



Delivering hot food on motorcycles: A mixed method study of the impact of business model on rider behaviour and safety

Nicola Christie^{*}, Heather Ward

Centre for Transport Studies, Chadwick 209, UCL, Gower street, London WC1E 6BT, United Kingdom

ARTICLE INFO

Keywords:

Road safety
Food delivery
Motorcyclists
Gig economy

ABSTRACT

In Great Britain, motorcyclists have the highest fatality rate per billion passenger miles of all road users, and people who work on motorcycles have a much greater risk of injury compared to other motorcyclists. Many hot meal delivery services are provided by people using motorcycles. Work can be accessed by an app or by being employed by a restaurant. There is a need to understand whether the business model under which riders work influences their experience of risk or whether this is just related to the risks of delivering food by motorbike per se. Interviews were conducted with six gig riders and 14 employed riders and an online survey was completed by 164 riders working via apps and 155 employed by restaurants. Gig workers were significantly more likely to agree that their phone was a distraction and that they violated traffic laws related to speeding, red light running and, unsurprisingly, they had more points on their licence compared to employed riders. Gig riders were also more likely to be incentivised to ride in dangerous conditions and carry unstable loads. Gig workers were more likely to report being involved in collisions where their vehicle was damaged and where someone was injured. These findings were also evident in interview narratives. More needs to be done to make gig companies embed practices that do not increase risks for delivery riders.

1. Introduction

Hot food delivery has become part of our lifestyle, especially among younger people (Panse et al., 2019) and has grown as a result of the pandemic (Lobel, 2020). Hot food delivery can be accessed directly from restaurants who have their own fleet of workers or can be accessed via digital platforms which connect restaurants to consumers via independent workers who provide delivery service and get paid per delivery or 'gig' via the app. There are benefits for these gig workers such as providing flexibility and opportunities for work (Healy et al., 2020). However, the nature of gig work is uncertain and precarious (Anwar & Graham, 2019; Bérastégui, 2021), and associated with a range of psychosocial risk factors including physical and social isolation, digital surveillance and work transience (Bérastégui, 2021). There is mounting evidence of growing concerns of gig workers about the low pay associated with their work which was felt to be unsustainable (Myhill et al., 2021). Arguably, gig work poses an existential threat to health and safety at work because there is no management of occupational risk faced by workers. Many food delivery services are provided by people using powered two wheelers which represent one of the most vulnerable

transport modes. In 2019 in Great Britain, motorcyclists accounted for 20 % of fatalities and have the highest fatality rate per billion passenger miles of all road users, a rate which is over 50 times greater than that of car occupants (Department for Transport, 2020). It is generally agreed that occupational motorcyclists have a much greater risk of injury compared to other motorcyclists considering age, experience, and exposure (Christie, 1996), however data on occupational status is not routinely collected as part of police reporting.

Recent research indicates a pressing need to address the rise in delivery riders and increasing crash rates (Choi et al., 2022). In their review of delivery rider injuries, Mckinlay et al., (2022) has shown that young (under 30 years) males were the key demographic group and the most common risk factors were lack of riding experience, pressure of the work and insufficient protective equipment. In addition to time pressure, the total time on road was an important risk exposure factor. Byun et al., (2020) also showed that most of injured riders were temporary workers and had less than six months experience as a delivery rider.

Little research has focused on the safety risks associated with food delivery under the gig business model compared to the risks of those employed by companies to deliver food, nor is much known about what

^{*} Corresponding author.

E-mail addresses: Nicola.christie@ucl.ac.uk (N. Christie), H.ward@ucl.ac.uk (H. Ward).

<https://doi.org/10.1016/j.ssci.2022.105991>

Received 1 March 2022; Received in revised form 17 October 2022; Accepted 21 October 2022

Available online 31 October 2022

0925-7535/© 2022 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

interventions could reduce these risks. Christie and Ward (2019) carried out research on the safety risks of people who delivered parcels and food and provided taxi services as part of the gig economy. This study involved interviews and an online survey and showed that a large proportion of the 231 respondents (42 %) had experienced a collision where their vehicle had been damaged. Of the total sample 10 % said someone (usually themselves) had been injured in a collision with those on motorcycles or mopeds being mostly like to report being injured. The study identified that safety management was virtually non-existent and that the gig business model created a work environment that was highly pressured, distracting and one that incentivised people to drive when the conditions were most dangerous i.e., wet, and icy. There was no regulation of driving hours and many riders and drivers worked long hours over several weeks and reported severe fatigue as a result. Online survey results revealed that many gig workers agreed that they committed traffic offences such as speeding and going through red lights to get the jobs done quickly and earn more. In fact, 74 % of those on powered two wheelers agreed that they travelled above the speed limit because of the pressure of work. Self-reported collisions involving someone being injured were 6 % among all gig car/van drivers but 20 % among vulnerable road users such as those on mopeds and motorcycles.

In the online survey the sample of respondents who used motorcycles was small (27), but analysis of their responses showed most were involved in food delivery and paid per delivery. Under half worked full time and had been riding for less than a year. Around a quarter also worked for two or more companies. A third were in the high-risk age group for collisions i.e., aged 17–24 and most were male. Most said they had travelled above the speed limit because of pressure and had experienced regular near misses. More than a third said they had gone through red lights. Of the total sample, 11 % had received points on their licence whilst working. Over a third agreed that the app was a distraction when working. Over half said they were given some training on managing risks and over two thirds said they had been given some safety equipment.

Gig riders reported fatigue and pressure to violate speed limits and to use their phones whilst driving or riding, for directions and to accept jobs. Christie and Ward (2019) concluded that owners of digital platforms could consider adapting their model in several ways to improve the safety of workers.

There is a need to understand whether the business model under which riders work influences their experience of risk, or whether this is just related to the risks of delivering food by motorcycle per se. The aim of this study was to compare road injury risks experienced by people who deliver food on motorcycles in relation to the business model in which they work and identify solutions for managing their safety.

2. Methodology

The methodology involved four main stages. First, six participants (three working as employees and three working as self-employed) formed a user group to test the topic guides for riders. Secondly, interviews were conducted with six gig riders and 14 employed riders. The smaller number of gig riders occurred because it soon became apparent that the emerging themes were very similar to those found in previous research i.e. thematic saturation had been reached (Christie and Ward, 2019).

All interviews were audio recorded and transcribed by the fieldwork company. The interview transcripts were analysed using template analysis, (King, 2004), which is regarded as a practical tool for applied research. The template was based on the topic guide of semi structured questions which was developed as a priori topics of interest.

This initial template was developed by analysing the first three transcripts for each participant group. Then this template was applied to the whole data set. Relevant quotes were highlighted, and verbatim quotes were selected to exemplify key messages. The first three transcripts were also coded by another researcher. Coding in the template

was broadly consistent between coders. The aim of the qualitative research was to reflect the ideas that arise in a guided conversation between interview and interviewee and give an 'interpretative' story of how the themes or ideas in the data inform our understanding of the safety risks experienced by people delivering food on motorcycles (Braun and Clarke, 2006).

Finally, from a review of the emerging themes, an online questionnaire was developed aimed at gig and employed riders. Cognitive interviews were carried out to test the questionnaire before it was launched online. The sampling was quota sampling requiring 150 each of gig and employed motorcyclists. The total sample size provided a 90 % confidence level for a 5 % margin of error. A field work company was contracted to carry out the online survey. All participants and respondents were financially compensated for their participation. Ethical approval for the study was obtained from UCL Ethics Committee.

3. Results

The qualitative and quantitative data are presented together to show whether the findings are similar or different. The quantitative data has been analysed to compare differences between gig and employed responses, using chi square statistics. A difference between the two groups is described as significant if the probability of it occurring by chance was equal to or <0.05 %. Finally, multivariate analysis was carried out to explore the role of company type with other key covariates to explore behaviour related to reported violation of the speed limit under pressure.

3.1. Interview survey

3.1.1. Characteristics of the interview participants

All 20 participants worked in urban centres and there was a spread of IMD deciles (Indices of Multiple Deprivation <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019>) but half the riders were from the more deprived areas (1 to 4). Most rode their own motorcycles for work. Though the number of gig workers compared to employed workers was small (and not statistically comparable) on average gig workers spent 37 h a week working whereas the employed did 18 h a week (Table 1).

3.2. Characteristics of online survey respondents

Of the 319 online survey respondents, 164 were working as gig workers and 155 as employees. Of the total sample 78 % were male, 50 % were aged between 25 and 35, 27 % were aged between 17 and 24 and 23 % were aged 36 or over. Over a third (36 %) identified as White British, 32 % as Asian (Indian, Bangladeshi) and 7 % as Black African, with 26 % as Other. There was no significant difference between the proportion of White British and non-White BAME (Black and Asian, Minority Ethnic) groups by worker type. From an analysis of postcodes most of the respondents were from England and Wales and lived in urban centres. There was no significant difference in the cc of motorcycles ridden (we were deliberately targeting those on 125 cc or less). Most were riding 125 cc (65 %), 22 % were riding a 50 cc, 9 % ride 126–400 cc and 3 % >400 cc.

3.2.1. Interview themes and online survey results

Where quotes are presented for interviews, they are followed by the participants sex, (ID), age, type of worker and location and can be cross-referenced to Table 1.

3.2.1.1. Work situation

3.2.1.1.1. Interviews. People who ride motorcycles for delivery work in the food delivery business have a range of employment situations. There were the 'desperate' – who needed money as no other work

Table 1
Characteristics of meal delivery rider participants.

| ID | Employment status | Age | How long worked as a rider | Who owns the vehicle | Motorcycle cc | Basis of work | Average hours per week | Sex | Area | IMD * |
|----|-------------------|-----|----------------------------|----------------------|---------------|--|------------------------|-----|----------------|-------|
| 1 | Gig | 28 | > 2 years | Owned | 125 | Flexible hours with no minimum | 10 | M | Manchester | 7 |
| 2 | Gig | 28 | > 2 years | Owned | 125 | Flexible hours with no minimum | 55 | M | London | 6 |
| 3 | Gig | 34 | > 2 years | Owned | 125 | Flexible hours with no minimum | 50 | M | London | 6 |
| 4 | Gig | 27 | 1–2 years | Owned | 125 | Flexible hours with no minimum | 60 | M | London | 6 |
| 5 | Gig | 27 | 6 months – 1 year | Owned | 124 | Flexible hours with no minimum | 31 | M | London | 4 |
| 6 | Gig | 22 | 1–2 years | Owned | 125 | Flexible hours with no minimum | 10–15 | M | London | 4 |
| 7 | Employed | 38 | 1–2 years | Owned | 125 | Part time contract with specific hours | 22 | M | Manchester | 1 |
| 8 | Employed | 36 | > 2 years | Company owned | 500 | Full time contract with specific hours | 25 | M | Yorkshire | 2 |
| 9 | Employed | 22 | 1–2 years | Owned | 50 | Part time contract with specific hours | 16 | F | London | 5 |
| 10 | Employed | 32 | < 6 months | Company owned | 125 | Part time contract with specific hours | 25 | F | Liverpool | 3 |
| 11 | Employed | 31 | 1–2 years | Owned | 125 | Part time contract with specific hours | 20 | M | London | 3 |
| 12 | Employed | 42 | 6 months – 1 year | Owned | 125 | Part time contract with specific hours | 10 | F | Not known | |
| 13 | Employed | 21 | 6 months – 1 year | Owned | 50 | Part time contract with specific hours | 16 | M | South East | 2 |
| 14 | Employed | 43 | 1–2 years | Company owned | 50 | Part time contract with specific hours | 18 | M | Not known | |
| 15 | Employed | 29 | 6 months – 1 year | Company owned | 50 | Part time contract with specific hours | 18 | M | Cambridgeshire | 8 |
| 16 | Employed | 33 | < 6 months | Owned | 125 | Part time contract with specific hours | 13 | M | London | 3 |
| 17 | Employed | 32 | 1–2 years | Company owned | 50 | Part time contract with specific hours | 10 | F | Not known | |
| 18 | Employed | 25 | 1–2 years | Owned | 50 | Full time contract with specific hours | 20 | F | London | 2 |
| 19 | Employed | 32 | 1–2 years | Owned | 125 | Part time contract with specific hours | 12 | M | South East | 5 |
| 20 | Employed | 44 | 1–2 years | Owned | 125 | Part time contract with specific hours | 25 | M | London | 4 |

* Indices of multiple deprivation.

was available. For these workers, during the Covid-19 pandemic, there was a clear lock down effect -with their usual employment no longer existing. Many of these were working fulltime on delivery. Other groups included people working part time and full time in other jobs who wanted extra money, and students who wanted income to support themselves whilst studying.

Most people were working in city centres near restaurants. Payment schedules were different for the two groups with employed workers on a contract with an hourly rate or on a contract with hourly rate plus an amount per delivery or were on a zero-hour contract. The employed workers were either working for an independent company or a chain of restaurants. Gig workers often worked for multiple companies. Hours worked were variable with some doing 12 h shifts.

3.2.1.1.2. Online survey. In the online survey, just under half of gig workers reported that their delivery work was their only source of income, whereas this was true for <40 % of employed workers, and not a statistically significant difference. Most riders did between 15 and 35 h a week and there was no significant difference between types of workers.

3.2.1.2. Equipment

3.2.1.2.1. Interviews. Gig workers used their own motorcycle whereas employed workers used their own or a company motorcycle. Gig workers were provided with a waterproof jacket by one company. Whereas many of the employed workers were provided with a range of equipment including a camera, waterproof jackets, protective clothes, gloves, helmets, motorcycle jackets and trousers and hi vis vests. For one

company, it was mandatory to wear their protective jacket and riders were encouraged to wear leather trousers (though this was not enforced). Many employed workers had their own safety equipment including long boots. Some gig workers were provided with waterproof jackets which they felt offered no protection in a crash and they provided their own safety equipment. Other equipment provided by companies were perceived to create risks such as the capacity of the food box - with the weight of food in back box affecting stability whilst cornering.

3.2.1.2.2. Online survey. These findings were supported by the online survey results. There were significant differences in responses with far fewer gig workers reporting that they had been given the following key safety equipment such as protective jackets (18 % vs 57 %, $\chi^2 = 50.62, df = 1, p < 0.001$), protective trousers (13 % vs 48 % $\chi^2 = 47.95, df = 1, p < 0.001$), protective gloves/gauntlets (37 % vs 13 %, $\chi^2 = 23.33, df = 1, p < 0.001$) and protective boots (23 % vs 8 %, $\chi^2 = 13.38, df = 1, p < 0.001$).

3.2.1.3. Risk management

3.2.1.3.1. Interviews. There was no discernible risk management input in terms road safety for the gig workers. Narratives provided by some participants in the gig economy used terms such as 'modern day slavery', where the 'customer was more important than the driver' that they were 'readily replaceable', with 'zero respect of for the driver. If you are in a crash you have to inform them so they can contact the customer and say sorry', Male (2), 28, Gig, London. One participant commented that the company 'is not playing any role in the safety of

their workers', Male (4), 27, Gig, London. Despite some participants liking the flexibility and autonomy of the work, one participant commented that because the company determines the job allocation: 'It doesn't feel like you are the only decision maker in the process like you are when you are self-employed', Male (1) 28, Gig, Manchester.

The narratives of employed workers about their relationship with the company and managers starkly contrasted to those in the gig. There was a real sense of a direct relationship with company and personal relationship with a manager who were described as 'caring' with there being a sense of team spirit, with offers of free food and drink. The employed workers felt that were encouraged to take breaks from the road if it was becoming too tiring and their employers did not expect riders to work in treacherous conditions and some were encouraged to report collisions.

In one company, workers had to do yearly safety video courses that covered food, customer service and 'not being a nuisance on the road and road safety as well'. They had to do the course and bring the certificate to the shift manager where it gets logged. One chain of restaurants actively promoted safety as part of their corporate image: 'Because you're wearing the [pizza restaurant chain] uniform ...you're representing the company as well so if you're speeding like a lunatic down the road, you're giving [pizza restaurant chain] a bad name as well', Male, (19) 32, Employed, South East.

It was also mentioned that their behaviour was actively monitored and the manager would show concern if they were quicker than the system estimated: 'if you go faster than that, it's suggesting you might have driven too fast so you will have to wait. The system they have maps it out. He puts you in the sin bin for a little bit.', Male, (19), 32, Employed, South East. In addition, this company provided insurance for their riders and paid out for any injury sustained to the rider or whoever they crashed into, and they used video to investigate the circumstances and took statements.

3.2.1.3.2. *Online survey.* In the online survey gig workers were statistically less likely to agree that the people they work for cared about their safety on the road (49 % vs74 %, $\chi^2 = 33.33$, $df = 4$, $p < 0.001$). The online survey data showed that 75 % of respondents said that they had had some training on how to manage risks on the road and there was no difference by type of worker. The online survey also showed that significantly fewer gig workers agreed that the company questioned them if they felt they were travelling too fast ($\chi^2 = 32.72$, $df = 2$, $p = 0.009$) and (unsurprisingly) were less likely to say that had a good working relationship with people in the company ($\chi^2 = 37.72$, $df = 2$, p

< 0.001) (Fig. 1).

3.2.2. Risk Factors for safety

3.2.2.1. Interviews

3.2.2.1.1. *Pressure.* Issues around the pressure of work did not feature as strongly in the narratives of employed workers compared to those in the gig economy. Pressure for the employed worker was regarded as 'self-induced and never from the company' Male, (19) 32, Employed, South East. Others spoke of a relaxed atmosphere: 'They don't push us to make us feel like we're rushing. At the same time, if we stopped and went into a shop on our own, they know how long the route is going to take. They've never had an issue with me taking too long. We just go at a leisurely pace', Male (15), 29, Employed, Cambridgeshire. Another participant commented: 'we're dispatched with way more time that we need to actually get it there'. Male (14) 43, Employed, Unknown. Some pressure was perceived from the customers who can rate the delivery: 'There's a little bit of pressure ...because the last thing you want is getting a bad review', Male (20), 44, Employed London. One employed worker had to cover a wide area, and this led to pressure: 'if I have deliveries and they're far apart and I'm quite time constrained in terms of getting from one place to another, this can impact my road safety and how I execute the task. Sometimes I find myself speeding or trying to take a shorter route to ensure that the delivery is there on time.' Male, (13), 21, Employed, South East.

The pressure was keenly felt by gig workers and negatively evaluated leading to a feeling of being 'Screwed over by the company', Male (5), 27, Gig, London. Pressure was exacerbated by difficulties finding addresses and waiting in restaurants for food leading to delays to the customer, with the system putting their account on hold if deliveries not completed in a reasonable time: 'So you have to try to get the food to the customer otherwise you might not get work for two or three days. That is why it makes me feel bad. I call it modern slavery', Male (2), 28, Gig, London. One participant said that [app-based company] gave them two deliveries at a time.

Gig workers felt this pressure affected their safety on the road leading to rushing: 'when you are in a hurry you might not see a car coming from a blind spot and you are going too fast you might not have time to stop.', Male (3), 22, Gig, London. In some cases, participants said this pressure led to violations: 'I was in a rush I crossed that red light and then after that for about 10 days I was in a mental stress expecting a ticket', Male

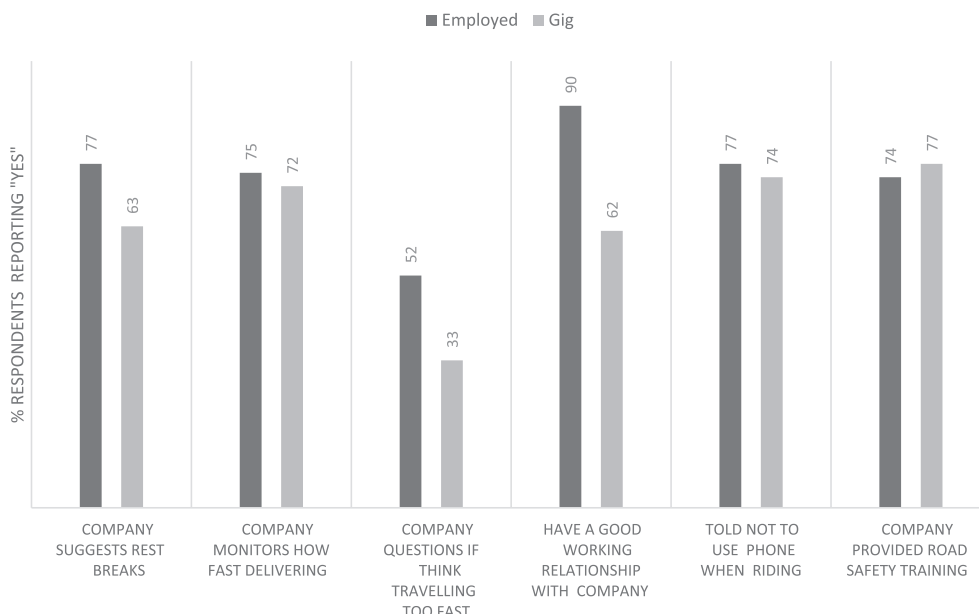


Fig. 1. Agreement with statements about training, monitoring and management of road safety risks by type of worker (Gig N=164, Employed N=155).

(3), 22, Gig, London.

Participants also talked about peak times of pressure being at the weekends and when they could make most money: ‘Friday and Saturday night are the ones you want to get the most out of it financially so that puts the pressure on to do each errand quickly’, Male rider (1), 28, Gig, Manchester. In addition, the app they used negatively evaluate them if they were late. This had happened for one participant, who had crashed: ‘Sends a sad face emoji if late in delivering even if you’re late because of an accident’, Male (5), 27, Gig, London.

One participant found the pressure overwhelming: ‘I would say it can be quite overwhelming because you’re under pressure to ensure that you deliver the food while it’s still hot and within the timeframe you’ve advised the customer. It can sometimes be overwhelming because you want to ensure that you’re still protecting your safety too’, Female, (18) Employed, London and another referred to the ‘clock of doom’.

3.2.2.1.2. Fatigue. Gig participants reported that working long hours affected their level of tiredness especially at circadian lows: ‘You can’t say it is easy to be on the road 10 or 12 h and this is not going to affect your sleep and your body. If I start at 10 am or 12 pm by 2 pm I can feel dizzy or sleepy, so I take some tea or coffee and it is going to be OK. It is always in the daytime between 2 pm and 6 pm that is when I feel tired not in the evening time’, Male (4), 27, Gig, London. One participant observed fatigue amongst other gig workers: ‘I see people sleeping on the bike they work crazy hours but for me that is ridiculous’, Male (2), 28, Gig, London. Participants said they could self-regulate and if they got too tired, they would just switch off the app and go home. One gig worker commented that there was no check on how long you worked: ‘you can work as long as you like no one will stop you’, Male (2), 28, Gig, London.

Employed workers also experienced fatigue with some experiencing falling asleep on the motorcycle at traffic lights or at a customer’s house. One employed worker whose shift was between 8.00 pm – 2.00 am felt fatigued: ‘times when I’m really tired working those shift patterns. It can be quite dangerous at times but I try not to do those really early morning shifts.There are times when I’ve been driving the moped and I haven’t been aware that there’s a car approaching me or another vehicle near me when I’m turning and stuff like that. That’s quite scary. That’s one of the main ways that tiredness affects my road safety.’, Male (13) 21, Employed, South East.

3.2.2.1.3. Speeding. The theme of speeding was prevalent for both gig and employed riders with many admitting going as fast as they can ‘but mindful of safety risks’ and that ‘stuff goes wrong when you rush’. Many admit to running through red lights, not giving way at roundabouts, weaving between traffic in queues, swerving between traffic and speeding in ‘back’ roads and even in low-speed areas: ‘If you are in a hurry and you drive at a 25mph in a 20-mph zone’ Male (4), 27, Gig, London. This participant had received licence penalty points for speeding whilst working.

3.2.2.1.4. Online survey. There were significant differences between

workers with more gig workers agreeing that pressure led to speeding ($\chi^2 = 13.47, df = 4, p = 0.009$), and to carrying loads that made the motorcycle feel unstable ($\chi^2 = 21.78, df = 4, p < 0.001$). More gig workers agreed that they would go through red lights under pressure, but this just missed being significant at the 5 % level ($\chi^2 = 8.49, df = 4, p = 0.075$), (Fig. 2). There was no significant difference between workers in response to the statement: “Sometimes I struggle to stay awake when riding” with only 16 % agreeing with this statement overall.

3.2.2.2. Phones and distraction

3.2.2.2.1. Interviews. Distraction did not come up as a theme in the narratives of employed workers who reported they used a personal digital assistant or phone but said there was little need to interact with a phone other than for directions. Sometimes these workers would receive calls from customers if they were running late. For some workers they could have a list of deliveries so they could pre-plan their route which reduced the pressure to interact with their phone.

For the gig workers distraction from their phone was an issue. They described notifications coming through frequently as many signed up to multiple providers and signed up to various apps. The app was described as highly distracting with the need to continually look down at their phone and created pressure to accept or reject a job quickly otherwise they would be negatively evaluated with the threat of their account being closed. One participant said that the [app company] app ‘doesn’t let you reject jobs even though you are self-employed’, Male (5), 27, Gig, London. One participant described a situation where it was not always easy to accept a job because they were on a route to another job: ‘[app company] say you should pull over to accept an order but when you are on a main A road where can you stop? So, when I get a job in, if I am on a main road at a speed of 40 or 60 [mph] I don’t accept deliveries but if I am on the quiet roads at 20/ 30 mph I take it - it is just a few seconds but it is a distraction’, Male (3), 22, Gig, London.

Moreover, the app was described as a workload factor that generated risks: ‘When you are on the phone and you are moving around and listening to your GPS and you don’t know where to go so you are having more chance of an accident as you are doing multiple things at a time - you are listening, you are accepting or rejecting orders and you are riding - there is plenty of risk.’, Male (3), 22, Gig, London.

Another risk that was mentioned by a participant was that when the delivery route was generated by the app it could mean that a rider with Compulsory Basic Training (CBT) (where the rider should display learner plates) could be sent on the motorway which is illegal for learners.

The workload of the app was also exacerbated by poor weather: ‘if you are using a map or a location app it affects you. Sometimes because you are using a Bluetooth to listen to direction and sometimes watching the location is a little bit difficult and in wet weather because of the looking down and looking up and in those seconds, anything can be

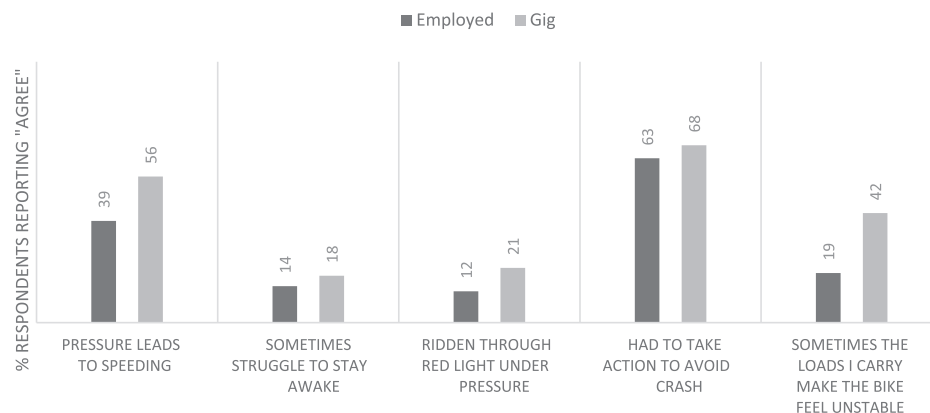


Fig. 2. Agreement with statements about road safety risks by type of worker (Gig N=164, Employed N=155).

happening’, Male (4), 27, Gig, London.

3.2.2.2. *Online survey.* The online survey showed a significant difference ($\chi^2 = 77.05$, $df = 3$, $p < 0.001$) in the reported distraction of the phone with more gig workers reporting higher levels of distraction (Fig. 3).

3.2.2.3. *Being stopped by the police, near misses and collisions*

3.2.2.3.1. *Interviews.* Few workers had experienced being stopped by the police and felt that they were unlikely to be stopped by them. One participant felt that there was a lot of illegal riding: ‘I have only been stopped by the police once in two years. A lot of people are illegally driving..’, Male (4), 27, Gig, London. Though one gig worker had been stopped every couple of months, where police checked their insurance and assessed whether the tyres were worn.

When asked about whether they had been stopped by the police a couple of participants said the police were more likely to stop people of colour implying the police were targeting BAME people. This was felt to be a policy issue: ‘I don’t want to be political about it but I am a white background so I don’t feel it is likely I’ll be stopped that is brutal but that is how it is. I know from others mainly Asian background or people of colour they have been stopped before and it never happens to white folks.’, Male rider, (1), 28, Gig, Manchester.

Riders in both groups had experienced collisions, injury and near misses. Collisions had mainly been with cars and one participant had been knocked off their motorcycle and had broken their collarbone leading to two months off work. One had experienced three collisions, one involving a drunk driver and had suffered a broken ankle, another had fractured their elbow when a car had cut across their lane.

Near misses were reported to be regular events ‘every couple of days’ and one participant felt junctions were particularly risky ‘where people nip out’ with conspicuity being an issue: ‘I will be coming down the street and scooter lights aren’t as bright as car lights, so they look for the car lights and only see you last minute’, Male (1), 28, Gig, Manchester.

It was felt to be particularly hazardous delivering in dark and wet conditions. Another participant talked of near misses with pedestrians in city centres. One gig worker reported seeing fellow riders involved in hit and run incidents whilst working but not getting anything from insurance or the gig company.

3.2.2.3.2. *Online survey.* The online survey showed that gig workers were significantly more likely to report damaging their vehicle in an accident ($\chi^2 = 18.72$, $df = 1$, $p < 0.001$) and being stopped by the police ($\chi^2 = 10.11$, $df = 1$, $p = 0.001$) (Fig. 4). Gig workers were more likely to report being involved in a collision where someone was injured which though this missed the 5 % significance level ($\chi^2 = 2.72$, $df = 1$, $p = 0.09$).

3.2.2.4. *Recommended changes by riders*

3.2.2.4.1. *Interviews.* Participants were asked to make recommendations to improve the safety for riders working in hot food delivery.

Participants suggested that refresher training and tests would be useful to make sure riders know what to do to keep safe. For gig workers, it was felt that training should emphasise that riders should not risk themselves on the road to make the delivery faster and stipulate it will not affect their account. It was felt that there should be an independent body to assess people and establish if they are safe enough to ride a moped. To manage fatigue, it was suggested that 30-minute breaks should be established after several hours of riding. Gig workers suggested that the companies set up a forum to interface with app companies and to gather and express grievances. Riders suggested the companies should provide free and better safety equipment such as knee pads and elbow protectors and when logging on to prove identity have a full selfie to show that the rider is wearing proper clothes, boots, gloves. Increasing pay was seen as a way of reducing the risks that riders take to make more money. The use of telematics was mentioned to ‘gamify’ [create a competition between riders] the work and reward riders who get a safe driving report – where they were within the speed limit, no harsh braking. It was suggested that motorcycles could have a GPS system and e-call if a collision occurs, should be regularly checked for roadworthiness and have speed limiters fitted.

3.3. *Multivariate analysis of online survey data*

A logistic regression model was developed for reported violation of speed limits and to simultaneously evaluate the relative importance of a range of potential explanatory categorical and continuous variables. The dependent variable was constructed from levels of agreement with the statement ‘The time pressure of meal delivery work can make you travel over the speed limit’ as this is a ubiquitous feature of food delivery work. A binary variable was created by aggregating all those agreeing with the statement as response level 1 and all other values set to 0. Ideally, injury collisions would have been chosen but the number was too small, and violation is a recognised proxy for collision involvement (Elliot et al., 2007). Independent variables including key demographics, exposure variables such as number of hours worked per week, licence status and type of company they worked for as a proxy for type of work (Table 2). SPSS v26 was used to analyse the data. The model (Table 3) was overall a good fit to the data ($\chi^2 = 68.4$, $df = 15$, $p < 0.001$). Reported speed limit violation can be explained by age (younger riders), company type (gig worker) and perceived high chances of getting stopped by the police by working (agree). The latter finding appears counterintuitive but may be explained by the fact that they violate regularly and therefore feel exposed to being caught, though the confidence limits are quite wide suggesting that it is an imprecise estimate.

4. **Conclusions and recommendations**

The aim of this study was to compare road injury risks experienced by people who deliver food on motorcycles in relation to the business

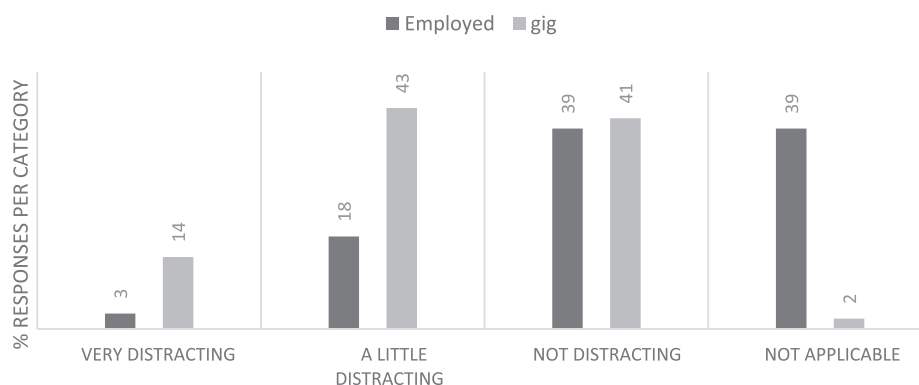


Fig. 3. Reported distraction by phone by type of worker (Gig N=164, Employed N=155)

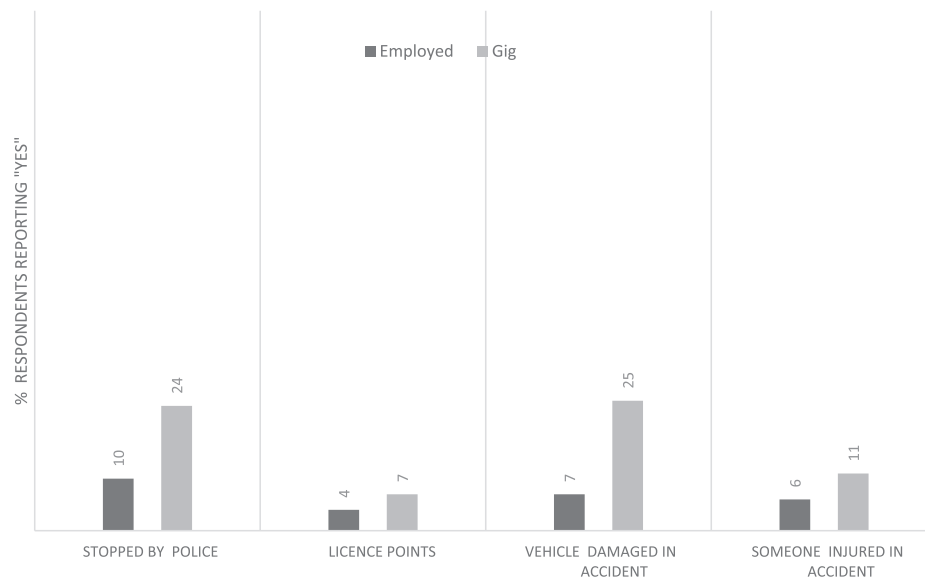


Fig. 4. Reported involvement in collisions, licence points and being stopped by police by type of worker (Gig N=164, Employed N=155).

Table 2
Explanatory variables used in multivariate analysis.

| Variable names | Variable description | Response levels |
|----------------|---|--|
| CC | CC of motorcycle ridden | 1 = 50, 2 = 125, 3 = 126–400, 4 = over 400 |
| Age | Age of respondent | Continuous |
| Molic | Type of motorcycle licence held | 1 = CBT, 2 = full |
| Longlic | How long they have had their motorcycle licence | 1 = less than a year, 2 = 1–3 years, 3 = >3 years |
| Weekh | How many hours they do in a week | 1 = under 15, 2 = 15–35 h, 3 = 35–60 h, 4 = >60 h |
| Ethnic | Ethnic origin of respondent | 1 = white UK, 2 = all other |
| Sex | Sex of respondent | 1 = male, 2 = female |
| Comp | Type of company | 1 = gig, 2 = employed |
| Chance | Agreement level that they have a high chance of being stopped by the police while working | 1 = agree, 2 = neither agree or disagree, 3 = disagree |

model in which they work and identify solutions for managing their safety. Our research shows that there are significant differences between the experience of risks and working conditions for people who access work via digital platforms compared to those who are directly employed by restaurants. Gig workers were significantly more likely to report being involved in a collision where their vehicle was damaged and were more likely to report being involved in a collision where someone was injured which was a difference rather unlikely to have occurred by chance. Gig workers were significantly more likely to report violations such as speeding, red light running and, unsurprisingly, they had more points on their licence compared to employed riders. Gig workers were significantly more likely to report that their phone was a distraction. They were also more likely to say that they were paid more to ride in dangerous conditions such as when wet and icy and carry unstable loads. These findings were highly similar to those (Christie and Ward, 2019).

It is clear that gig workers are vulnerable as riders because no one is managing their risk or tracking what they do as long as the food is delivered on time. The business model where motorcyclists are employed seems to be a much more effective way to manage the

Table 3
Pressure to speed model.

| Explanatory variables | B | S.E. | Wald | Df | Sig. | Exp(B) | 95 % C.I. for EXP(B) | |
|-----------------------|--------|-------|--------|----|--------------|--------|----------------------|--------|
| | | | | | | | Lower | Upper |
| Cc | | | 2.148 | 3 | 0.542 | | | |
| cc(1) | -0.500 | 0.764 | 0.428 | 1 | 0.513 | 0.607 | 0.136 | 2.712 |
| cc(2) | -0.732 | 0.732 | 0.998 | 1 | 0.318 | 0.481 | 0.115 | 2.021 |
| cc(3) | -1.063 | 0.824 | 1.661 | 1 | 0.197 | 0.346 | 0.069 | 1.739 |
| molic(1) | -0.378 | 0.310 | 1.487 | 1 | 0.223 | 0.685 | 0.373 | 1.258 |
| longlic | | | 2.205 | 2 | 0.332 | | | |
| longlic(1) | -0.548 | 0.374 | 2.139 | 1 | 0.144 | 0.578 | 0.278 | 1.205 |
| longlic(2) | -0.323 | 0.319 | 1.030 | 1 | 0.310 | 0.724 | 0.388 | 1.351 |
| weekh | | | 2.127 | 3 | 0.546 | | | |
| weekh(1) | 0.823 | 0.784 | 1.101 | 1 | 0.294 | 2.277 | 0.490 | 10.592 |
| weekh(2) | 0.618 | 0.736 | 0.704 | 1 | 0.401 | 1.855 | 0.438 | 7.855 |
| weekh(3) | 0.933 | 0.760 | 1.509 | 1 | 0.219 | 2.543 | 0.574 | 11.277 |
| Ethnic (1) | -0.155 | 0.287 | 0.292 | 1 | 0.589 | 0.857 | 0.488 | 1.502 |
| Sex (1) | -0.374 | 0.344 | 1.183 | 1 | 0.277 | 0.688 | 0.350 | 1.350 |
| Age | -0.043 | 0.017 | 6.222 | 1 | 0.013 | 0.958 | 0.926 | 0.991 |
| Comp(1) | 0.652 | 0.260 | 6.265 | 1 | 0.012 | 1.919 | 1.152 | 3.198 |
| Chance | | | 37.577 | 2 | 0.000 | | | |
| Chance (1) | 1.985 | 0.328 | 36.666 | 1 | 0.000 | 7.276 | 3.827 | 13.830 |
| Chance (2) | 0.469 | 0.306 | 2.352 | 1 | 0.125 | 1.598 | 0.878 | 2.910 |
| Constant | 1.028 | 1.212 | 0.720 | 1 | 0.396 | 2.797 | | |

occupational risks of hot food delivery by motorcycle compared to work via digital platforms. It has been argued that the safety risks are potentially the worst for gig workers because 'of the absence of the protective effect of working in a public workplace' (Tran and Sokas, 2017).

In our small sample of interviews several participants had experienced significant injuries such as broken bones. Research has shown that fears of being involved in a road collision were reported as a major source of anxiety and identified as the 'greatest hazard of their work' (Gregory, 2021).

Because delivering quickly means earning more money the gig business model leads to taking more risks than those who are employed by a company. In contrast, employed riders, whilst admitting to going too fast at times and feeling tired, felt cared for, part of a team, paid for time not delivery and operated within a safety culture that puts the rider first. Arguably, these digital platforms are at the 'pathological' end of Hudson's safety culture ladder (Hudson, 2001).

Whilst some gig workers enjoyed the flexibility of the work others felt enslaved. The employment status of gig workers is a moot point (Lobel, 2020). Workers who access the work via digital platforms are regarded as self-employed, contingent or freelance workers. However, via algorithms, these companies tell riders where to go, control the time window they have to accept a job, evaluate their performance and log them off the system if they 'underperform' (i.e., have a low job acceptance rate). Digital platform companies that use workers in this way externalise the risks and show little or no responsibility for the health or safety of the people who make profit for them. In fact, some researchers have argued that online food delivery platforms are associated with more 'accident' costs, than employment gains in the cities where they operate (Tan et al., 2021).

4.1. Recommendations

Riders offered several recommendations to improve the safety of people who deliver food by motorcycle. Telematics could have a central role in managing the risk for riders and could be adopted in both the gig and employed business models. A participant suggested 'gamifying' safe riding and reward riders who get a safe driving report to encourage others to comply where they were within the speed limit or with no harsh braking. It could also be used to exclude people from digital platforms if their telematics score shows high level of unsafe riding. In addition, this could have a tracking function with GPS and e-call if a collision occurs. Technology exists to support the safety of motorcycling and could be more widely adopted to reduce the occupational risks associated with delivery work (<https://cordis.europa.eu/project/id/216355>).

We restate our previous recommendation (Christie and Ward, 2019) that mobile phones should not be allowed to cause a distraction and require handling to accept or reject jobs whilst riding. Distraction caused by using mobile phones is recognised as a major contributor to collisions (WHO, 2011).

Jobs should only be allocated and accepted providing the rider is parked. Less distracting interfaces need to be developed by the digital platform industries. Alternatively, if workers sign up for time blocks with a set number of jobs and set pay this would reduce the need for sporadic messaging about available jobs.

It was also suggested that when riders working in the gig logged on to prove identity with a headshot selfie, they could do a full body selfie to show that they were wearing proper protective clothes. To manage speed, it was suggested that speed limiters could be fitted on motorcycles.

Riders suggested that regular monthly training would help reinforce and re-teach safe riding by a qualified trainer. There should be an independent body to assess people and establish if they are safe enough to ride a motorcycle.

App companies could provide free and better safety equipment such

as knee pads and elbow protectors, such as hi-vis jackets (fluorescent/reflective) and all companies should limit the weight of the loads carried.

Delivering food by motorcycle for several hours at a time is clearly physically and mentally fatiguing for riders. Fatigue is a contributory factor to road collisions and it has been estimated to contribute to a fifth of casualties in the UK (Jackson et al., 2011). App companies need to find a way of monitoring hours at work. Hours riding for work should be monitored and regulated in line with passenger carrying vehicles (e.g., "Daily driving limit" - *You must not drive for >10 h in any working day. After 5 h 30 min of driving you must take a break of at least 30 min for rest and refreshment. Or, within any period of 8 h 30 min, you must take at least 45 min in breaks. You must also have a break of at least 30 min at the end of this period, unless it's the end of the working day.* <https://www.gov.uk/drivers-hours/gb-domestic-rules>).

App companies should increase the pay for riders and not incentivise those on two wheels to take additional risks by paying a higher rate to ride in poor weather conditions. Instead, they could establish an acceptable drop or delivery rate which considers the time it takes to travel to the destinations within the speed limit and the time it takes to perform administrative functions. App companies should allow riders to sign up for a time block and be paid for their time not for a drop or delivery rate to depressurise the work.

For gig workers, managers with a responsibility for safety should be appointed locally to ensure vehicles are roadworthy with an up-to-date MOT where applicable and are properly insured. At a minimum there needs to be a forum set up to enable workers to interface with app companies to express their views and grievances.

All companies need to monitor collisions and learn from them. Nationally, the monitoring of collisions data on people who drive for work needs to be strengthened to understand the real scope of the problem. Local authorities should monitor collisions with motorcyclists that occur during peak times for food delivery i.e., at night during the weekend and investigate whether they are connected with the delivery sector. Journey purpose is now a compulsory field in the police STATS19 (official police reporting form) injury report.

4.2. Strengths and weaknesses

All online surveys are prone to biases and limitations. Our respondents may have given socially acceptable answers and under-reported violations or may not be able to accurately assess their own behaviour. With self-reported measures, what people say they do may not reflect what they actually do and therefore this may limit the validity of findings. In addition, the online survey was in the English language, and this may have precluded people with low English literacy skills from participating. A strength of the study was that, despite these potential biases, the questionnaire did show clear differences between types of workers. We also developed the online questionnaire with riders, our user group, to ensure that it had face validity. Another strength of the study was that the interview and online survey data triangulated well, showing the value of mixed methods research in demonstrating the reliability and generalisability of our research (Creswell and Plano Clark, 2007).

CRedit authorship contribution statement

Nicola Christie: Writing – review & editing, Writing – original draft, Project administration, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Heather Ward:** Writing – review & editing, Writing – original draft, Methodology, Funding acquisition, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

We would like to thank the Department for Transport for supporting this research, to the fieldwork company Further Afield for recruiting the people and finally to all the participants for sharing their experiences and insight.

Funding

This research was funded by the Department for Transport Road Safety Grant

References

- Anwar, M. A. & Graham, M., 2019. Hidden transcripts of the gig economy, labour agency and the new art of resistance among African gig workers. *Environment and Planning A: Economy and Space*, Volume 52, Issue 7, October 2020, Pages 1269-1291. <https://doi.org/10.1177/0308518X19894584>.
- Bérestégui, P., 2021. Exposure to Psychosocial Risk Factors in the Gig Economy: A Systematic Review, <https://www.etui.org/publications/exposure-psychosocial-risk-factors-gig-economy>.
- Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology* 3 (2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>.
- Byun, J.H., Park, M.H., Jeong, B.Y., 2020. Effects of age and violations on occupational accidents among motorcyclists performing food delivery. *Work* 65, 53–61.
- Choi, S.J., Kim, M.J., Myung, J., Hong, J.Y., Chung, Chung, S.P., & Lee, J.H. 2022. Characteristics of crashes and injuries on delivery motorcycles: A retrospective cohort study, *Traffic Injury Prevention*, 23:3, 146-151, DOI: 10.1080/15389588.2022.2030056.
- Christie, N. 1996. The accident liability of motorcycle despatch riders: Stage 1; Unpublished Project Report, PR/SE/196/96.
- Christie, N., Ward, H., 2019. The health and safety risks for people who drive for work in the gig economy. *Journal of Transport and Health*. <https://doi.org/10.1016/j.jth.2019.02.007>.
- Creswell, J.W., Plano Clark, V.L., 2007. *Designing and conducting mixed methods research*, 2. Sage, Thousand Oaks, CA.
- Department for Transport. 2020. Statistical Release 30 September 2020 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/922717/reported-road-casualties-annual-report-2019.pdf.
- Elliot, M.A., Baughan, C.J., Sexton, B.F. 2007. Errors and violations in relation to motorcyclists' crash risk. *Accident Analysis & Prevention*. Volume 39, Issue 3, May 2007, Pages 491-499.
- Gregory, K., 2021. 'My Life Is More Valuable Than This': Understanding Risk among On-Demand Food Couriers in Edinburgh. *Work, Employment and Society* 35 (2), 316–331. <https://doi.org/10.1177/0950017020969593>.
- Healy, J., Pekarek, A., Vroman, A., 2020. Sceptics or supporters? Consumers' views of work in the gig economy. *New Technology, Work and Employment* 35, 1–19. <https://doi.org/10.1111/ntwe.12157>.
- Hudson, P. 2001. *Safety Management and Safety Culture: Safety Management and Safety Culture The Long, Hard and Winding Road*, Centre for Safety Research Leiden University, Netherlands, pp.9-10, 2001.
- Jackson, P., Hilditch, C., Holmes, A., Reed, N., Merat, N., Smith, L. 2011. Fatigue and road safety: a critical analysis of recent evidence. *Road Safety Web Publication No. 21*, Department for Transport, London, UK.
- King, N., 2004. Using Templates in the Thematic Analysis of Text. In: Symon, G., Cassell, C. (Eds.), *Qualitative Methods and Analysis in Organizational Research: A Practical Guide*. Sage Publications Ltd, pp. 256–270.
- Lobel, O., 2020. We Are All Gig Workers Now: Online Platforms, Freelancers & the Battles over Employment Status Rights during the Covid-19 Pandemic. *San Diego Law Review* 57 (4), 919–946.
- McKinlay, A., Mitchell, G., Bertenshaw, C., 2022. Review article: DINED (Delivery-related INjuries in the Emergency Department) part 1: A scoping review of risk factors and injuries affecting food delivery riders. *Emergency Medicine Australasia* 34, 150–156. <https://doi.org/10.1111/1742-6723.13927>.
- Myhill, K., Richards, J., Sang, K., 2021. Job quality, fair work and gig work: the lived experience of gig workers. *International Journal of Human Resource Management* 32 (19), 4110–4135. <https://doi.org/10.1080/09585192.2020.1867612>.
- Panse, D.C., Rastogi, D.S., Sharma, M.A., & Dorji, N. 2019. Understanding consumer behaviour towards utilization of online food delivery platforms. *Journal of Theoretical and applied Information Technology* 31st August 2019. Vol.97. No 16.
- Tan, X., Liu, R., Shen, K. 2021. Economic Benefits and Costs of Convenience in Gig Economy: The Effects of Online Food Delivery on Car Accidents and Unemployment Based on Staggered Difference-in-Difference Methodology. In *Proceedings of the 2021 International Conference on Control and Intelligent Robotics (ICCIR 2021)*. Association for Computing Machinery, New York, NY, USA, 436–443. DOI:<https://doi.org/10.1145/3473714.3473790>.
- Tran, M., Sokas, R.K., 2017. The Gig Economy and Contingent Work: An Occupational Health Assessment. *Journal of occupational and environmental medicine* 59 (4), e63–e66. <https://doi.org/10.1097/JOM.000000000000097>.
- WHO. 2011. Mobile phone use: a growing problem of driver distraction. Geneva, Switzerland, World Health Organization, 2011. http://www.who.int/violence_injury_prevention/publications/road_traffic/en/index.html.