

# Compulsory citizenship behavior of food delivery riders under algorithmic management: a resource perspective

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## Abstract

**Purpose** – This study aims to examine how perceived algorithmic control (PAC) influences compulsory citizenship behavior (CCB) among gig workers, with a focus on the mediating role of organizational dehumanization and the moderating role of prosocial motivation.

**Design/methodology/approach** – Drawing on Conservation of Resources (COR) theory, this study conducted a two-wave time-lagged survey of 214 food delivery couriers in China. Structural equation modeling was used to test the hypothesized mediation and moderation effects.

**Findings** – Results showed that PAC was positively associated with CCB through the mediating effect of organizational dehumanization. Furthermore, this indirect relationship was stronger for workers with lower levels of prosocial motivation, indicating a significant moderated mediation effect.

**Originality/value** – This research offers novel theoretical insights by applying COR theory to explain how perceived algorithmic control can undermine worker self-worth and foster compulsory citizenship behavior through organizational dehumanization. It extends prior literature by demonstrating a moderated mediation mechanism rarely examined in gig economy contexts.

**Keywords** Perceived algorithmic control, Organizational dehumanization, Compulsory citizenship behavior, Prosocial motivation, Conservation of resources

**Paper type** Research article

Digital technologies have profoundly reshaped the nature of managerial control in the platform economy. In the food delivery sector, algorithmic systems allocate orders, track couriers' locations, and evaluate their performance, subjecting workers to continuous digital oversight (Liu *et al.*, 2021). Gig workers' perceived algorithmic control (PAC) refers to their overall perception of how algorithms dynamically regulate their service process through normative guidance, performance tracking, and behavioral constraints (Pei *et al.*, 2022). Although PAC has gained increasing scholarly attention, existing research has primarily focused on its structural or operational features, while the underlying psychological pathways through which it shapes worker outcomes remain underexplored (Kadolkar *et al.*, 2024).

Algorithmic management extends managerial control by leveraging customer feedback mechanisms, effectively transforming clients into evaluators who indirectly enforce organizational standards (Möhlmann *et al.*, 2021). As a result, food delivery couriers as one of the gig workers are often asked to fulfill non-standardized customer requests such as taking out the trash or purchasing beverages on the way to deliver the package (Guangming Daily, 2021), which substantially increase their workload and time pressure (Zhu *et al.*, 2023). While prior research has often framed such behaviors as proactive service, emerging evidence suggests that algorithmic control does not inherently promote genuine proactivity (Pei *et al.*,

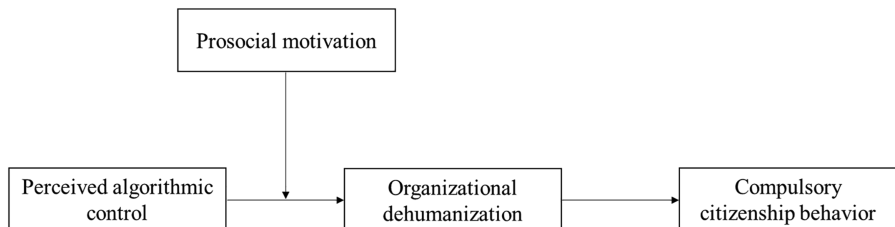


2022; Wang *et al.*, 2025a, b). Instead, we argue that these requests may compel couriers to comply in order to maintain high ratings or avoid penalties, reflecting compulsory citizenship behavior (CCB), the “forced but goal-oriented” actions undertaken in highly controlled work environments to achieve personal security or performance outcomes (Vigoda-Gadot, 2007; Spector and Fox, 2010). Previous research has largely emphasized external pressures from leaders or organizations as the antecedents of CCB (Vigoda-Gadot, 2007; Liu *et al.*, 2019; Zhao, 2014), but the digital form of control may trigger similar compliance through impersonal algorithmic authority.

Algorithmic control has been increasingly identified as a significant source of workplace stress (Zhan and Zhao, 2024; Cram *et al.*, 2022), which may provoke both physiological and psychological strain (Sonnetag, 2015). Yet, most existing studies have examined structural mediators, such as adverse working conditions (Wood *et al.*, 2019; Sayre, 2023), reduced autonomy (Duggan *et al.*, 2020; Parent-Rocheleau and Parker, 2022), and diminished social interactions (Schmidt and Van Dellen, 2022; Ai *et al.*, 2023), offering limited insight into the psychological processes through which algorithmic control may erode workers’ self-worth and increases compliance. Conservation of Resources (COR) theory predicts that resource loss is the principal ingredient in the stress process (Hobfoll, 2001), and we argue that workers may perceive that their self-worth is being threatened or depleted under continuous digital surveillance. This experience aligns with organizational dehumanization (OD), the perception that one is treated as an object or tool rather than as a human being (Bell and Khoury, 2011; Nguyen *et al.*, 2022; Lagios *et al.*, 2025). Consequently, they may feel compelled to go the extra mile to conserve resources and avoid further resource loss. In other words, workers who experience OD may engage in CCB as a resource-protective coping response, attempting to preserve residual resources or prevent further loss.

Furthermore, according to COR theory (Hobfoll, 2001; Hobfoll *et al.*, 2018), individuals possess not only external but also internal psychological resources that help them resist resource loss and recover from stress, such as motivation (Hobfoll, 2001; Halbesleben *et al.*, 2014). We propose prosocial motivation attenuates the impact of algorithmic control on perceived dehumanization, which represents the desire to benefit others and make meaningful contributions (Grant, 2008; De Dreu and Nauta, 2009), and has a positive impact on a number of work outcomes, such as employees’ connection with the workplace (Shao *et al.*, 2017) and citizenship behavior (Arshad *et al.*, 2021). Employees high in prosocial motivation tend to autonomously initiate helpful actions, interpret work challenges as opportunities to serve others, and remain less affected by stressful events (Grant and Sumanth, 2009; Hickey, 2014; Patil and Lebel, 2019). Hence, algorithmic control may have a weaker association with OD among prosocially motivated individuals.

Drawing on COR theory, we develop a resource-based model to explain how PAC influences couriers’ coping behavior (see Figure 1). Specifically, we propose that PAC depletes psychological resources by inducing feelings of organizational dehumanization, which in turn drive compulsory citizenship behavior. Furthermore, prosocial motivation functions as a key psychological buffer that helps individuals reinterpret stressful algorithmic



**Figure 1.** Research model. Source: Authors’ own work

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control as opportunities for contribution, thereby maintaining self-worth and reducing dehumanization. Personnel Review

This study seeks to make three primary theoretical contributions. First, it aims to extend the literature on algorithmic management by theorizing the psychological costs of perceived algorithmic control. Drawing on COR theory, we propose that PAC may deplete couriers' psychological resources, thereby fostering compliance-oriented behavioral tendencies. Second, this research seeks to advance our understanding of CCB by conceptually positioning algorithmic management systems as a novel source of compliance pressure. In doing so, it highlights the potential for algorithmic practices to shape employee behavior while raising concerns about workers' self-worth. Finally, by incorporating prosocial motivation as a key moderating resource, this study aims to identify an important boundary condition that may buffer the adverse effects of algorithmic control. Collectively, these contributions bridge the algorithmic management and CCB literature and underscore the importance of more human-centered digital management systems.

## 1. Theoretical background and hypotheses

### 1.1 PAC and CCB: the mediating role of OD

Algorithmic control manifests as surveillance, standardization, and performance quantification, which restrict workers' autonomy and reduce their decision-making authority (Gagné *et al.*, 2022), and introduces various resource-draining stressors (Cram *et al.*, 2022), such as constant monitoring and the pressure to meet algorithmic performance criteria. According to COR theory (Hobfoll, 1989, 1998), stress arises when individuals face threats to or actual losses of valued resources. Loss of autonomy and control can erode individuals' sense of self-worth (Halbesleben and Buckley, 2004; Pierce *et al.*, 1989). These conditions align closely with OD, which refers to employees' perception that they are treated as mere instruments rather than as individuals with agency and subjectivity (Bell and Khoury, 2011; Brison *et al.*, 2023). Dehumanization reflects the loss of perceived autonomy, recognition, and relational connection within the organization (Sainz *et al.*, 2023; Zhang and Chen, 2024). Research suggests that when autonomy is undermined, dehumanization is likely to intensify (Blauner, 1964).

In platform-based gig work, algorithmic systems often displace human supervisors, limiting interpersonal interactions and diminishing perceived organizational care (Möhlmann *et al.*, 2021; De Cremer, 2020). They also constrain decision-making latitude, leaving workers with little control over workflows, schedules, or outcomes (Curchod *et al.*, 2020; Stark and Pais, 2020). Moreover, real-time algorithmic feedback, rigid performance metrics, and fragmented, repetitive tasks further reinforce the perception of being objectified and mechanized (Baldissarri *et al.*, 2017; Caesens *et al.*, 2017). Taken together, these features of algorithmic control including loss of autonomy, limited interpersonal engagement, and mechanical work processes, converge to create a work environment that fosters OD. Therefore, we propose the following hypothesis:

- H1. Perceived algorithmic control is positively associated with organizational dehumanization.

OD represents a cognitive and emotional response to the loss of critical psychological resources such as autonomy, dignity, and recognition (Brison *et al.*, 2023). COR theory proposed that individuals are motivated to protect existing resources and acquire new ones, especially when they perceive current or potential resource loss (Hobfoll, 2001; Hobfoll *et al.*, 2018). Resources are defined by their capacity to help individuals achieve valued goals (Halbesleben *et al.*, 2014), and their subjective value is often tied to their instrumental utility in specific work contexts. When workers feel dehumanized, treated as tools rather than as valued individuals, they may engage in compensatory strategies to preserve performance outcomes and avoid further loss. One such strategy involves aligning with external expectations through

CCB unwilling but adaptive acts aimed at gaining favorable evaluations or avoiding penalties (Spector and Fox, 2010; Zhao, 2014).

This is particularly salient in platform-based gig work. For food delivery workers, income and future work opportunities are tightly linked to algorithmic performance metrics and customer ratings (Kellogg *et al.*, 2020). These evaluations are often opaque, subjective, and difficult to challenge (Duggan *et al.*, 2020), placing pressure on workers to exceed basic job requirements. Under conditions of OD, such pressure may intensify, as workers attempt to regain control and secure essential economic and psychological resources by complying with implicit expectations such as fulfilling extra requests or tolerating customer incivility (Gandhi *et al.*, 2018). Thus, OD may inadvertently promote behaviors that appear prosocial on the surface but are in fact driven by resource anxiety and perceived coercion. Therefore, we propose the following hypothesis:

H2. Organizational dehumanization is positively associated with compulsory citizenship behavior.

The algorithmic system continuously monitors, evaluates, and directs couriers' behaviors through data-driven mechanisms such as task assignment, performance tracking, and customer rating systems (Kellogg *et al.*, 2020). Accordingly, PAC represents a salient job stressor in the platform-based gig economy (Zhan and Zhao, 2024; Cram *et al.*, 2022). Prior research suggests that compulsory citizenship behavior (CCB) often emerges as a coping response to organizational pressure, serving to prevent further resource loss rather than reflecting genuine prosocial intent (Spector and Fox, 2010; Vigoda-Gadot, 2007). In algorithmic work contexts, the continuous and data-driven nature of control intensifies such pressure. Couriers' evaluations are tightly linked to algorithmic performance metrics and customer feedback, rendering compliance with implicit rules and extra-role demands a practical necessity for maintaining favorable ratings and future work opportunities (Möhlmann *et al.*, 2021). As a result, when couriers perceive stronger algorithmic control, they may be more likely to engage in CCB as a defensive response to algorithmic pressure rather than a voluntary form of citizenship.

Drawing on conservation of resources (COR) theory, workplace stressors are expected to erode individuals' valued resources (Hobfoll, 2001; Hobfoll *et al.*, 2018). For delivery workers, prolonged exposure to opaque, evaluative, and uncontrollable algorithmic systems can undermine core psychological resources, including autonomy, dignity, and social recognition (Hobfoll, 2001; Brison *et al.*, 2023). Such conditions are likely to foster perceptions of organizational dehumanization (OD), wherein workers feel treated as expendable tools rather than valued individuals (Brison *et al.*, 2023).

Importantly, COR theory further posits that following resource loss, individuals are motivated to invest remaining resources to prevent further depletion (Hobfoll *et al.*, 2018). Under conditions of OD, couriers may therefore engage in CCB as a compensatory strategy to regain control and secure economic and psychological resources. By complying with implicit expectations, workers attempt to protect their standing within the algorithmic system despite limited autonomy (Gandhi *et al.*, 2018). Consequently, OD is expected to function as a key mechanism linking perceived algorithmic control to compulsory citizenship behavior. The following hypothesis is proposed:

H3. Organizational dehumanization mediates the relationship between perceived algorithmic control and compulsory citizenship behavior.

### 1.2 The moderating role of prosocial motivation

Individuals are not merely passive recipients of environmental stressors but active agents who strategically invest and protect their valued resources (Halbesleben *et al.*, 2014). According to the COR theory, personal resources play a crucial role in shaping how individuals appraise

stress and regulate their behavioral responses (Hobfoll, 2001). Prosocial motivation can be considered as a key personal resource (Kelly *et al.*, 2020), which refers individual's desire to benefit others and make meaningful contributions (De Dreu and Nauta, 2009; Grant, 2008). Individuals high in prosocial motivation are motivated to regulate their behaviors in alignment with moral and relational values, emphasizing meaningful and beneficial outcomes rather than self-serving returns (Grant and Berry, 2011; Bolino and Grant, 2016), and inclined to engage in constructive social behaviors, even under adverse conditions (Wang *et al.*, 2014). Empirical studies have shown that prosocial motivation can buffer the detrimental effects of stress, such as mitigating the negative impact of job insecurity on engagement (Shin and Hur, 2021) and alleviating emotional distress caused by customer mistreatment (Kim *et al.*, 2023).

We assert that prosocial motivation weakens the positive effect of perceived algorithmic control (PAC) on organizational dehumanization (OD). First, prosocial motivation encourages individuals to interpret external demands or control cues in more positive and prosocial ways (Grant, 2008), which enable them to reinterpret such control as opportunities to serve others rather than as coercive restrictions (Bolino and Grant, 2016). Second, prosocial employees tend to attend to information outwardly (De Dreu and Nauta, 2009). Prosocially motivated state influences how people process a broad range of social and contextual information (Meglino and Korsgaard, 2004), and their other-oriented value orientation provides emotional stability and meaning (Utz *et al.*, 2014), buffering the depletion of self-worth that arises from dehumanizing work conditions.

Moreover, prosocial motivation also influences how individuals respond once dehumanization occurs. COR theory posits that individuals with stronger internal resources are better equipped to prevent resource loss spirals and engage in adaptive coping (Hobfoll, 2001). Prosocially motivated workers driven by concern for others and guided by moral purpose are less likely to resort to self-protective yet compliance-oriented strategies such as CCB. Instead, they are more inclined to regulate their behavior constructively, even under pressure (Shin and Hur, 2021; Kim *et al.*, 2023). Conversely, those low in prosocial motivation, being more self-focused, may experience stronger threat perceptions and thus engage in CCB to protect their remaining resources (e.g. ratings or customer approval). Therefore, prosocial motivation moderates not only the direct effect of PAC on OD but also the indirect pathway leading to CCB, attenuating the overall resource-depleting process. Accordingly, we propose the following hypotheses:

- H4. Prosocial motivation negatively moderates the positive relationship between perceived algorithmic control and organizational dehumanization, such that the association is weaker when prosocial motivation is high.
- H5. Prosocial motivation negatively moderates the mediating effect of organizational dehumanization between perceived algorithmic control and compulsory citizenship behavior. Specifically, the indirect effect is weaker when prosocial motivation is high.

## 2. Methodology

### 2.1 Sample and data collection

The survey data for this study were collected from gig workers engaged in food delivery services on two leading platforms operating in Beijing and Ningxia, China. Data collection was conducted through three approaches: (1) contacting site managers at various delivery stations to seek assistance and invite participation via online groups; (2) recruiting couriers at popular gathering spots during non-peak hours; and (3) leveraging personal networks and referrals. Participants who completed a questionnaire were promised monetary reward of 10 RMB, and those who completed two rounds of the survey would receive an additional reward (5 RMB).

Data were collected in two phases, 2 weeks apart, in order to reduce the common method variance problem (Zhou and George, 2001; Podsakoff *et al.*, 2003). In the first wave, respondents provided demographic information, the last four digits of their phone numbers (for matching purposes), and responses to measures of perceived algorithmic control and prosocial motivation. A total of 277 valid responses were collected. The second wave of data collection was conducted two weeks later. Through the same channels, data on OD and CCB were collected. After matching, 231 valid responses were obtained. Questionnaires with large sections of uniform answers, or obvious contradictions between reverse-coded and regular items were excluded. The final valid sample consisted of 214 respondents, yielding a valid response rate of 77.26%.

Among valid respondents, the food delivery workers had been in the job for 35.71 months ( $SD = 27.39$ ), worked 10.51 h per day ( $SD = 2.36$ ), and 93.9% relied on this job as their primary source of income. The majority were male (91.6%), with an average age of 31.50 years ( $SD = 7.24$ ). Most had a high school diploma or associate degree or below (62.1%) and were married (65.0%).

## 2.2 Measures

The instruments used in this study are well-established scales that have been widely applied in both domestic and international research. All English scales were translated and back-translated using standard procedures (Brislin, 1970).

*Perceived Algorithmic Control (T1)*. Measured using an 11-item scale developed by Pei *et al.* (2022), which assesses gig workers' perceptions of algorithmic control. Example items include: "The algorithm provides real-time feedback on my job performance." Responses were rated on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). Cronbach's  $\alpha$  for this scale was 0.94.

*Prosocial Motivation (T1)*. Measured using Grant's (2008) scale as adapted by Tu *et al.* (2020). A sample item is: "I want to make a positive impact on others through my work." Responses were rated on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). In this study, the scale had a Cronbach's  $\alpha$  of 0.88.

*Organizational Dehumanization (T2)*. Measured using the 11-item scale developed by Caesens *et al.* (2017), with modifications to fit the context of food delivery workers. Sample items include: "If my work could be done by a machine, the platform would not hesitate to replace me with new technology." Responses were rated on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*). The scale's Cronbach's  $\alpha$  in this study was 0.98.

*Compulsory Citizenship Behavior (T2)*. Measured using the 5-item scale developed by Vigoda-Gadot (2007), adapted for the food delivery context (e.g. replacing "work" with "platform work"). Sample items include: "Even when I'm unwilling, I still feel compelled to perform tasks beyond delivery as requested by the platform." Responses were recorded on a 5-point Likert scale (1 = *never* to 5 = *always*). Cronbach's  $\alpha$  in this study was 0.89.

*Control Variables*. We controlled for gender, age, education level, work experience, marital status and daily working hours, because prior research indicates that these demographic characteristics are closely associated with employees' work attitudes, stress responses, and citizenship behaviors (Bolger *et al.*, 1989; Chen and Aryee, 2007; Wang and Huang, 2019). For example, gender has been found to influence stress tolerance and extra-role behaviors (Deery *et al.*, 2017; Bergeron and Rochford, 2022), educational level is linked to coping self-efficacy (Bandura, 1997). And income sources, marital status and work experience is linked to CCB (Wu and Peng, 2018; Liu *et al.*, 2017; Li *et al.*, 2025). Besides, working city and delivery model were also controlled for, as these objective factors can influence stress responses. Individuals who rely more heavily on a particular job are more sensitive to potential resource loss and thus more likely to exhibit stronger stress reactions (Rosenblat and Stark, 2016). Prior research has shown that urban context can shape platform workers' stress experiences. Differences in order density, traffic conditions, regulatory environments, and social support

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resources across cities may lead to variations in perceived stress and coping strategies (Tassinari and Maccarrone, 2020). Controlling for these factors thus helps to reduce omitted variable bias and improve generalizability (Blanchflower and Graham, 2022). Personnel Review

### 2.3 Common method variance (CMV): control and assessment

To minimize potential CMV, anonymity was ensured to reduce respondents' evaluation concerns and social desirability bias, and a time-lagged, two-wave data collection design was used to temporally separate the measurement of variables. For statistical assessment, Harman's single-factor test was conducted using exploratory factor analysis. The first unrotated factor accounted for 29.39% of the total variance, which is below the 50% threshold, indicating that no single factor dominated the variance (Podsakoff *et al.*, 2003). Then CFA was performed by loading all measurement items onto a single latent factor. The model fit was poor ( $\chi^2/df = 8.89$ , CFI = 0.23, TLI = 0.18, RMSEA = 0.19, SRMR = 0.31), suggesting that the constructs were not attributable to a single source of method variance. Finally, the unmeasured latent method factor technique was employed. Two competing models were tested: one without the latent method factor ( $\chi^2/df = 1.70$ , CFI = 0.93, TLI = 0.93, RMSEA = 0.06, SRMR = 0.05), and one with the latent method factor doesn't fit the data. In summary, both procedural and statistical evidence suggest that common method bias is not a serious threat in this study.

### 2.4 Analytic strategy

This study employed SPSS 29 and Mplus 8.3 to conduct statistical analyses and hypothesis testing. First, confirmatory factor analysis (CFA) was performed to assess the construct validity of the research model. Second, the average variance extracted (AVE) for each variable was calculated. To evaluate discriminant validity, the square root of each AVE was compared with the corresponding inter-variable correlation coefficients. Third, correlation analyses were conducted to examine the relationships among the study variables. Finally, path analysis was carried out to test the hypothesized model, and the moderated mediation effects were examined using bootstrapping with 20,000 resamples. Following the recommendations of Cudeck (1989), unstandardized regression coefficients were reported.

## 3. Results

### 3.1 Validity analysis

CFA was conducted to examine the discriminant validity among the five core constructs. To further test discriminant validity, a series of competing models were constructed by combining variables collected at the same time point and/or with similar conceptual properties. Notably, when proactive personality and OD were merged into a single factor, the model failed to achieve acceptable fit, indicating poor discriminant validity.

The fit indices for all models are presented in Table 1. Results showed that the four-factor model demonstrated the best overall fit. Moreover, the Satorra–Bentler scaled chi-square difference tests indicated that the five-factor model fit significantly better than any of the alternative models, providing strong evidence for the discriminant validity of the five constructs.

### 3.2 Descriptive statistics and correlation analysis

As shown in Table 2, the descriptive statistics indicate that perceived algorithmic control (PAC) is moderately high in the sample ( $M = 3.93$ ), which is comparable to prior findings obtained using the same scale in the Chinese context ( $M = 3.68$ ; Pei *et al.*, 2022). Organizational dehumanization (OD) is slightly above the scale midpoint ( $M = 3.19$ ), closely aligning with mean levels reported in previous research employing the same measurement instrument ( $M = 2.88$ ; Lagios *et al.*, 2023). In contrast, compulsory citizenship behavior

**Table 1.** Model fits of measurement models

	<i>N</i>	$\chi^2$	<i>df</i>	$\Delta\chi^2$	$\Delta df$	$\chi^2/df$	<i>S-B</i> $\chi^2$	<i>CFI</i>	<i>TLI</i>	<i>RMSEA</i>	<i>SRMR</i>
4 Factor model	214	777.86	458	–	–	1.70	–	0.93	0.93	0.06	0.05
3 Factor Model <sup>a</sup>	214	1276.47	461	498.60	3	2.77	1.22	0.83	0.82	0.09	0.15
3 Factor Model <sup>b</sup>	214	1207.26	461	429.40	3	2.62	1.26	0.84	0.83	0.09	0.13
3 Factor Model <sup>c</sup>	214	979.91	461	202.05	3	2.13	1.25	0.89	0.88	0.07	0.07
3 Factor Model <sup>d</sup>	214	1109.81	461	331.94	3	2.41	1.25	0.86	0.85	0.08	0.096
3 Factor Model <sup>e</sup>	214	1305.75	461	527.89	3	2.83	1.26	0.82	0.81	0.09	0.19
3 Factor Model <sup>f</sup>	214	3318.48	461	2540.61	3	7.20	1.26	0.40	0.36	0.17	0.30
2 Factor Model <sup>g</sup>	214	1403.83	463	625.97	5	3.03	1.26	0.80	0.79	0.097	0.14
2 Factor Model <sup>h</sup>	214	3653.33	463	2875.46	5	7.89	1.27	0.33	0.28	0.18	0.31
2 Factor Model <sup>i</sup>	214	3765.91	463	2988.05	5	8.13	1.27	0.31	0.26	0.18	0.31
1 Factor Model <sup>j</sup>	214	4122.97	464	3345.11	6	8.89	1.24	0.233	0.18	0.19	0.31

**Note(s):** PAC: perceived algorithmic control; PM: prosocial motivation; OD: organizational dehumanization; CCB: compulsory citizenship behavior

<sup>a</sup>PM + CCB; <sup>b</sup>PM + OD; <sup>c</sup>OD + CCB; <sup>d</sup>PAC + PM; <sup>e</sup>PAC + CCB; <sup>f</sup>PM + OD, PMC + CCB; <sup>g</sup>PM + OD + CCB; <sup>h</sup>PAC + PM + OD, CCB; <sup>i</sup>PAC + OD + CCB; <sup>j</sup>PAC + PM + OD + CCB

**Source(s):** Authors' own work

(CCB) is slightly below the midpoint ( $M = 2.93$ ), a pattern consistent with prior studies conducted in the Chinese context where CCB was examined as an outcome variable ( $M = 2.83$ ; Wang *et al.*, 2025a, b; Liang, 2024). Taken together, these comparisons suggest that the levels of PAC, OD, and CCB observed in the present sample are broadly consistent with those reported in prior studies, supporting the representativeness and external validity of the data. These results suggest that while employees generally perceived substantial algorithmic oversight, their compelled extra-role behaviors were less frequent, providing initial descriptive support for our proposed model. PAC was positively associated with OD and CCB, indicating that employees who perceived stronger algorithmic oversight also reported higher levels of dehumanization and coerced extra-role activity. OD was positively related to CCB, consistent with the hypothesized mediating role. In contrast, prosocial motivation was negatively correlated with both OD and CCB, suggesting that prosocially inclined employees may be less affected by these adverse psychological processes.

### 3.3 Hypothesis testing

**Mediation Analysis.** The full results are presented in Table 3. First, the results showed that PAC had a positive effect on OD among food delivery riders ( $b = 0.29$ ,  $p = 0.002$ , Model 1), Hypothesis 1 was supported. Second, the results showed that PAC was positively associated with CCB ( $b = 0.28$ ,  $p = 0.001$ , Model 3). Moreover, OD was positively associated with CCB ( $b = 0.43$ ,  $p < 0.001$ ), providing support for Hypothesis 2. Third, when the effects of OD and PAC were considered together (Model 4), PAC was not significant ( $b = 0.03$ ,  $p = 0.63$ ), but

**Table 2.** Descriptive statistics and correlation analysis

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Gender													
2. Age	0.049												
3. Educate	-0.20**	-0.25**											
4. Work experience	0.04	0.27**	-0.14*										
5. Daily work hours	0.20**	0.03	-0.19**	-0.07									
6. Marriage	-0.1	-0.34**	0.16*	-0.21**	-0.04								
7. Work place	0.08	0.14*	-0.41**	-0.13	0.41**	0.22**							
8. Delivery mode	-0.02	-0.19**	0.20**	-0.04	-0.05	0.15*	0.14*						
9. Salary	0.32**	0.02	-0.22**	0.04	0.32**	-0.01	0.22**	-0.18**					
10. PAC	-0.04	-0.04	0.18**	0.07	-0.21**	-0.17*	-0.48**	-0.02	-0.16*	0.94			
11. PM	-0.07	0.1	-0.02	0.20**	-0.05	-0.26**	-0.28**	-0.16*	-0.07	0.46**	0.88		
12. OD	0.14*	-0.06	0.14*	-0.08	0.17*	0.23**	0.38**	0.37**	-0.07	0.004	-0.22**	0.98	
13. CCB	0.1	0.04	0.14*	-0.03	0.23**	0.16*	0.34**	0.30**	-0.05	0.01	-0.002	0.62**	0.89
Mean	0.95	31.5	3.19	35.71	10.51	1.37	0.56	0.44	0.98	3.93	3.87	3.19	2.93
SD	0.29	7.24	1.07	27.39	2.36	0.53	0.5	0.5	0.25	0.83	0.79	1.26	1.05

**Note(s):**  $N = 214$ ; \* $p < 0.05$ , \*\* $p < 0.01$ . PAC: perceived algorithmic control; PM: prosocial motivation; OD: organizational dehumanization; CCB: compulsory citizenship behavior

**Source(s):** Authors' own work

**Table 3.** Regression results

Control variable	OD Model 1			Model 2			CCB Model 3			Model 4		
	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>
Gender	0.59	0.25	0.02	0.52	0.25	0.04	0.45	0.21	0.03	0.20	0.18	0.28
Age	0.01	0.01	0.35	0.01	0.01	0.60	0.02	0.01	0.07	0.01	0.01	0.07
Educate	0.33	0.08	0.00	0.3	0.08	0.00	0.21	0.06	0.001	0.07	0.06	0.20
Daily work hours	0.00	0.03	1.00	0.01	0.03	0.89	0.06	0.03	0.04	0.05	0.02	0.03
Work experience	0.00	0.00	0.58	-0.001	0.00	0.69	0.00	0	0.97	0.00	0.00	0.86
Marriage	0.32	0.15	0.03	0.25	0.15	0.10	0.22	0.12	0.07	0.11	0.11	0.29
Delivery mode	0.44	0.15	0.00	0.38	0.15	0.01	0.45	0.12	0.00	0.32	0.11	0.00
Work place	1.36	0.20	0.00	1.35	0.19	0.00	0.9	0.16	0.00	0.23	0.16	0.14
Salary	-0.66	0.32	0.03	-0.55	0.31	0.08	-0.55	0.26	0.03	-0.26	0.23	0.25
Independence variable												
PAC	0.29	0.09	0.002	0.37	0.1	0.00	0.28	0.08	0.001	0.03	0.07	0.63
Mediator												
OD										0.43	0.05	0.00
Moderator												
PM				-0.24	0.11	0.02						
Intercept												
PAC × PM				-0.20	0.10	0.05						
Intercept	-0.56	0.82	0.49	0.89	0.7	0.20	-0.89	0.65	0.17	-0.24	0.59	0.68
R <sup>2</sup>	0.37	0.05	0.000	0.38	0.05	0.00	0.35	0.05	0.00	0.50	0.05	0.00

**Note(s):** PAC: perceived algorithmic control; OD: organizational dehumanization; CCB: compulsory citizenship behavior

**Source(s):** Authors' own work

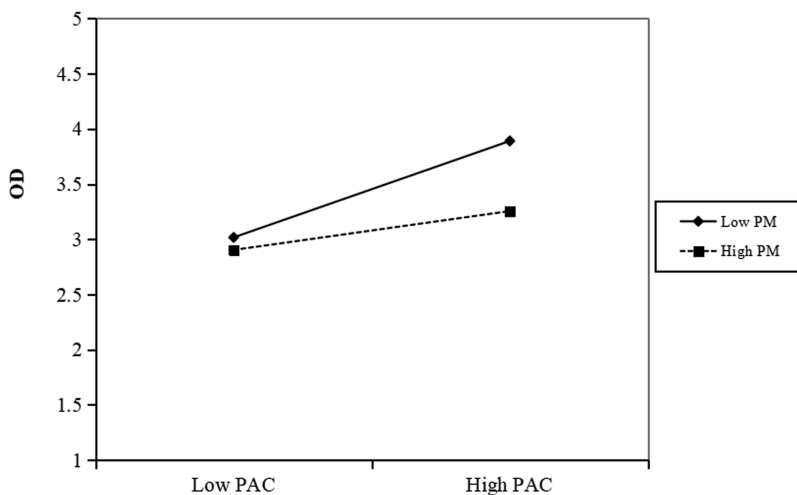
OD was significant ( $b = 0.43, p < 0.001$ ). Thus, OD played a completely mediating role between the PAC and CCB relationships.

We also use bootstrapping with 20,000 resamples to estimate the 95% confidence interval for the indirect effect. The results indicated that OD significantly mediated the relationship between PAC and CCB (indirect effect = 0.13,  $p = 0.003$ ). The 95% bias-corrected confidence interval for the indirect effect was [0.05, 0.21], which does not include zero, confirming its significance. These findings support [Hypothesis 3](#), which proposed that PAC increases CCB among riders by elevating their sense of OD. In other words, the effect of PAC on CCB operates entirely through employees' perceptions of organizational dehumanization.

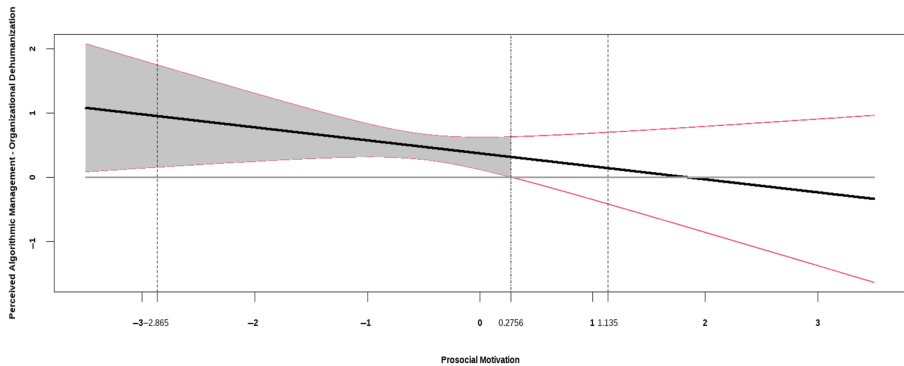
**Moderation Analysis.** Prior to testing the moderation effect, PAC and prosocial motivation were grand-mean centered to facilitate interpretation of the interaction term ([Dalal and Zickar, 2012](#)). The results of the path analysis are presented in [Table 3](#). As shown, the interaction between PAC and prosocial motivation was marginally significant and negative ( $b = -0.20, SE = 0.10, p = 0.05$ , Model 2), providing tentative support for [Hypothesis 4](#). This suggests that prosocial motivation may attenuate the positive relationship between PAC and OD among food delivery riders.

To further illustrate the moderating effect of prosocial motivation, a simple slope analysis was conducted by categorizing prosocial motivation into high and low groups ( $\pm 1$  SD). The results of the simple slope test ( $t$ -test) are shown in [Figure 2](#). When prosocial motivation was lower ( $-1$ SD), PAC increased food delivery workers' OD ( $b = 0.53$  ( $SE = 0.14$ ),  $t = 4.03, p < 0.001$ ). In contrast, when prosocial motivation was higher ( $+1$ SD), algorithmic control was not associated with OD ( $b = 0.21$  ( $SE = 0.13$ ),  $t = 1.66, p = 0.10$ ). These findings support [Hypothesis 4](#), suggesting that prosocial motivation buffers the positive relationship between PAC and OD.

Additionally, to overcome the limitations of the pick-a-point method, the Johnson-Neyman (J-N) technique was employed to examine the conditional effect of PAC on OD across the full range of prosocial motivation levels. As shown in [Figure 3](#), within the observed range of prosocial motivation among the sample (dotted line:  $-2.865$  to  $1.135$ ), the effect of PAC on OD was significantly positive when prosocial motivation was below  $0.275$  (dashed line). In this region, the 95% confidence interval of the conditional effect did not include zero. However,



**Figure 2.** Moderation effects of perceived algorithmic control (PAC)  $\times$  prosocial motivation (PM) on organizational dehumanization (OD). Source: Authors' own work



**Figure 3.** Johnson–Neyman regions of significance for the interaction effect of the conditional effect of perceived algorithmic control on organizational dehumanization at values of prosocial motivation. Source: Authors' own work

when prosocial motivation ranged between 0.275 and 1.135, the effect was not statistically significant.

These results provide further support for [Hypothesis 4](#), indicating that prosocial motivation can mitigate the dehumanizing impact of PAC among food delivery riders.

**Moderated Mediation Analysis.** [Hypothesis 5](#) proposed that the mediating role of OD in the relationship between PAC and CCB would be negatively moderated by prosocial motivation. To test this, a moderated mediation analysis was conducted using bootstrapping with 20,000 resamples. As shown in [Table 4](#), the results indicated that when prosocial motivation was low ( $-1$  SD), the indirect effect of PAC on CCB via OD was significant (*indirect effect* = 0.23, *SE* = 0.07, *p* = 0.001, 95% *CI* = [0.11, 0.37]). However, when prosocial motivation was high ( $+1$  SD), the indirect effect was not significant (*indirect effect* = 0.09, *SE* = 0.06, *p* = 0.11, 95% *CI* = [-0.01, 0.21]). The Johnson-Neyman (J-N) plot further confirmed that the conditional effect of PAC on OD decreased as prosocial motivation increased. The indirect effect of PAC on CCB via OD was significant when prosocial motivation was low, but non-significant when prosocial motivation was high, indicating that prosocial motivation buffers the mediating pathway. The index of moderated mediation further confirms this attenuating effect, supporting [Hypothesis 5](#).

## 4. Discussion and conclusion

### 4.1 Discussion

In the present study, we aimed to answer how perceived algorithmic control (PAC) influences compulsory citizenship behavior (CCB) among gig workers. Our findings reveal that

**Table 4.** Moderated mediation test

PAC→OD→CCB	Indirect effect( <i>SE</i> )	<i>p</i>	95% confidence interval (two-tailed test)
High prosocial motivation (+1SD)	0.09 (0.06)	0.11	[-0.01, 0.21]
Low prosocial motivation (-1SD)	0.23 (0.07)	0.001	[0.01, 0.37]
Difference test (high-low)	-0.13 (0.07)	0.05	[-0.28, 0.00]

**Source(s):** Authors' own work

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organizational dehumanization plays a significant mediating role in linking algorithmic control to employees' psychological experiences and behavioral responses. Specifically, algorithmic control increases workers' perceptions of dehumanization, which in turn undermines their well-being and adaptive coping behaviors. This finding highlights organizational dehumanization as a key psychological mechanism through which algorithmic management exerts its effects.

#### 4.2 Theoretical implications

First, COR theory posits that stress arises when valued resources are threatened or lost (Hobfoll, 2001; Hobfoll *et al.*, 2018). However, prior COR-based studies have primarily examined interpersonal or managerial stressors such as abusive supervision or social exclusion (Harris *et al.*, 2011; Halbesleben and Buckley, 2004). By demonstrating that resource depletion can be generated by impersonal, data-driven control systems, our study extends COR theory from socially enacted stress to algorithmically mediated stress. This shift is theoretically important because algorithmic systems lack intention or reciprocity, features central to traditional social stressors, yet can still evoke profound psychological loss. We thus introduce algorithmic dehumanization as a distinct resource-loss mechanism that operates without direct human agency, broadening COR's explanatory reach into technology-mediated work environments.

Second, our findings further enrich the literature on compulsory citizenship behavior (CCB) by clarifying its psychological antecedents and boundary conditions under algorithmic management. Prior research has linked CCB to coercive managerial demands or organizational pressure (Vigoda-Gadot, 2007; Liu *et al.*, 2019). In contrast, our study shows that algorithmic systems can evoke similar compliance without explicit human pressure. Workers comply with informal customer demands not due to interpersonal obligation but to protect algorithmic resources including ratings, order access, or income managed by automated systems. This suggests that CCB can also reflect a data-driven compliance behavior rather than a purely interpersonal one, advancing the construct beyond traditional organizational contexts.

Importantly, our findings challenge the assumption that dehumanized workers simply perform prosocial tasks "strategically" in the same way across contexts. In traditional organizations, strategic prosociality often emerges as a socially negotiated behavior, a means to regain managerial approval or peer acceptance (Ng *et al.*, 2019). In contrast, algorithmic settings depersonalize both the source of pressure and the recipient of effort: the "audience" for these coerced acts is a digital rating system, not a human supervisor. This impersonal nature transforms CCB into a survival strategy, a behavioral adaptation to algorithmic governance where individuals perform extra-role acts to maintain algorithmic legitimacy rather than social belonging. By uncovering this shift from social compliance to systemic compliance, the study advances scholarship on CCB and contributes to a broader understanding of how coercive prosociality evolves under digital control.

Third, this study contributes to the refinement of COR theory by identifying prosocial motivation as a psychological resource that mitigates the dehumanizing effects of PAC. Whereas previous research has emphasized external contextual moderators such as algorithmic transparency (Parent-Rocheleau and Parker, 2022), perceptions of fairness (Shin, 2020), or managerial styles such as servant leadership (Lin *et al.*, 2024), our findings highlight an internal motivational buffer that alters how individuals cognitively interpret algorithmic control. Workers high in prosocial motivation perceive algorithmic directives less as coercive and more as opportunities to sustain meaningful contribution, thereby preserving self-worth and reducing the likelihood of CCB. This underscores that resource dynamics are not only quantitative (i.e. how many resources are lost) but also qualitative—depending on how individuals frame and reinterpret stressors. By integrating prosocial motivation into COR's resource model, this study advances a cognitive-motivational perspective on resource conservation in technology-mediated work.

#### 4.3 Practical implications

With the rapid expansion of the gig economy driven by digital technologies and consumer demand, ensuring a positive and sustainable work experience for gig workers has become crucial for platform sustainability. This study provides several actionable implications for both platform organizations and policymakers.

First, platforms should adopt the principles of human-centered algorithmic management (Meijerink and Bondarouk, 2023), ensuring that algorithmic systems augment rather than constrain workers. Under algorithmic control, workers often experience reduced autonomy and interpersonal recognition (Lee *et al.*, 2015), which can lead to organizational dehumanization and motivational decline. By embedding human-centered design principles, such as transparency in task allocation, feedback channels for contesting algorithmic decisions, and flexible performance monitoring, platforms can preserve workers' sense of control and dignity.

Second, while platform operations often prioritize customer satisfaction, gig workers' extra-role efforts (e.g. accommodating informal requests or handling emotionally demanding interactions) are rarely acknowledged within formal evaluation systems. Prior studies indicate that these behaviors often stem from organizational or algorithmic pressure rather than intrinsic motivation (Vigoda-Gadot, 2007; Liu *et al.*, 2019). Examples include integrating qualitative indicators of service quality, granting workers the right to decline unreasonable requests without penalty, and recognizing genuine prosocial contributions through incentive mechanisms. These measures can reduce coercive citizenship behaviors and foster sustainable engagement. Specifically, platforms could (1) explicitly delineate what counts as "standard service" vs. "extra request" in their user interface, (2) introduce an optional surcharge or flagged indicator for customer requests beyond the standard scope, and (3) implement a transparent appeals or escalation channel for workers who believe they have been penalized for refusing non-standard service demands.

Third, at the ecosystem level, policymakers and industry regulators should work toward establishing ethical and human-centered governance frameworks for platform work. This includes promoting algorithmic transparency standards, setting boundaries for data-driven surveillance, and encouraging worker participation in algorithmic decision-making processes. By aligning technological efficiency with human dignity and psychological sustainability, such systemic initiatives can ensure that the future of digital labor remains both productive and humane.

#### 4.4 Limitations and future directions

Despite its contributions, this study has several limitations that merit attention in future research. First, to reduce the risk of common method variance (CMV), this study employed multi-wave data collection and conducted various statistical tests (Podsakoff *et al.*, 2003), and our empirical analyses further suggested that CMV was not a serious issue. Second, we measured organizational dehumanization and compulsory citizenship behavior after perceived algorithmic control, which corresponds to the temporal order proposed in our model. Third, interaction effects cannot be artifacts of CMV and the presence of CMV makes real interactions harder to detect (Siemsen *et al.*, 2010). Hence, the presence of interaction effects suggests that common method variance was not a major concern in our study. Nevertheless, we cannot completely rule out this concern. Future studies may extend the data collection period or increase measurement frequency to provide stronger causal evidence. Moreover, as all focal constructs in our theoretical model were assessed through self-reports, the study is still susceptible to CMV, which might inflate the observed relationships. However, since our goal was to capture employees' subjective perceptions and experiences, self-reported measures were the most appropriate approach. As Conway and Lance (2010) argued, self-reports are particularly suitable for assessing private events, and demonstrating the construct validity of measures can effectively rule out substantial method effects. Consistent with this view, our

measures exhibited satisfactory internal consistency and discriminant validity. Taken together, these results reduce the likelihood that the observed associations were merely due to response biases. Although diagnostic tests indicated that CMV was not a severe threat, future research could incorporate multi-source data (e.g. supervisor ratings) or objective behavioral indicators such as digital activity logs to further strengthen measurement validity and causal inference.

While this study uses COR theory to explain why food deliverymen engage in extra-role behaviors (e.g. taking out trash) as a response to self-worth threat, resources investment may also involve seeking social support or using other coping strategies. Future research could explore broader range of strategies and their behavioral consequences. Besides, this study demonstrates the buffering role of prosocial motivation from an individual-level perspective. Future research could examine platform-level interventions, such as interactive control mechanisms. For example, interactive controls compared to supervisory controls have been shown to improve workers' experiences (Wang *et al.*, 2022).

#### 4.5 Conclusion

The growing population of flexible workers underscores the importance of understanding how algorithmic control shapes work experiences in the new employment landscape. This study drawing from COR theory, provides a novel explanation for gig workers' coerced extra-role behaviors (e.g. taking out trash) and expands the theoretical framework linking algorithmic control to cognitive and behavioral outcomes. It highlights both the risks and adaptation strategies in the platform-mediated work environment, offering insights for theory and practice in the digital labor economy.

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