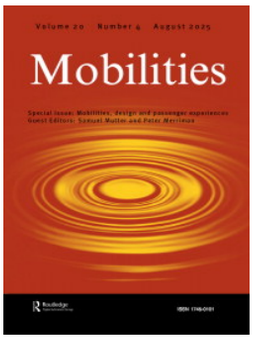

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Food warriors: app-based delivery on electric micromobilities

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ABSTRACT

Electric micromobilities (EMMs), including electric bikes, standup kick-style electric scooters, and electric unicycles are highly efficient and low impact modes for urban food delivery. However, the mobility they and their associated algorithmic platforms afford is implicated in a set of work practices and relations that reinforce precarious employment outcomes. Our interviews, observational and autoethnographic research in Vancouver, Canada, revealed that food delivery platforms promise flexibility and high earnings while motivating workers to toil for variable and low wages and engage in high-risk behaviour. We focused on food delivery workers using EMMs because barriers to accessing an EMM are lower than for a car, while affording greater mobility on congested city streets, incurring no parking fees, and delivering zero emission operation. However, ostensibly low financial barriers to entry mask the requirement for considerable knowledge of, and navigational skills within, the physical and virtual environments that workers must master to resist the control exercised by platforms (apps) in an intensely competitive playing field. App-based food delivery using EMMs implicates workers in a game that requires upfront investment, skill and the navigation of risk. It is a stacked game, in which mostly the house wins.

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Electric micromobilities; platforms; precarity; gig-work; food-delivery

Electric micromobilities (EMMs) are highly efficient and low impact modes for food delivery, often more accessible and appropriate to the task than cars (Travers et al. 2024), as their uptake by app-based food delivery workers (FDWs) indicates. The most popular EMMs being electric bikes (e-bikes), then standup kick-style electric scooters (e-scooters), with a small number of electric unicycle riders (EUCs) on the scene. This article draws on the experiences of 17 FDWs who relied on EMMs and the autoethnographic fieldwork of Travers and Park who engaged in food delivery work on EUCs between September 2021 and February 2023. Our research captured a perfect storm of economic opportunity in the exponential growth of food delivery platforms during the Covid 19 pandemic shutdowns in Metro Vancouver, Canada that appears to be short-lived. FDW earnings have declined with the easing and eventual end of pandemic restrictions, and look set to fall further with the imminent replacement of flesh and bone workers with robots. Our findings show that food delivery platforms promise flexibility and high earnings while motivating workers to toil for low wages, engage in high-risk behaviour, and recruit other workers to compete against them in a race to the bottom.

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EMMs are a low-barrier form of transportation that is central to the work of app-based food delivery. This mode of transportation enables a set of precarious labour relations and fragmentation along lines of race and immigration status. In this article we trace the implication of EMMs in a particular manifestation of racial capitalist exploitation. FDWs are structurally under-utilized, with the costs of being available on-call and having to deal with workplace hazards, as well as the costs of providing their critical work-tools (EMMs, smart phones with data plans, food delivery backpacks, safety and appropriate weather gear), downloaded onto them. At the same time, close observation of tactics, in particular gaming the apps designed to control the labour process and manage their mobility, reveals the ways in which FDWs negotiate and attempt to push back against algorithmic control.

The gig economy, labour relations, and food delivery workers

The rise of the gig economy, including platform food delivery work, is often attributed to the flexibility it affords to employers, workers, and customers. Flexibility and income, and the autonomy that comes with it, are noted as some of the most prominent motivators driving people to gig work and food delivery (Churchill and Craig 2019; Griesbach et al. 2019; Milkman et al. 2021; Richardson 2020; Uchiyama, Furuoka, and Akhir 2022). Flexibility refers to both the ability to determine one's own schedule and the (perceived) lack of surveillance or on-site supervision – essentially, the lack of a boss to report to (Churchill and Craig 2019; Milkman et al. 2021). This flexibility also marks gig work as a purported solution for economic problems of labour and consumption in neoliberalized western societies wherein once taken for granted standard forms of employment have been degraded, resulting in labour market experiences characterized by precariousness, insecurity, and low pay (Stewart, Shanahan, and Smith 2020; Lord et al. 2023; Pirina, Puppa, and Perocco 2024). Platform employers actively promote the flexibility of gig work, attracting workers to "be your own boss' and 'earn great money" (Gregory 2021, 318).

However, the 'freedoms' supposedly afforded by gig work are also an implicit part of platforms' control systems. Griesbach et al. (2019) and Barratt, Goods, and Veen (2020) cite Burawoy's notion of hegemonic control by which granting workers a degree of autonomy, such as their choice of shifts or jobs in platform work, secures workers' consent to their own exploitation. The algorithmic systems used to allocate jobs and compensation to workers are a main site of control which recent studies have focused on (Muldoon and Raekstad 2023; Newlands 2021). Griesbach et al. (2019, 2) use the term 'algorithmic despotism' to capture how platform companies manage their workers through 'the strategic use of information asymmetry, the surveillance of workers through … performance measures, and behavioral nudges like surge pricing.' Shibata (2020) contends that the discourse of gig worker flexibility is a means to address socio-economic troubles and ultimately, 'presents an opportunity to both the state and to firms to meet the competing pressures which they face in contemporary capitalism' (547–548).

In a study of urban delivery platforms in Spain and Chile, Diz and Casas-Cortés (2025) observe that 'delivery waiting emerges as a central and ambivalent practice among riders' everyday lives' (1). Waiting as an unpaid aspect of the work is central to capital accumulation and reflects food delivery platforms' dependence on an oversupply of active workers to extract profit. As Attoh, Wells, and Cullen (2024) observe, 'food delivery platforms … make sure delivery is as instantaneous as possible by flooding the market with underutilized workers' (3843). The authors explain that 'The more workers on 'stand-by,' the easier it is for such companies to deal with rapid spikes in demand or to ensure that delivery times never exceed some specified limit (Graham et al. 2017 as cited in Attoh, Wells, and Cullen 2024, 3844). Platforms recruit a reserve army of labour (Marx [1867] 1990, 798) that keeps delivery times and wages down by remaining on standby. Worker underutilization enables platforms to mobilize a workforce without having to bear 'the costs associated with generating a workplace' (Diz and Casas-Cortés 2025, 4). The fact

that platform companies compete for market share only exacerbates this tendency toward worker underutilization (Attoh, Wells, and Cullen 2024).

Algorithms and spatial practices have in common that information about the ways in which companies manage and use them is concealed from workers, creating information asymmetries that facilitate control over the labour process (Griesbach et al. 2019; Heiland 2025). Altenried (2020) argues that crowdworking platforms, particularly those oriented around microtasking, act as digital factories that exercise pervasive forms of surveillance and regimentation to discipline and control a spatially dispersed and heterogenous labour pool. The resulting socio-technical relationship is characterized as a form of digital Taylorism, 'to describe how a variety of forms and combinations of software and hardware as a whole allow for new modes of the measurement, standardisation and quantification, decomposition and surveillance of labour – often through forms of (semi) automated management and control' (149).

The implication that platform labour is inferior to previously dominant forms of waged employment under mass production, however, runs counter to the structural realities of capitalism. Situating her analysis in gig-based sex work, Berg (2022) argues that workers may prefer dealing with algorithmic management instead of human bosses in traditional workplace settings who also enact coercive forms of control and inflexibility. Berg observes that 'nostalgic visions of Fordism as a moment in which working-class solidarity and consciousness flourished' neglects to recognize that 'both were violently stratified along the lines of race and gender' (45). Berg points out that 'Such framings also fail to capture the harsh realities of the jobs they posit as more just alternatives to gig work' (46).

Workers respond to and challenge controls in numerous ways, individually and collectively, but their agency is constrained and the freedoms that invest them in this type of employment come at a significant cost (Griesbach et al. 2019; Heiland 2025). In fact, the same flexibility that is lauded as a benefit of platform food delivery prioritizes companies' needs over workers and ultimately reduces workers' autonomy, flexibility, and earnings in the long term. This finding is consistent across studies focusing on multiple regions, including Barcelona, Spain and Chile, Venice, Sweden, China, South Korea, the USA, and Australia (see, for example, Cano, Espelt, and Morell 2021; Griesbach et al. 2019; Sun, Yujie Chen, and Rani 2023).

The agency of app-based workers is shaped by their status as contractors rather than employees and by platforms' organizational fixes (Barratt, Goods, and Veen 2020; Sun, Yujie Chen, and Rani 2023). Sun, Yujie Chen, and Rani (2023) coined the term 'sticky labour' to elaborate on how this de-flexibilization emerges as the result of a combination of management tactics and sociotechnical factors. Food delivery platforms often rely on migrant workers (Katta et al. 2024) whose compromised agency van Doorn (2023) describes in terms of *liminal precarity*. Liminal precarity

> is primarily an act of wishful thinking – a promise to oneself that the precarity experienced is transitory, part of the rite of passage that is the migration trajectory – which does not end upon arrival. Liminal precarity is also a bargain with oneself, in which the pros and cons of app-based work are thrown on the scale and deliberations about (un)acceptable working conditions and the proper time to move on are hashed out. It is an in-between space of intensified risk-taking and absorption under the understanding, or pretence, that the stuff one puts up with will be temporary. In the meantime, however, this space expands and goalposts are moved (van Doorn 2023, 174).

Migrant workers are particularly vulnerable to predatory employers because they lack better options, conditions that have 'contributed to the emergence of a 'migrant division of labour' in global cities such as London' (May et al. 2007 as cited in van Doorn 2023, 163). What migrants profiled in May et al.'s study have in common 'is the ambivalence of their affective and material attachments to gig platforms, which serve as a stopgap but also act like a trap, throwing out a lifeline that is not actually attached to anything. In their narratives we see how platform labour both alleviates and exacerbates migrant precarity, often simultaneously, which makes it difficult to determine if and when to quit' (van Doorn 2023, 174). These conditions keep surplus

workers 'stuck' to the digital platforms they work for (Sun, Yujie Chen, and Rani 2023). Furthermore, platforms' organizational fixes limit the forms of agency available to workers, 'resulting in individual expressions of agency … which [align] individual workers, as labour, with platforms while pitting workers against each other … sustaining this labour market arrangement' (Barratt, Goods, and Veen 2020, 1650).

Precarious work is hardly new, however, and many scholars have traced how macro-economic trends and neoliberal policies over the last 50 years have pushed labour markets to be more flexible, contingent, and insecure (Kalleberg 2003; Standing 2011) through the globalization and offshoring of workforces, fiscal austerity policies (Harvey 2007), and the weakening of union power (Weil 2014). In this context, standard work arrangements and secure employment are increasingly disappearing and being replaced by temporary staffing solutions, leading to the loss of a 'clear relationship between a well-defined employer and a worker' (Weil 2014, 7).

Standing (2011) argues that neoliberalism has generated 'a global 'precariat', consisting of many millions around the world without an anchor of stability' (1). This lack of stability—political, economic, social, cultural—is a defining feature of *platform capitalism*[1] (Srnicek 2017) and is central to the functioning of digital labour platforms such as Uber and DoorDash (Rosenblat 2018). Standing (2011) argues that the precariat is increasingly composed of *denizens* 'who, for one reason or another, [have] a more limited range of rights than citizens do' (23). Denizens are structurally and legally prevented from accessing full labour protections, social services, and have limited class mobility and employment opportunities. This pushes them into low-wage, low-status, unpredictable, and service-based positions that are not afforded the state-regulated employment protections that stable, full-time, and high-wage positions provide. In tandem, the precaritization of labour is marked by its hyper-flexibility, 'making the labour relationship more responsive to demand and supply, as measured by its price, the wage' (52–53). A key feature of this flexibility is that firms are more easily able to respond to market dynamics by relying on temporary labour pools while simultaneously shrinking corporate employee headcount.

Digital platforms such as Uber and DoorDash exemplify neoliberal dynamics of capital accumulation. These platforms espouse themselves as flexible and entrepreneurial to attract workers for a hyper-mobile, available, and fungible workforce. They promise workers control over their own schedules and ample earning opportunities. Scholarship on platform labour, however, has delineated how the freedom, autonomy, and earnings of gig workers are heavily compromised and constrained by algorithmic management (Chen and Sun 2020; Griesbach et al. 2019; Qadri 2021; Ravenelle 2019), hyper-surveillance (Rosenblat and Stark 2016), gamification (Rosenblat 2018), deregulation (Dubal 2020), corporeal, financial risk, and precarity (Schor, Tirrell, and Vallas 2023).

Despite claims from companies like Uber that they are mediators—and not employers—between workers and markets, platform structures centralize significant control over the labour process (Rosenblat and Stark 2016). Griesbach et al. (2019) argue that although app-based food delivery work can support a sense of agency for workers, 'freedom is often illusory' (13) due to the dominating influence of *algorithmic despotism*. Algorithms mystify how orders are distributed from the perspectives of workers. Lack of transparency in order distribution accentuates the precarity workers can experience and nudges them to accept low-pay orders and work fixed-schedules around peak times.

In the absence of a fixed physical workspace and direct managerial oversight, FDWs are also controlled and measured on performance metrics such as acceptance rates, cancellation rates, and restaurant and customer ratings (Ravenelle 2019). Ratings function to externalize company responsibility for managing workforces to restaurant workers and customers. FDWs must navigate these productivity systems by means of self-surveillance and customer supervision, which limits their autonomy and leaves them exposed to sudden deactivations—the equivalent of being fired—with little room for recourse. Rating systems intensify the power customers have over workers; Ravenelle (2019) shows how false accusations can result in instant non-appealable

deactivations for ride-hail drivers and how they must tolerate being harassed or discriminated against by customers or risk receiving a poor rating.

Additionally, gig work research has been expanded by scholarship that has examined the heterogeneity of workers' subjectivities and socio-economic background in relation to platform work. While the structural features of platform architecture engage all workers, platforms attract workers from different socio-economic backgrounds—with varying levels of capital and dependency on gig work—which affects how they experience, consent to, and negotiate with platform structures (Peticca-Harris, deGama, and Ravishankar 2020). According to Schor et al. (2020), gig work should be analyzed within a framework of 'differential embeddedness, in which the structural positions that gig workers hold in the economy condition how they perceive and experience the risks that platform work entails' (5). Thus, workers had differentiated evaluations of work risk that correlated with their financial situation, employment status, and existing support systems. Schor et al.'s arguments follow similar tracings by Malin and Chandler (2017) who refer to the contradictions in gig work—that it can be simultaneously enjoyable and exploitative—as 'a splintering precarity - identif[ication] with the same mythic dotcom labor of fun and autonomy that exacerbates many of their anxieties and risks even as it separates them from others who are denied access to this labor' (16).

FDWs do invoke agency by individually and collectively rejecting low paying orders; lobbying for safety equipment; joining unions; participating in media coverage; initiating court proceedings; using multiple platforms; evading work restrictions; and renting accounts. Riordan, Robinson, and Hoffstaedter (2023) report that 'workers 'also used 'tricks' and 'hacks' to make their work more profitable and enjoyable. Others respond to restaurants that they believe have treated them poorly by cancelling orders or leaving negative online reviews.' The authors emphasize that 'While these acts make workers feel better, they have little impact on their broader circumstances' (2743).

To combat worker-hostile labour practices of digital labour platforms, there have been numerous cases and ongoing legal and labour advocacy efforts across multiple jurisdictions to establish labour protections – minimum wage standards, health benefits, and sick pay – for gig workers with varying degrees of success (CBC News 2022; Dubal 2020; Kroman 2024; Lindsay 2023; Zhou 2023). Most notably, in a 2018 landmark case overseen by the Supreme Court of California, Dynamex Operations West v. Superior Court of Los Angeles, the court ruled that delivery drivers for Dynamex were considered employees and not independent contractors, and thus entitled to minimum wage, sick pay, and other standard employment protections (Dubal 2017). This ruling was expanded in 2019 by the passing of Assembly Bill 5 (AB5) in the California Legislature (Ovetz 2023). AB5 essentially reclassified ride-hail and food delivery workers as employees, thus requiring Uber and Lyft to comply with state employment regulations to provide 'minimum wage protections, overtime, expense reimbursements, workers' compensation, and unemployment insurance' (Dubal 2017). Uber and Lyft refused to comply, however, and mounted an intense $204 million USD lobbying campaign for Proposition 22 (Prop 22), a ballot initiative that would reclassify ride-hail and delivery workers as independent contractors with certain limited benefits (Ovetz 2023). In September 2020, Prop 22 was passed with a yes vote of 58%, even though, as legal scholar Veena Dubal (2017) argued, 'the law took away all basic employment rights—including the minimum wage and overtime protections and in a few instances, replaced them with lesser versions' (21). In response to newly introduced minimum wage protections for ride-hail workers by the City of Minneapolis, Uber and Lyft announced they would cease operations when the new law was to be implemented in May 2024 (Ahmed 2024). This threat paid off as these platforms were ultimately able to negotiate a lesser guaranteed rate per mile and minute for workers than that enshrined in the original law (Thamer 2024).

In Canada, grassroots organizing by FDWs led to a monumental 2020 ruling by the Ontario Labour Relations Board that Foodora, a German-based food delivery company, had misclassified their workers and that they should be classified as dependent contractors, which would give

them the legal right to unionize and pave a path towards attaining further workers' rights (CBC News 2020). Citing profitability concerns, however, Foodora shut down its operations and exited the Canadian market just months after this ruling, leaving couriers without work in the middle of the COVID-19 pandemic (Lee 2023), further demonstrating the lengths platforms will go to avoid legal regulation.

The Government of British Columbia Ministry of Labour (2023) tabled new legislation that took effect September 2024 to ensure gig workers are protected by provincial labour protection laws and imposed a new minimum earning standard that pays ride-hail or FDWs 120% of minimum wage for engaged time, defined as 'when a worker accepts an assignment through its completion… and does not include the time spent waiting between assignments.' Other proposed changes include increasing pay transparency and providing wage statements, a review process for terminations, and work safety coverage. Although these proposed solutions are not without fault, particularly the lack of a minimum earnings framework that would address unpaid waiting time between assignments, such regulatory intervention and collective worker action curb platforms' influence over workers. We explore some of the tactics used by FDWs to push back against coercive work controls.

Racial capitalism, and gig work

Bolstered by streams of immigrant and international student populations, the functioning of the gig economy depends on a racialized surplus workforce that is easily replaceable, dependent on precarious sources of income, and lacking access to secure employment (Dubal 2020; Gebrial 2024). Relevant literature indicates that the workforce in western contexts is 'predominantly migrants for whom a delivery job is also a form of arrival infrastructure that helps new migrants to settle in' (Chung 2024, 576). Yin (2024) observes that 'Digital labor platforms rely on the long-standing historical, structural, and institutional factors which produce a cheap labor force' (130). As Lee and Wang (2024) document, 'Food delivery work has long comprised mostly immigrant and non-white labourers because these informalized jobs were accessible with linkages to ethnic community networks, low barriers of entry, and frequent turnover' (5). The informalization of labour associated with the emergence of the gig economy is an evolving characteristic of racial capitalism (Lee and Wang 2024).

In their study of food delivery work in New York City during the pandemic, Lee and Wang (2024) chronicle how city government managed tensions between public health and capital accumulation during the pandemic by designating FDWs as essential. This move protected the health of more privileged residents by enabling their immobility (isolation) while tapping into the surplus pool of precarious (racialized) labour that resulted from pandemic shutdowns to ensure ongoing capital accumulation by restaurants and food delivery platforms. The pandemic accelerated a shift that was already underway from restaurant-based to app-based delivery work, heightening pre-existing relations of exploitation. This shift produced a deterioration in labour conditions as workers 'lost access to restaurant spaces such as bathrooms and places to shelter and to charge equipment… These shifts of spatial access in the city…intensified the embodied risks, and burdens of the pandemic for FDWs' (Lee and Wang 2024, 8).

Gig work can be particularly attractive to migrant workers, the denizens (Standing 2011) of the global workforce, as they often face difficulty accessing the formal labour market due to challenges with language, limited working visas, skill development, and lack of officially recognized credentials (Altenried 2024; van Doorn 2017). As Lata, Burdon, and Reddel (2023) contend, the precarious status of migrant workers 'makes [them] a hyper exploitable demographic, as there are few options available to earn a liveable income within the boundaries of labour [that] lies dependent on citizenship' (14).

Migrant labourers face various challenges that shape how they interact with and make sense of gig work. The precarity of gig work is accentuated further by a legal labour regime that effaces the labour of gig workers through their misclassification. Altenried (2024) views the gig economy as a continuation of existing exploitative migrant labour structures exacerbated by 'new forms of algorithmic management and hyper-flexible forms of employment' (12). We emphasize, however, that migrant workers are not a monolithic category as immigrant status and experience is profoundly shaped by factors including race, class, gender, professional training, and dominant language proficiency (Maury 2024; Stingl and Orth 2024).

The overall precarious status and poor working conditions of gig workers impacts racialized peoples, migrants, and those with low economic mobility the hardest (Jeon, Liu, and Ostrovsky 2019; McDonald et al. 2019). In Canada, for example, it is arguably international students attending universities and colleges with lax entrance requirements that provide food delivery platforms with a labour pool (Kshatri 2023). In 2022, approximately 250,000 Canadians participated in ride-hail or food delivery work (Statistics Canada 2022). The rise of gig work in Canada is set against the backdrop of a stratified labour market where racialized people earn on average lower wages than non-racialized Canadians, experience higher levels of poverty, and are more likely to work in precarious forms of employment (Block and Galabuzi 2011). International students in Canada were limited to working 20 hours a week at the time of the interviews, and most are further differentiated from Canadian citizens by language, employment skills, race, and residency status. Platforms in turn, fully capitalize on institutional flows of migrant workers and legal landscapes that deem them disposable. Despite these drawbacks, app-based food delivery work on EMMs is attractive for international students in Canada because it offers low barrier employment, flexibility, and the potential for earning higher than minimum wage.

Methodology and fieldwork

This article draws on 17 interviews with EMM riding FDWs in Vancouver, British Columbia between September 2021 and September 2022 and the autoethnographic fieldwork of Travers (T), a white, Canadian trans non-binary Professor in their late 50s, who delivered for 17 months from September 2021 to January 2023, and Park (P), a 27-year old East-Asian-Canadian male graduate student Research Assistant who engaged in food delivery work for three months (July 2022 to September 2022). During this time, T delivered 2200 orders for UberEats and 200 for DoorDash, while P delivered approximately 1000 orders for both platforms (Table 1).

Table 1. Interview participants.

Pseudonym	Age	Gender	Race/Ethnicity	E-mobility	Country of birth	Orders completed	Main Occupation
Aliya	27	F	South Asian	E-scooter	Sri Lanka	100–1000	Student
Anna	34	F	Latin American	E-bike and E-scooter	Brazil	100–1000	Officer worker
Maria	34	F	Latin American	E-scooter	Brazil	100–1000	Office worker
Alandra	38	F	Latin American	E-scooter	Brazil	100–1000	Office worker
Rahul	21	M	South Asian	E-scooter	Canada	5000+	Student
Tom	21	M	White	E-bike and E-scooter	United Kingdom	1000–5000	Food delivery
Mark	22	M	East Asian	E-scooter	Canada	5000+	Student
Ross	22	M	East Asian	E-scooter	Canada	5000+	Student
Hoban	24	M	Latin American	Electric unicycle	Argentina	100–1000	Student
Andrei	25	M	White	E-bike	Montenegro	1000–5000	Food delivery
Robert	25	M	White	E-bike rental	Canada	100–1000	Student
Hasan	26	M	East Asian	E-scooter	Sri Lanka	100–1000	Student
Ricardo	28	M	Latin American	E-bike rental	Colombia	100–1000	Student
Kamal	30	M	South Asian	E-scooter	Sri Lanka	100–1000	Student
Antonio	38	M	Latin American	E-bike	Brazil	1000–5000	Office worker
Nam	38	M	East Asian	E-bike	Canada	1000–5000	Food delivery

From our observations of FDWs on EMMs in downtown Vancouver, easily recognizable by the large food delivery packs they carried, the most predominant demographic appears to be young South Asian men on e-bikes or e-scooters. Representative recruitment proved difficult, however, with language barriers a likely factor, although the vulnerability of workers who are on temporary or student visas may be an additional barrier. Our participants came from diverse backgrounds: six identified as Latin American, five as South Asian, three as East Asian, and three as White. Thirteen were men and four were women. The number of women interview participants was much higher than expected given that T and P observed few women doing food delivery on an EMM.[2] All four women were born outside of Canada, one being from Sri Lanka and three from Brazil. The three women from Brazil were friends and referred each other to the study.

Of 17 interview participants, nine were recruited through paper recruitment flyers P handed out in downtown Vancouver while conducting fieldwork, two from postings P made on local Facebook food delivery groups, and six from chain referral sampling (Penrod et al. 2003).[3] P conducted the interviews, as we expected that as a young visible minority man he would be more relatable to workers than T.

Participants ranged in age from 21 to 38 years old. Nine used e-scooters, six used e-bikes, one used both, and one used an EUC. Their experience with food delivery work varied although we screened to ensure each participant had delivered at least 100 orders. Nine had completed between 100 and 1000 deliveries, four had completed between 1000 and 5000 deliveries, and four had completed between 5000 and 10,000 deliveries. Twelve of our 17 participants were born outside of Canada.

Interviews took place over oom, were semi-structured and lasted approximately one hour. An interview script was used to collect demographic information and explore food delivery experience. Interviewees received a $50 honorarium for their participation. Interviews were transcribed using Otter Ai and thematically coded using an inductive approach informed by our fieldwork. For privacy, pseudonyms have been used in place of names.

T and P recorded autoethnographic fieldnotes after each shift of work, using an inductive approach to data collection that became more structured in terms of key data points as we gained experience: date; number of hours worked; lunch or dinner shift; total earnings (broken down into the set delivery fee and tips); hourly earnings; distance travelled; satisfaction rating (derived from customers and restaurants); and notable weather conditions (rain, snow, ice, heat). Fieldnotes encompassed all aspects of our experience, ranging from the satisfaction P felt at developing the ability to deliver four orders at once, our improving spatial knowledge of the city, the rush we felt when we received an exceptionally good order, mistakes we made, the anxiety associated with waiting (for an order to be ready at a restaurant or for a customer to come down from their apartment), the near- and actual accidents we experienced, and our efforts to 'make sense' of the UberEats or DoorDash algorithm driving our experience and remuneration. Our purpose was to document and record as much as we could and included stream-of-consciousness reporting on all aspects of our experience. Food delivery work was a new world to both of us and we explored it with open-ended curiosity, recording our impressions and insights along with the data points noted above. T's fieldnotes, totaling 86,000 words, began on 14 September 2021, and concluded on 23 January 2023. P's three-month period of fieldwork – July 2022 to September 2022 – resulted in fieldnotes totaling 39,000 words.

We cannot overstate how crucial it was for our understanding of food delivery work that members of the team engaged in sustained fieldwork as FDWs on EMMs (Figures 1 and 2). The day-to-day experience of working in this sector provided us with crucial insider knowledge that shaped our interview guide and allowed us to understand participant responses. It also allowed us to observe the actions and interactions of other workers while on the job. Beyond formal interviews, T and P took opportunities to chat with other FDWs while waiting to pick up orders from restaurants, including workers who relied on cars, about the workday (are you busy today? How is your day going?), exchanges that we often recorded in our fieldnotes.[4]

Figure 1. Lead author, Travers, delivering food in the snow, December 24, 2021.

After T and P had completed fieldwork, the Research team became aware of two other autoethnographic studies of food delivery work. Timko and Melik (2021) draw on autoethnographic data and interviews with FDWs from the Netherlands and Germany while Chung (2024) employed autoethnography in a study of food delivery work in South Korea. Chung observed that fieldwork 'allowed me to grasp mobilities arising from delivery work in situ, following people, connections, and relationships. Crucially, there are aspects of the lives of the researched that become accessible and apprehensible only by the researcher taking part in the mobile practices' (575). T and P went from being completely new to food delivery work to becoming experts, and we note how that process led to a sense of achievement, intensification of work, and increased exposure to bodily harm (Figure 3).

T began food delivery work by signing up for DoorDash in September 2021 and venturing out with the bright red food delivery pack, emblazoned with '*DoorDash*' in large print, they had ordered and paid for through the app. Once T started working for UberEats, they replaced the DoorDash bag with a generic (non-platform branded), smaller and more efficient – faster/easier to open and close – food delivery backpack. P started with Doordash in September 2022. It took longer for both T and P to get signed up on UberEats because the platform requires workers to undergo an identity verification process that can take up to three months. As a nod to the public health concerns that prevailed during our fieldwork, UberEats required us to allow

Figure 2. Conducting fieldwork and making deliveries on an electric unicyle.

the app to take a photo of us wearing a mask before we were allowed to 'go online' in the hope of receiving orders.

Findings

When asked what they found most advantageous about food delivery work, all participants stressed the importance of flexibility and the potential to earn higher than minimum wage. Unlike traditional work arrangements that are structured with fixed working hours that require supervisor approval to change, our participants valued the flexibility of food delivery work. Participants who were students, either part or full-time, found food delivery particularly conducive to their schedules as they could choose when to work. Ricardo, who came to Canada less than a year ago from Colombia and was enrolled at a local college, explained:

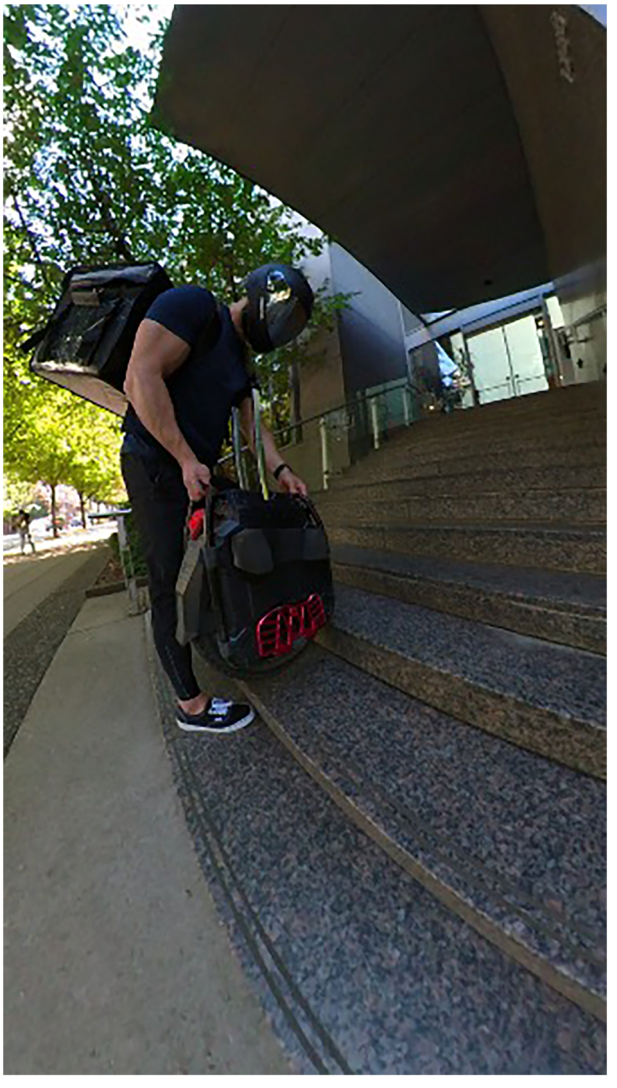

Figure 3. Transporting EUC inside a building with no accessibility ramp.

> You can just decide [when] you want to work. If you don't want to. For example, if I have an exam tomorrow or difficult presentation I can just quit my work for today and practice and prepare. There's the benefits that traditional works don't have for sure.

Mark, a domestic university student who began delivering during the COVID-19 pandemic, reported that he enjoyed delivering because of the flexibility and relatively good pay: 'You get to choose your own hours and as a student I did find that very beneficial…I think it was the flexibility that made the position really really good for me.' For some, the benefits of flexibility even outweighed the potential higher earnings they received in previous jobs such as serving. When asked what other jobs she would consider doing, Anna, who had moved to Canada from Brazil said 'I have experience waitressing so I would probably be doing that. It's good money. It's actually better money, but I just chose to do [food delivery] over [serving] because I can do it anytime I want to. I manage my time; I manage my schedule.' Tom relied on delivering food full-time to pay for living expenses and worked an average of 30 to 50 hours a week

depending on weather conditions. Food delivery enabled Tom to work autonomously and secure earnings he otherwise would not have been able to achieve.

Participants also cited pay as an advantage, reporting average hourly earnings between $20 and $25 per hour, while some earned as much as $35 to $40 per hour during the height of the pandemic. There were some shifts where T earned more than $50 an hour and, on several occasions, P achieved an hourly rate of $80. At the time of the interviews, the minimum wage in British Columbia was $15.65 per hour. Higher than minimum wage-earning potential in addition to flexibility was paramount for Muhammad, who arrived in Canada on a student visa in late 2019 with a master's degree from Bangladesh. Muhammad engaged in food delivery on an e-scooter to cover student fees and the cost of living which he said would have been difficult working a minimum wage job.

> For us [international students] [tuition] is around like $20,000, $15,000 minimum. We have to pay per year. So it's a big amount for us for tuition… How can I manage $20,000 like if we are allowed to work for 20 hours?[5] So if we do a normal job, we get a minimum payment because we didn't have Canadian experience right? So we cannot make this for sure.

Although low pay and less than minimum wage earnings among ride-hail and FDWs have been widely documented (Ravenelle 2019), our findings show that this was not commensurate with the experience of our participants during the pandemic, although this appears to be a temporary aberration. T stopped delivering food at the end of January in 2022, largely because the volume of orders had declined so much. Subsequently, whenever T encounters a FDW 'in the wild,' that is, waiting at a light or in a restaurant, they check in about current conditions. Although anecdotal, responses typically characterize the current labour climate for FDWs in Vancouver as 'terrible, slow, not enough orders, too many workers.'

Our findings show how the experience of food delivery work is multi-faceted and shaped by workers' unique circumstances and needs. It follows prior scholarship, based in the U.S. and Canada, that show platforms attract a diverse labour pool and can offer advantages that traditional occupations lack (Schor et al. 2020). Whether it was the flexibility, higher than minimum wage-earning potential, exploration of the city, or a refreshing change-up from existing occupations, the participants we interviewed all shared an overall sense of satisfaction and sometimes even enjoyment with their work experience.

In the following section, we address the knowledges, strategies, and skills that participants and T and P mobilized to increase earning potential and mitigate risk while reckoning with anxiety about displeasing each platform's algorithm and risking deactivation.

How to succeed as a food delivery worker

On its surface, food delivery seems to be relatively simple: you receive an order, pick it up, and deliver it to the customer. But according to what participants revealed about their experience and reflecting on our own, food delivery work is anything but simple and involves a significant learning curve. When orders are popping, time is literally money, and inefficiencies and poor decision-making negatively impact earnings. As FDWs navigate urban and suburban streets, they are constantly negotiating the tension between efficiency and personal safety, especially given that payouts for orders tend to increase with dangerous environmental conditions (rush hour, darkness, rain, ice, snow).

Success as a FDW depends on external conditions that the worker cannot control – the ratio of orders to delivery workers, restaurant efficiency, weather and traffic conditions – and factors that the worker can control – efficiency in moving through traffic while avoiding injury/death, navigating sidewalks and buildings to pick up and deliver orders, packing and unpacking orders quickly and effectively to avoid spills, and the worker's ability to 'double app' or even 'triple app,' by signing on with more than one food platform at a time to maximize earnings. Our

participants described various knowledges, strategies, and skills they learned and implemented in their work to maximize earning potential. Common themes included: positioning themselves by specific restaurants or neighborhoods depending on the time, developing order acceptance criteria, and multi-apping.

Start-up costs

Platform based food delivery work contributes to capital accumulation by offloading mobility costs and occupational hazards onto workers (Lee and Wang 2024, 6). As the costs of the work are borne solely by the worker, a significant outlay is required before earning any money.[6] T's fieldnotes report an extensive trial-and-error experience in finding the best gear to keep them warm and dry without causing them to overheat when inside buildings. Appropriate gloves were particularly difficult to find as they needed to include protective wrist guards, be warm and waterproof, and be easy to put on and take off so T could work their phone with a bare hand. Many of the FDWs we observed during our fieldwork, however, looked poorly equipped for safety or bad weather.[7]

'Good' versus 'bad' orders

FDWs navigate an algorithm that strives to maximize platform profits by minimizing wages and employing various mechanisms to 'motivate' workers to accept every order.[8] Workers describe a process of learning to 'game the algorithm' by attempting to resist/work around opaque mechanisms that distribute orders without endangering their access to the platform. FDWs typically report initially taking every order the app gives them but quickly realizing they will not make much money if they continue to do so. When workers accept every order, they often end up riding far outside the downtown core for a low payout and then must spend unpaid time riding back to busier zones before they can pick up another order. Rahul described developing criteria based on experience:

> My first week or something I was making those mistakes, I'd go off into different communities, like, 'shit like why am I here?' I'd have to go back to downtown which would waste more time. So I became more aware of where does [the app] take me.

Rahul made the bulk of his deliveries in the downtown core and rarely ventured outside of it. Ross, a 4th year domestic university student who lived at home with his parents and was engaging in food delivery to supplement his income, avoided orders from Chipotle or McDonalds during dinner because he noticed their customers did not tip well. Instead, positioned himself near upscale dining restaurants, saying, 'I know people order Miku[9] for dinner. So then I might spend more time around that area in general and hope that I get an order from there and that during the peak times I would see myself getting at least three or four Miku orders.' But knowing where *not* to go was just as important as knowing where to go and at what times.

The iterative criteria that FDWs use to evaluate orders was a central theme in fieldnotes and interviews. Such criteria depend largely on the order's pay, distance, estimated time to deliver, and the restaurant—information that is presented on the app. There was no universal standard among participants: a 'good' order could be anything that paid between $1 and $7 per kilometre while a 'bad' order is marked by low pay and high delivery distance. P, for example, defined a good order as one that paid at least $5 per kilometre and had a delivery distance under 3 kilometres.

Both DoorDash and UberEats attempt to undermine worker agency to discriminate among the orders they are offered by including 'acceptance rate' among the data visible to the worker on the app, with the inference that since the app is recording and displaying this data, it must 'mean something' for algorithmic worker management. When T began delivering for UberEats, only

earnings and customer ratings were displayed on the interface of the app, not the acceptance rate. Later in their fieldwork they noticed this new data point being presented to them and, even though they tried to resist letting it shape their decisions to accept or decline orders, 'it got in my head!' The anxiety that a lower acceptance rate would result in their receiving fewer and/or less lucrative orders influenced T to accept some of the orders they would have previously declined.

There is tension among FDWs about order selection as inexperienced workers contribute to depressing everybody's earnings by accepting low-paying orders. The FDWs we interviewed expressed frustration with 'inexperienced' or 'not serious' workers who reward the algorithm's profit-making tactics by accepting 'bad' orders. A Reddit discussion among DoorDash workers also addressed this conflict, with experienced FDWs encouraging worker solidarity in keeping wages up by turning down 'bad' orders. As Timko and Van Melik (2021) note in their study of FDWs in the Netherlands and Germany, 'The practice of being a Deliveroo Rider is thus always a conditional process responsive to the surrounding environment and conditions; any given Rider may routinely engage in an evolving constellation of practices depending on the situation' (518). They emphasize, however, that it is ultimately Deliveroo that benefits the most.

Who's gaming who?

The pay indeterminacy that is built into the app experience exploits FDWs by 'motivating' them to accept any order to secure earnings. Workers have no control over how the pay of an order is calculated, and when analyzed in tandem with the fact that most orders are 'bad,' food delivery work can be highly unreliable and low paying, although our fieldwork and interviews indicated that pandemic conditions temporarily increased demand and hence wages. The more experienced workers we interviewed expressed confidence that they were 'winning' in their battle to resist the app's drive to keep wages low.

However, the vast information asymmetries leveraged by digital platforms force workers to interact with an ever opaque, ambiguous, anxiety-inducing, coercive, and algorithmically managed order allocation system that constrains decision-making to accept, reject, or cancel orders. Even at the height of increased pandemic demand for food delivery, T and P often experienced periods of time without receiving an order. The success of both platforms' efforts to control worker behaviour is evident in that we internalized prompts that produced anxiety, even though neither of us depended on the work for economic security. We also experienced a dopamine response to the sound our phones made when the app was offering us an order. This socialization by app is insidious: when there was a noticeable decrease in app activity (i.e., receiving few orders), both T and P would feel compelled to accept orders that did not meet our typical criteria because it was *better to earn something than nothing*. This response was echoed by our participants. The uncertainly FDWs experience serves to coerce many into accepting bad orders, including those that on an hourly basis paid less than minimum wage.

To encourage workers to be less selective, UberEats regularly employs 'promotions' whereby workers will receive a bonus (for example, $100 extra for completing 100 orders in a specified time frame) as an incentive to take every order offered. T learned to calculate the projected impact of the bonus on their hourly wage ($30/hour being their target minimum during peak hours around lunch and dinner) before deciding to participate. Other promotions involved FDWs being paid a bonus to recruit new workers – their competition.

UberEats also shapes worker behaviour by using *heat maps* in various shades of orange and red in the app which 'compare[s] the demand in different areas around your city. The map displays different color intensities to indicate areas of low, high, and surging' (Uber n.d.). Heat maps lure more FDWs to the area, at times with surge pricing promising $1 or more extra per order. While UberEats claims these heat maps are based on demand, the demand is, in part, produced by the UberEats algorithm which is always driven by the logic of maximizing company profits. In the beginning of field work, T and P were enticed by visual heatmaps to travel to

'red zones' – supposedly high demand areas – only to receive few or no orders at all. Several interview participants reported similar experiences. Experienced workers learn to ignore UberEats' heat maps and stick to areas they have consistently good experience in.

Tipping is another aspect of pay indeterminacy. Without tips, FDWs would rarely earn above minimum wage. When T began their fieldwork, tips were concealed by UberEats until after delivery. This changed part way through because of worker protest in other regions, and the tip amount became visible when the order was offered to the worker. This produced the unintended consequence, however, of more uncertainty as the practice of tip-baiting emerged, whereby a customer promises a big tip to ensure a FDW accepts their order, only to reduce the tip in the hour allotted after delivery completion. This digital tussle between customers and FDWs over tipping reflects the collective agency workers can exert and customer attempts to undermine it.

Spatial knowledge

Like many of our interviewees, T and P amassed a sizable working knowledge and skills on how to maximize earning potential. As Chung observes,

> While digitally mediated interactions through an app are prominent, couriers move in physical environments and interact with others on the road. Couriers must attend to their material surroundings through their sensorium, especially when navigating the hectic traffic of Seoul, full of impatient car drivers and a variety of other moving subjects (2024, 577)

A critical component of T & P's emerging skills was the development and internalization of a detailed spatial understanding of Vancouver. Although we were longtime residents of Metro Vancouver, the intricate knowledge required to achieve efficiency and road safety took time to acquire. The knowledge we acquired while 'on the job' included: street names, numbering systems (T developed an 'east is even' mantra), which streets were one-way, the location of bike lanes and curb cuts, which streets had good paving, and optimal routes from point A to point B. This had to be learned by doing, and as we continued delivering orders, we gained more confidence and efficiency. The UberEats and DoorDash apps provide workers with map-based directions to pick up and drop off locations, but these were not always the most efficient routes and typically instructed us to ride in traffic on busy streets, even when separated bike lanes were available. We soon found ourselves resisting many navigational directions and improvising our own routes based on our ever-increasing geographic knowledge. Developing this knowledge was necessary for evaluating new orders while on the move; FDWs need to be able to look at their phones while riding and immediately decide whether to accept or reject an order based on the pay, distance, location, type of restaurant, and time of day.

Like our participants, there were also areas, specific restaurants, or delivery addresses we avoided or gravitated towards. We learned to avoid food courts, because they are often located underground and/or far away from building entrances, and restaurants that are either inaccessible (steep stairways) or had kept us waiting too long for an order. With time and experience, T learned to recognize and avoid – from the map pinpoint the app provided for delivery address – certain buildings with too many stairs or a concierge who refused to allow T's EUC into the building: asking customers to come down to the lobby to pick up their food carries the risk of receiving a negative rating.

Becoming an expert food delivery worker

For T and P, the process of learning the *game* was one of trial and error. On P's very first UberEats' order, he received a double order[10] and mistakenly gave both orders to the customer

at the first drop off address. He realized his mistake after he had marked the order as complete in the app and the customer had gone back up to their apartment. Although some details of a completed order are saved in a worker's order history, customer contact information is not included. P Googled what to do and learned that he needed to contact customer support in the app. They resolved the situation and told P he could ignore the second order and continue working. Through other similar mistakes, T and P learned that customer support can unassign orders from a worker's account so that they are not penalized for failing to complete a delivery. T and P quickly gained our footing, however, and noticed our earnings steadily increasing, which motivated us to work more and experiment with ways to further increase earnings. On P's 9th day, for example, he started multi-apping by using DoorDash alongside UberEats.

Multi-apping is the process of using two or more food delivery apps simultaneously and is a mark of an expert worker. Most of our participants reported using UberEats and DoorDash together to filter through a larger volume of orders to screen good offers and to help offset bouts of inactivity from one platform. Some participants picked only the best orders between the two apps while others accepted multiple orders concurrently from both apps if the pickup and drop off locations were geographically proximate. Multi-apping could double the pay for what was originally a single order trip. Muhammad, a veteran worker, proudly shared his mastery of multi-apping:

> Yeah. I can do that. Not everyone can do that. But when you are expert you can do that when you are used to it. When [you know the] map you can do that. Otherwise, it's risky. You cannot maintain all the orders together at a time. Yeah, I'm actually satisfied because it comes with your talent, right? I would say it's like a game.
>
> Multi-apping *is* a *skill.*

The process of learning to succeed in food delivery was iterative, stressful, and sometimes enjoyable, involving a nexus of spatial intuition, speedy and efficient traffic navigation, temporal awareness, restaurant knowledge, and elevator and battery – EMM and phone – management. Although EUCs are electrically powered and require no pedalling, riding one for six to seven hours a day in all kinds of weather, making frequent stops, coordinating multiple orders simultaneously while paying attention to two apps, vehicle traffic and other hazards is exhausting. At his most productive, P would be carrying four orders in his hands and arms while holding his phone to navigate to four different addresses, while riding at speed through motor vehicle traffic, avoiding potholes, cyclists, other delivery riders, and pedestrians. P managed to maintain a 4.85 out of 5 rating on his DoorDash account and a 94% rating on UberEats during the period of fieldwork, a testament to his efficiency, speed, and care. T also developed a great deal of efficiency and high ratings but after experimenting with multi-apping avoided it for the most part because doing so while riding in traffic, checking their phone, navigating in darkness and rain, seemed like an eventual death sentence. In fieldnotes, T emphasizes needing to remind themselves, over and over, to 'slow down and stay alive!' Other measures T, P and several participants took to decrease time spent on delivering included: removing the order from the pack while inside the elevator, using the pack to keep the elevator door from closing, running or riding down the hall to drop off an order and take a photo (as required by the apps to prove delivery), and running back to the elevator.

Capital costs and mitigating theft

In contrast to car-based FDWs, workers using EMMs require far less capital investment to begin working and this makes it more accessible to those with limited means. For workers who are unable buy an EMM, e-bike rental companies have emerged to profit from the food delivery industry and enable entry into the sector. Unless a worker is physically fit enough to do a lot of hard pedaling on an analog bike, an EMM or a car is a job requirement. Ricardo began food

delivery with an analog bike but found cycling up hills too difficult and rented an e-bike for $200 per month on a 3-month contract.

Unlike EUC riders who mostly keep their EUC with them – rolling it alongside them like a suitcase – FDWs on e-bikes and e-scooters must leave their EMM outside. They worry about theft and factor in that risk along with the time involved in locking and unlocking their EMM as time is literally money under a structure of piece-work labour that is intensified by lack of minimum wage guarantees. For FDWs, time is money and taking too long to deliver orders can result in negative customer ratings and poor performance metrics which increase the risk of account deactivation. The time required to securely lock an EMM inspires some FDWs to gamble between speed/efficiency and the risk of theft: T frequently observed FDWs leaving e-bikes and e-scooters unlocked as they stepped into street-level restaurants and shops to pick up orders. Andrei began by using a robust steel lock for his e-bike but soon switched to a simpler – and less secure – lock. Losing their EMM to theft would deprive FDWs of earnings; an outcome compounded for FDWs relying on e-bike rentals that need to be paid off if they are stolen.

Ratings: when the app is your boss and everyone is your supervisor

Rating systems are how platforms imbue customers and restaurant staff with quasi-managerial responsibilities and shift the balance of power heavily in their favour. Falling below a certain rating makes workers eligible for deactivation; T, P, and many of our interviewees experienced this as being socialized by the app in self-disciplining behaviours.

One means of shaping worker behaviour stems from UberEats' use of acceptance ratings. These ratings are not intertwined with the ability to go online; however, they can still impact worker behaviour. FDWs are unable to access or determine how acceptance ratings on UberEats relate to its black boxed algorithm (Pasquale 2015) and how it may affect the types of orders they receive. This can produce feelings of anxiety and apprehension. Although P tended to ignore his acceptance ratings, during periods of slowness, he would sometimes accept low pay orders to *please* the algorithm, hoping that by accepting a 'bad' order, the algorithm would show him favour. Anna also sometimes accepted low pay orders on UberEats to improve her acceptance rating, explaining that 'It's just because I have a feeling that it kind of gets into this momentum, you know, if I don't accept it, it might give a wrong impression, but if I accept it, they [the algorithm] probably see that I'm there, that I'm active.' T noted the tendency to anthropomorphize the algorithm and found themselves having imaginary conversations with 'IT,' constructing the algorithm as a more traditional (human) boss or supervisor who one can build a relationship with.

Waiting: a reserve army of labour

Waiting is an unpaid but unavoidable aspect of food delivery work: waiting to be offered an order, waiting at restaurants for orders to be ready, waiting for customers to arrive, and waiting for tips to be finalized for UberEats' earnings. EMM-based FDWs can be observed congregating on street corners, in parking lots, and other points of public infrastructure while they wait to receive orders. Waiting is a recurring theme in field notes and interviews, an explicit manifestation of FDWs' status as surplus labour. According to Chung (2024), 'As peak time is limited, minutes spent on waiting for food is the biggest source of stress for couriers as it leads to a loss in earnings. Information on the screen and reality are out of sync when restaurant staff do not correctly update the food status, or a restaurant simply fails to manage overflowing orders' (586). It is common to wait for orders to be ready at restaurants. Andrei was particularly frustrated about this as he routinely experienced servers telling him his order would 'take 5 more minutes' by one server, only for it to be brought by another server a minute later. He

was sympathetic that restaurant workers are busy and have other priorities, but it was nevertheless a frustrating experience. T's fieldnotes contain frequent references to the frustration of waiting and their internal reckoning with the 'sunk cost fallacy mentality' that overcame them once they had waited for some time already. An excerpt from P's fieldnotes captures the frustration, anxiety and mental calculus of uncertainty that waiting produces:

> Yesterday [I] had a big oof moment. I decided to wait for a double order at Earls Yaletown. It was over the Cambie bridge, drop off around 1st [and] Quebec, that area. Started a timer because both weren't ready. It was 6pm. I already knew before I got there they wouldn't be ready because 6pm, nothing is ready. I decided to wait because it was approximately $15. [While waiting] I get an Uber order for an additional $7-8, and then another DoorDash order for a similar amount. So now this one trip over the bridge, with drop offs all within 500 metres of each other is going to be $30. Now, I'm even more invested in waiting for the double order. But it's taking too long and I'm getting anxious about the other two orders I already have.[11] At 16 minutes [of waiting], I say fuck it, can't get dragged into sunk cost fallacy, so I cancel the second order. The first order was ready after 10 minutes or so. 10 seconds [after] cancelling the second order, the server comes out to hand it to me. Fukkkkkkk. Lost $7-8 for that. I think next time I'm going to not wait and leave as soon as one order comes out (September 23rd, 2022, 6 p.m.).

For Anna, anxiety about displeasing the apps meant she never cancelled orders 'because it's better than nothing because I don't know if I'm cancelling it, I may not even receive another one, you know, so I'll keep it.'

Workers learn to avoid restaurants that keep them waiting for more than a few minutes but delays on the delivery end are harder to predict and avoid. FDWs wrestle with whether to wait for an unknown period or leave the order at the door and risk receiving a poor customer rating. Although Kamal was earning approximately $400 a week, this figure could fluctuate depending on how much time he spent waiting for an order to be ready or to meet a customer at a drop-off address.

> Sometimes when you arrive at customer's place they won't be there and you have to wait for a long time. And delivery time is money for you. Like if you have to wait for 10-15 minutes you're losing the opportunity to do another delivery. And so for platforms, there's an option if you wait for more than five minutes, you have an option to keep the food or [place] them in a secure place and go. So if we do, sometimes the customers won't be happy. So they will complain and it might impact our rating.

Most of the orders T and P delivered were to apartment units. However, in some cases, customers' instructions would say 'Meet at door' or 'Call/message me when you arrive.' We would do so and then wait at the front entrance. Even if the customer arrived quickly, the experience of waiting was anxiety-producing and disempowering. These points of uncompensated waiting in the delivery process are a significant source of stress for workers that reflects their precarity.

Waiting is also linked to completion ratings – based on the number of orders a FDW accepts and delivers – on DoorDash. If an order is accepted and then cancelled by the worker, the completion rate decreases. On DoorDash, maintaining a 'safe' completion rate is critical. Underneath the completion rate in the app, it warns 'Dashers below 80% *may* [our italics] be deactivated.' Deactivation exists as a possibility that intrudes on FDWs as an existential, and yet materially consequential, form of precarity. In doing so, it shapes workers' behaviour to maintain high ratings to their own detriment by cementing them to orders they accept. This is how unpaid waiting time is built into the structure of food delivery platforms.

Food delivery work is further deflexibilized by platform-specific control structures (Mason 2018). Unlike UberEats, which allows workers to go online anytime, DoorDash operates by giving workers the option to either schedule a shift or *Dash Now* in a specified geographical delivery zone. However, the ability to Dash Now depends on a mixture of market demand and worker supply that is algorithmically determined, making it unreliable, and slots in the schedule are often fully booked due to limited availability. Both factors limit the ability to work and coerce workers to attain and maintain—often to their financial detriment—*Top Dasher* status, which

unlocks the ability to 'Dash anytime'. To receive Top Dasher status the following month, workers must meet the eligibility criteria by the end of each month. Andrei had *Top Dasher* status, which let him work all day, but he had to maintain a 70% acceptance rate by the end of each month to qualify. Andrei's strategy was to accept only 'good' orders for most of the month and then in the last five days, accept every order offered to him to get his acceptance rating back over 70%. In addition to the Top Dasher program, DoorDash also has a *Priority Access* program which they say prioritizes high paying orders for Dashers who qualify based in part on high acceptance ratings. DoorDash uses the phrase, 'higher likelihood of seeing high paying offers,' to motivate workers to attain the status. These DoorDash programs promise indeterminate rewards for achieving high acceptance ratings while implicitly threatening low or no earnings for FDWs who fail to achieve a specified standard. FDWs navigate a range of dilemmas that include accepting only good orders to earn decent money versus maintaining a high acceptance rate to access preferred work slots and presumably be treated more favourably by the algorithm and earning good money versus staying alive.

Safety and risk-management while multi-tasking in traffic

Chung (2024) observes that FDWs navigate 'ever-changing urban environments [that] constantly disrupt digital and physical synchrony. The hybrid environment is therefore experienced as inherently seamful for connected mobile users (Licoppe et al., 2016). For [FDWs], this means constant exposure to road hazards' (578). FDWs on EMMS need to watch for road irregularities and are more exposed to hazards in their environment than workers using cars. In addition, automobile-centred urban design and the apps themselves direct FDWs on EMMs to share road space with cars even when dedicated bike lanes are available nearby.

Delivering food is physically demanding (riding, lifting and carrying, climbing staircases, dealing with rain/cold/excessive heat depending on the season) and involves prolonged exposure to traffic hazards (Lee and Wang 2024). It cannot be overstated how dangerous EMM-based food delivery can be as profits are prioritized over everything else, including worker safety. As Chung (2024) notes, 'The pursuit of speed has made risky riding a common practice among couriers. Especially, motorbike riders perform perilous maneuvers to move around any frictions and obstacles as quickly as possible' (584). Ross (2019) reports that food delivery work 'has one of the highest risks per kilometre travelled' as evidenced by numerous incidents where workers have been assaulted and even killed while working. Lee and Wang (2024) report that,

> From 2020 through 2022, 33 New York City food delivery workers died during work with 26 dying from vehicular crashes, five dying during robberies, and two from unknown causes… This occupational fatality rate for food delivery workers is more than four times the fatality rate of construction workers, which is historically the New York City occupation with the highest fatality rate (9).

We lack comparable data for Metro Vancouver. Except for the well-publicized stabbing of a FDW in Vancouver in 2022,[12] we can only report on our own experiences and those of our participants. Both T and P experienced the pressure to forgo safety in favour of speed and observed other FDWs on EMMs engaging in risky behaviour.

In the absence of regulatory and employment protections, the responsibility of risk is externalized to workers who must self-assess for financial and physical risk (Gregory 2021). Regarding the recent deaths of FDWs in Australia, Orr et al. (2023) state that the accumulation of value by platform companies is based on the 'willingness' of FDWs 'to do labour that puts them at risk of debilitation' (206). The disposability and expendability of workers is furthered by their contingent and fungible labor status and the lack of employment benefits in case of injury (Bissell 2022). The status of FDWs as independent contractors absolves platforms of any legal responsibility to provide compensation or sick pay and marks individual workers as disposable,

especially given platforms' profit-maximizing structure of over-recruitment and underutilization of workers.

At the beginning of fieldwork, T and P often felt stressed making deliveries as there were numerous challenging dynamics to engage with. Riding an EUC with an uneven load in a bulky pack was one. Trying not to die in traffic was another. Sometimes pedestrians would step into the street or the bike lane without looking up, forcing us to brake quickly or swerve to avoid them. On top of this, we learned to check our phones for orders while riding as stopping would take time and time was money, quickly decide whether to accept them or not, follow/or not follow the app's directions to pick up and drop off locations, and keep our phones charged. In essence, we had to learn and master a new set of skills to make money and not die on a platform where, as workers, we were completely expendable, without employment protections or health benefits in the event of injury.

Participants reported numerous close calls, ultimately amounting to the fact that at any moment, they could be hit by a moving vehicle, the opening door of a parked car, or thrown off their EMM due to road irregularities. Nam, who had been making deliveries on his e-bike since 2019, was T-boned by a car while delivering for DoorDash. He told us 'The moment that it happened, I thought in my mind, like immediately I thought I'm dead.' It was a jarring incident for him, and he only went to the hospital after ensuring his order was taken care of by asking a nearby pedestrian to return it to the store. Nam was fortunate to escape the accident without broken bones but found himself unable to work for a week because he was in too much pain.

Although neither T nor P occupied a precarious status while working,[13] we nevertheless felt internal pressure to complete deliveries as quickly as possible to maximize earnings. Following the rules of traffic, riding slowly and walking an EMM rather than riding it on the sidewalk results in longer delivery times, and when time is literally money, we found ourselves engaging in riskier riding behaviour as time went on, such as riding in traffic on busy roads, at times reaching speeds of 50 kph. We were conscious of the risks, however, and kept the possibility of death by car in mind, reminding ourselves to stay focused, not rush too much, and 'STAY ALIVE!'

Sharing urban space with vehicles is dangerous. Many participants reported worrying about their safety while riding and employing various strategies to minimize the risk of injury, such as riding slower, constantly monitoring their surrounding environment and paying extra attention to large vehicles. T and a minority of participants also wore high visibility vests. Although Vancouver was rated as the second most bike friendly city in Canada in 2019 (Anderson 2019), some interviewees stated that there was still significant room for improvement.

Most participants rode on the right side of roads when there were no available bike lanes because they feared that taking the centre of the lane as a safety strategy risked provoking aggressive behaviour from drivers. However, riding on the right side of the lane put them at risk of being hit by the opening door of a parked car.[14] Antonio reported taking extra precautions when riding near parked cars.

> I'm just really careful because obviously if there's a parked car, then you could see a door opening anytime so I try to be really careful with that. I'm trying always to observe the mirrors because you get to see if anybody's inside the car. And I always pay attention to the position of the tire of the wheel because I see if the wheel is turning to the left, I know that the car might be wanting to come out. So you are always trying to observe little details right that will try to make you anticipate anything that might happen.

Danger from cars was also particularly concerning for Anna, who tended to ride slowly for safety purposes:

> It just reminds me of my biggest fear, which is being in between two lanes of parked cars. And then somebody just opens the door without looking. And then I fly away. So that's actually my main concern. I'm constantly riding and thinking about it. Like that's big, even before thinking about the car that is speeding right next to me

T, P and most participants reported experiencing close calls with inattentive drivers. During our fieldwork, there were numerous times when car drivers could have seriously injured us had we not taken evasive maneuvers. Sometimes these situations involved drivers who appeared to be actively hostile to cyclists in general and/or FDWs rather than simply careless. These negative interactions are reminiscent of the hostility bicycle couriers engendered from car drivers when they 'exploded' on the scene in urban spaces in the 1980s (Day 2015).

T experienced four relatively minor accidents in a 17-month span that would have resulted in injury had they not been wearing high quality (and expensive) protective gear (knee and shin protectors, a padded motorcycle jacket, full-face helmet, and hand and wrist protection). On two of these occasions T hit the ground with such force that their Apple watch detected a fall and asked them if needed emergency assistance. The cause of these falls varied: twice it was road/sidewalk irregularities, once T was cut off by a cyclist who turned left without signaling, whereas in another case, T was jostled and knocked to the ground by a cyclist going the opposite direction on a bike path. In this last instance, the glass bottle of soda that T was carrying for delivery shattered in their hand as they hit the ground.

P was more stubborn than T when it came to wearing the protective gear and high vis vest the Project provided. Indeed, in his fieldwork, P was consistent with the demographic of the study population who can frequently be seen whirring about the city dressed all in black with only a helmet on at the best of times, and he paid the consequences for this. While riding at night in a separated bike lane, a rider on an e-scooter cut in front of him and knocked him to the ground. The outcome for P was a fractured hand and the end of his career as a FDW.[15] It speaks to the impact of ratings on the app that, like Nam, P's first thought was to contact platform support to report his injury so he would not be recorded as having failed to deliver an order. The very structure of the platforms themselves, by way of externalizing managerial responsibility via rating systems and performance measures, implicitly directs workers to prioritize the *safety of the order* before themselves.

Vehicular hazards motivated participants to ride in bike lanes whenever possible. But riding in a bike lane does not make one completely immune from potential collisions, as K's experience indicates. Tom cited an alarming incident where a car abruptly cut in front of him as he was riding in a bike lane and about to cross an intersection on a green light: 'That was another close call. That one actually really shook me up because it was like, really close actually.'

Underlying the dangerous working environment is the platform structure of piece-rate work that implicitly compels workers to complete orders as quickly as possible. In such a context, workers often attempt to decrease delivery times by rushing and making unsafe decisions, increasing their risk of injury. The limited and precarious earning potential of relying on a single app that can lead to multi-apping also contributes to this dynamic as FDWs must mentally and physically handle the logistics of multiple orders on different apps while navigating through traffic.

Who is gaming who?

In some respects, food delivery is like a high-speed arcade game. 'Gamification' is understood as the application of game systems – with competition, rewards, quantifying player/user behaviour – into non-game domains, such as work, productivity and fitness. New technology has provided increasingly detailed and granular ways to monitor workers (Moore and Robinson 2016). However, no matter how technologically advanced the means of surveillance in the workplace are, 'such systems cannot solve the problems of motivation on their own. It is at this point along the path of the increasingly disciplinary uses of surveillance technology that gamification enters the picture' (Woodcock and Johnson 2018, 545). Woodcock and Johnson distinguish between two types of gamification: first, 'gamification-from-above', involving the optimization and rationalizing of work practices by management; and second, 'gamification from- below,' a

form of active resistance against control at work (542). However much FDWs may feel they are 'gaming the algorithm,' profit-driven food delivery platforms depend on 'gaming' the workers.

Gamification-from-above co-opts players into neoliberal pressures by finding newer ways to encourage people to work. The marketed mantra of free to work anytime presupposes there is work available and that the work will support a minimum earning standard. However, food delivery work is generally most active during lunch and dinner hours. These market dynamics coupled with Uber and DoorDash's legal circumvention of employment regulations create an app-mediated labour structure that encourages FDWs to engage in a high-tech split-shift that they may experience as game-playing. Workers are spatially dispersed, atomized, and have little contact with one another, creating the conditions for gamification-from-above.

Gamification from below includes the knowledges and strategies developed by T, P and our participants that relied on a heuristic learning process (Palacios Crisóstomo and Kaufmann 2024). Although there are grassroot labour organizations and food delivery forums online where FDWs can discuss their experiences and pick up tips, the experience of working for a digital labour platform is fundamentally self-contained within individual workers. This provides platforms with significant leverage and control which makes it difficult for collective labour action to occur and can lead to a heightened sense of powerlessness for workers (Glavin, Bierman, and Schieman 2021). Anxiety resulting from pay indeterminancy becomes internalized for FDWs. During P's most intense period of work, he developed a sense of achievement about his hourly earnings which were higher than our participants, those reported on local food delivery Facebook groups, and what we learned from the broader literature on gig work. P started to identify with his earnings as a source of achievement and means of measuring his food delivery skills. The metric of average hourly earnings was the only way he could quantify how well he was doing individually. P reported feeling a high degree of accomplishment and satisfaction with his earnings, and this shaped his desire to work more. All of this points to the incorporation of K in gamification-from-below.

Conclusion/discussion

The participants we interviewed enjoyed the flexibility of their work and high earnings relative to minimum wage, but the characterization of food delivery work as flexible and relatively high paying should be understood within a matrix of market constraints, algorithmic domination, self-surveillance, information asymmetries, gamification, and a neoliberal rhetoric of individual choice that intrudes on and limits workers' agency while elevating their exposure to bodily harm. Digital platforms, motivated to keep labour costs low, produce these structures within racial capitalism to exacerbate already uneven power relations between workers and platforms.

Participants who worked during the peak of the COVID-19 pandemic reported that they earned much more then compared to now, as the volume and quality of orders they subsequently received had decreased and worsened. The pandemic was a catalyst for a surge in demand for food deliveries amid lockdowns and other social distancing restrictions (Ford 2021). However, after lockdowns and social distancing measures were lifted, demand for food deliveries quelled and workers that came to expect high earnings were disappointed without any room for recourse. Rahul reported that:

> There was a bit of a gradual slowdown. But there were updates on the app, and then I kind of noticed that consumer demand was kind of falling, and then Uber payouts were also falling a little bit. I felt that competition was also increasing. I saw a lot more scooters and e-bikes downtown. So I tried it for a few more days and the payouts weren't worth it in my eyes. So I just stopped doing it.

Any changes in market trends are directly absorbed by FDWs because they are independent contractors and are paid a piece-wage rate. Our participants varied in terms of their vulnerability to such changes: of the four domestic students we interviewed, three lived at home with their

parents and casually commented that they would most likely stop working as much, if they hadn't already, because of how slow the market had become post-pandemic. In contrast, the international students we interviewed were more insecure.[16] Without Canadian work experience and facing potential language barriers, a busy school schedule, high international tuition and fees, and exorbitant housing costs, their capacity to make decisions regarding their employment were very limited. Purchasing an EMM—or renting one—and signing up to be food courier may have been the best option for them, and many commented that for their circumstances, it was, given the structural barriers they faced to access stable-higher-paying-regulated-employment.

Standing (2011) argues that one feature of neoliberalism is the way it shifts firms' exposure to market risk by externalizing it to workers through the casualization of labour and development of contingent labour pools. We have traced how these risks are unevenly distributed among FDWs, and how individually they have responded. The physical mobility of FDWs – enabled by EMMs, smartphone apps, algorithmic platforms and other technologies – provides food producers and consumers alike with considerable convenience and financial value. FDWs strive to overcome considerable practical and social barriers to acquire the tools and knowledge required, and some succeed. Yet, it is their mastery of this mobility game that casts them as surplus labour. They compete with each other to suppress earnings, while waiting immobile for the next delivery request.

Notes

1. Srnicek (2017) defines platforms as 'digital infrastructures that enable two or more groups to interact' (31) and argues that, in contrast to traditional firms, digital platforms 'became an efficient way to monopolise, extract, analyse, and use the increasingly large amounts of data that were being recorded' (31).
2. The relationship between gender and precarious work in general and the gig economy specifically is longstanding and significant but beyond the scope of this study.
3. The recruiting process for interview participants began with K handing out paper recruitment flyers to prospective interviewees while conducting fieldwork. Recognizable as a food delivery worker because of the bulky food delivery pack on his back, *K* would approach potential participants while they were either waiting in front of a traffic light, at a restaurant, or by the entrance of an apartment. K would often have to follow potential participants from a distance as they rode their EMM, and at the first sign of rest, introduce himself and hand them the recruitment flyer which contained information such as eligibility criteria, what participation involved, the honorarium amount, and contact information for the .
4. T's fieldwork began during the first year of the Covid pandemic, giving them a front row seat to observe the public health enforcement burden placed on low wage restaurant workers, almost exclusively racialized women, who were required to check vaccine passports before allowing a customer to dine in. T also observed fast food workers of the same demographic being the first line of contact for mentally ill and impoverished community members, responsibilities for which they were neither trained nor remunerated.
5. A Canadian legal restriction that has subsequently changed to allow international students to work up to 40 h.
6. These costs are modest, however, in comparison to using a car for delivery.
7. We observed many FDWs dressed all in black with no reflective gear, often without helmets, or adequate rain gear.
8. Profitability for restaurants is another matter that is beyond the scope of our study to address.
9. $$$$ Japanese restaurant in Vancouver.
10. UberEats and DoorDash will sometimes offer you another order on top of the one you already accepted if the second order has a pickup and drop off location close to the first one.
11. While waiting for the two orders at Earls, K received additional orders with pickup locations nearby. He picked up the two additional orders and came back to Earls to wait for the original two orders.
12. On 11 September 2022, Hamid Habibi, a refugee from Afghanistan, was stabbed in Vancouver's Chinatown while making a food delivery for DoorDash (Chan 2022). He suffered grave injuries and was hospitalized. Unable to work and without employment benefits, a GoFundMe was setup to support his living and medical expenses.
13. T is a professor and K was a graduate student who was earning money as a Research Assistant and doing food delivery as a bonus until he purchased his own EUC that he needed to pay off with food delivery income.
14. Subject to a high fine for the driver, but only after an injury to the rider.
15. This occurred after his employment as a Research Assistant when he continued to engage in food delivery work because it was so lucrative for him.

16. At the time of the study, international students in Canada were only permitted to work 20 h per week. In September 2024, this was increased to 24 h per week (Mallees 2024).

Informed consent

The study received research clearance from Simon Fraser University in 2020. Informed consent was submitted in writing by each participant upon reviewing a letter outlining the purpose of the study and nature of consent. Participants consented to a 60–90-minute interview and were advised that they could choose not to answer a question or withdraw from the study at any time. No identifying information has been shared in the article. Participants received a $50 honorarium upon completion of the interview.

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