.44	2.24	1.50	3.33
	Else	1.62	1.36	1.94	1.30	0.95	1.77
Self-rated health	Excellent	1.00	(reference)		1.00	(reference)	
	Good	1.14	0.96	1.35	1.05	0.75	1.46
	Fair	1.35	1.18	1.56	1.48	1.13	1.94
	Poor	2.00	1.66	2.42	2.46	1.73	3.49
	Bad	1.80	1.15	2.82	3.49	1.84	6.63
Smoking status	Non smoker	1.00	(reference)		1.00	(reference)	
	Past smoker	1.29	1.12	1.48	1.55	1.18	2.02
	Current smoker	1.41	1.24	1.61	1.52	1.19	1.95
Amount of drinking (alcohol g/day)	Non drinker	1.00	(reference)		1.00	(reference)	
	–19.9	1.13	0.99	1.29	0.92	0.70	1.19
	20–39.9	0.90	0.77	1.04	0.83	0.62	1.12
	40.0–	1.17	1.01	1.35	1.24	0.95	1.62

a)Security or transportation were combined with “Else” occupation.

Construction was also combined with occupations involving carrying, cleaning, and packaging.

during the COVID-19 pandemic^{41, 42}).

In order to protect temporary workers, including those engaged in the gig economy, the Occupational Safety and Health Administration and National Institute for Occupational Safety and Health have recommended the following practices to staffing agencies and host employers^{43, 44}): 1) evaluate the host employer's worksite; 2) train agency staff to recognize safety and health hazards; 3) ensure the employer meets or exceeds the standards of other employers; 4) assign occupational safety and health responsibilities and define the scope of work in the contract; and 5) injury and illness tracking. The Japan Food Delivery Service Association was established in February 2021⁴⁵) by major platforms (e.g., Uber Eats Japan, Demaekan, Menu, RIDE ON EXPRESS HOLDINGS) in the Japanese food delivery sector and it developed traffic safety guidelines in October 2021⁴⁶). It is hoped that digital platforms for gig work in other sectors will adopt a similar approach to ensure occupational safety.

Our study has some limitations. First, available data was restricted to whether the respondents had prior experience of gig work; information pertaining to the type of work (e.g., food delivery, transport using a self-owned vehicle, translation, professional service) was not available. We were also unable to obtain details regarding the injuries sustained by gig workers. Second, as we analyzed data obtained via self-reported questionnaires, our results may have been affected by recall bias. Nevertheless, a previous study demonstrated that self-reported data on workplace injuries accurately reflected actual incidence rates²⁰). Fourth, it is possible that freelancing and self-employment were misclassified, due to their overlapping definitions. Professional workers tended to select "freelance," while construction and retail workers tended to select "self-employed" (data not shown). Finally, as this was a cross-sectional study, we could not demonstrate a causal relationship between gig work experience and occupational injury. Nevertheless, while the increased risk of occupational injury may be explained by exposure to gig work, there would be no rational explanation for the reverse causal relationship.

In conclusion, the results of this study demonstrated a relationship between gig work and an increased risk of occupational injury. Our findings highlight the need for measures to ensure the safety of gig workers, particularly during the COVID-19 pandemic.

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