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Meijer, Wo; Verhoeff, Bent; Verma, Himanshu; Bourgeois, Jacky

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Fast Drink: Mediating Empathy for Gig Workers

Wo Meijer
W.I.M.T.Meijer@tudelft.nl
TU Delft
Delft, The Netherlands

Bent Verhoeff
bentverhoeff@gmail.com
TU Delft
Delft, The Netherlands

Himanshu Verma
h.verma@tudelft.nl
TU Delft
Delft, The Netherlands

Jacky Bourgeois
j.bourgeois@tudelft.nl
TU Delft
Delft, The Netherlands

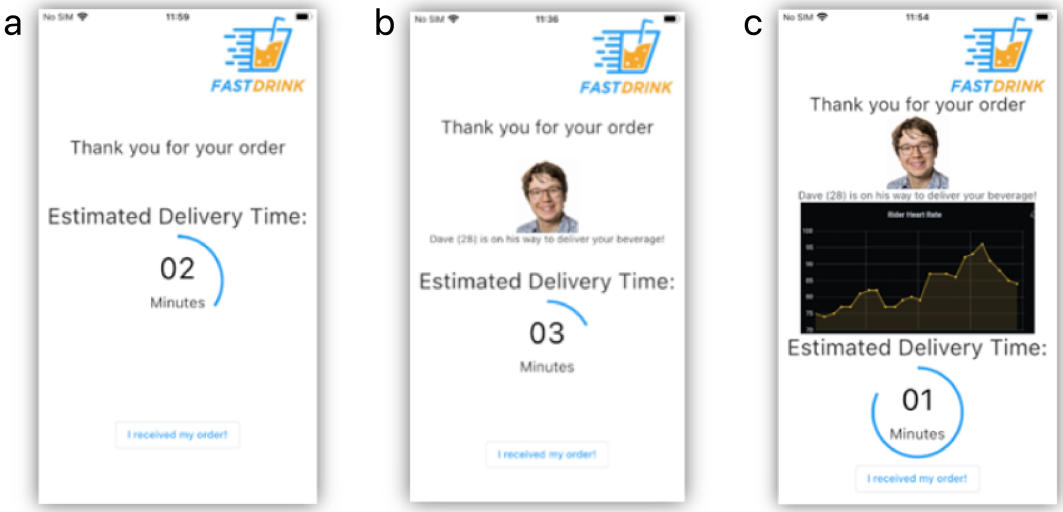

Figure 1: The three different app conditions: a) only a count-down timer, b) the countdown timer with the name, age, and (blurred for publication) face of the delivery worker, and c) the previous conditions plus a graph of the heart rate of the delivery worker.

ABSTRACT

The digitization of services and global lock-downs have led an explosion of delivery services, which use gig-workers as delivery personnel. They can face apathy from both their employers and users of the service. Previous studies focused on mediating interactions between workers or workers and tasks. However, delivery presents the opportunity for HCI interventions to mediate the interaction between worker and users to increase their empathy. We conducted an empirical study where 63 participants ordered a drink with an app which presented a different level of information about the delivery person (nothing; name and photo; heart rate). Initial results show no significant impact on empathy measures between conditions, however post-hoc analysis showed that heart rate lead to increased Compassionate and decreased Affective empathy. This raises the question of what "type" of empathy is beneficial for delivery personnel and the need to refine the concept and measures of empathy used in HCI.

CCS CONCEPTS

• **Human-centered computing** → **User studies**; *Empirical studies in HCI*.

KEYWORDS

empathy, gig-work, biosignals

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1 INTRODUCTION

Due to the increasing digitization of services and the recent global lock downs, the number of "instant" delivery services have increased dramatically [1, 8]. These services use "gig-workers"; freelance contractors that choose when they work and can switch between jobs easily. While many companies argue this flexibility is a benefit for gig-workers, workers experience challenges such as poor working conditions [15], lack of career development [7], and many other organizational, identity, relational, and emotional challenges [3].

A number of HCI studies have explored methods to improve the experiences of gig-workers, these are often focused on the interactions between gig-workers [26, 27] or between gig-workers and their tasks [6, 9]. Instant delivery services offer a unique opportunity to use HCI interventions and UI/UX techniques to mediate the interaction between users and specific gig-workers: delivery personnel. Specifically, when the customer is waiting for their delivery they have a brief window to "engage" with the delivery person.

In this paper we explore how augmenting the interaction in this window (additional personal information and Expressive Biosignals) to a delivery app impacts the interpersonal empathy formed during the interaction between users and delivery personnel. We focus on interpersonal empathy to increase understanding and cooperation between remote partners in brief interactions [21]. While this does not address the systemic challenges gig-workers face, we believe increased empathy could positively impact gig-workers *in addition* to regulations and policy changes on a company level.

2 RELATED WORK

2.1 Empathy

Visser and Kouprie [23] offer a definition of "Empathy [as] a person's ability to identify with and understand another person's feelings, ideas and circumstances". This understanding is often linked to increased cooperation [21] and in-turn more meaningful and pleasant interactions between delivery personnel and users [24]. In addition to empathy, delivery personnel can also benefit from increased *sympathy* [2]; feelings of concern for the workers themselves which could improve how they are treated by users. In this paper we focus on "state" interpersonal empathy, the empathy a person feels for another in the moment (e.g. when the delivery takes place and the customer and delivery person interact).

2.2 Static Personal Information

HCI research has explored how adding static information to "personas" [17], increases feelings of similarity and affect how much observers like personas [22]. This increase in understanding from easy to gather information make it an ideal intervention to increase interpersonal empathy between users and delivery personnel. Large international services such as Uber Eats [1] and Getir [2] already show users this information, however the rationale for including this information and impact on empathy has not been thoroughly studied.

[1]https://www.ubereats.com/
[2]https://getir.com/

2.3 Expressive Biosignals

One method to increase interpersonal empathy in remote, digital communications is with the use of Expressive Biosignals; including physiological signals (e.g. heart rate, breathing rate) with existing digital interactions [10]. Specifically, including information about the heart rate of the other person has been shown to increase empathy and many of related measures [12–14, 25]. Because heart rate can be measured using commercial smart watches, capturing this information (which hints at how much the delivery person is exerting themselves and their affect) is trivial, and the potential impact on empathy of a graph of heart rate is significant [11, 14].

3 RESEARCH QUESTION AND HYPOTHESIS

Given the goal of increasing interpersonal empathy between users and delivery personnel and the potential for previously established HCI interventions to increase that empathy, we aim to address the following research question:

RQ: What is the impact of adding information about a delivery person (either static information or static information with expressive biosignals) on the state empathy of users of delivery apps?

Based on previous studies about how empathy is increased when adding static personal information, we believe that adding this information would also increase empathy for delivery personnel. Furthermore, Expressive Biosignals have been shown to increase interpersonal empathy when used in digital applications. Thus the combination of static information and Expressive Biosignals would increase interpersonal empathy even more. Our hypothesis is that measures of interpersonal empathy increase as follows: no information < static personal information < static personal information and expressive biosignals.

4 METHOD

In order to test this hypothesis, we conducted an empirical study where 63 participants tested a mock-up delivery application called "Fast Drink". While waiting for their delivery participants were randomly assigned one of three conditions: **Control** no information about the delivery person, **Static** personal information about the delivery person, or the **Dynamic** heart rate of the delivery person in addition to the static information. Participants were then asked to rate the app and delivery person, and their state empathy was measured using the Measure of State Empathy.

4.1 App Development

In order to develop the Fast Drink we first gathered the necessary personal data from the researcher acting as the delivery person:

> Static Information: The age, name, and photo of the researcher.
> Dynamic Information: The heart rate of the researcher biking a representative route between the location of the research and the nearest grocery store[3].

[3]The heart rate data was collected before the tests as opposed to a live heart rate to save the researcher the stress and monotony of biking the same route 60 times in quick succession.

The Fast Drink app was made using Flutter [4]. The application randomly selected one of the three conditions (see Figure 1) and collected overall ratings for the app, delivery time, and delivery person.

4.2 Empathy Measures

For this study we selected two measures of empathy: direct rating of the delivery person's performance on a scale of 1-5 and the Measure of State Empathy (MSE) [19]. The MSE consists of nine questions subdivided into three categories of empathy: Affective ("feeling with the other"), Cognitive ("understanding the thoughts and feelings of the other"), and Compassionate ("Having feelings of concern or compassion for the other"). The participants responded to the questions using a 7-point Likert scale from "not at all" to "entirely".

4.3 Participant Phase

Participants were gathered in person in a public area at a university in The Netherlands. Researchers asked participants if they were willing to participate in a test and evaluation of a delivery application while they could continue their own activity. Participants followed the following steps:

(1) Select a drink from six drink options presented in the Fast Drink app.
(2) Wait for their drink, while being able to viewing one of the three randomly selected conditions (shown in Figure 1).

Control: A countdown timer.
Static: A countdown timer and the age, name, and photo of the delivery person.
Dynamic: A countdown timer and the age, name, and photo of the delivery person along with an animated graph of the heart rate of the delivery person showing the last few seconds of heart rate data.

(3) Meanwhile, the researcher responsible for recruiting the participant sat a short distance away, reading a book to clearly show they were not monitoring the participant.
(4) Upon receiving their drink, fill in 1-5 star ratings for the app, delivery time, and the delivery person.
(5) Following the use of the app the participant is asked to fill a questionnaire containing the MSE.
(6) Finally the participant was able to enjoy their drink.

In order to simulate a scenario in which users might be less empathetic to the delivery person, participants were given a 3 minute estimate for their drink delivery [5], however the drink after 5 minutes to create some friction in the delivery (see Section 6.4).

4.4 Data Collection

63 participants were recruited over the course of two weeks from the common areas of a the Delft University of Technology public university in The Netherlands. Researchers recruited them in the wild. Of the 63 participants, 28 identified as male, 30 identified as female, and 5 did not disclose; the participants ages ranged between 18 and 26.

[4] flutter.dev/ accessed on December 1st 2022.
[5] Based on the distance between the nearest store and the testing area.

5 RESULTS

We used both parametric and non-parametric statistical tests to analyze our study data. The choice amongst the parametric and non-parametric tests was based on Harwell [5]. While examining differences between the independent variables, we either used ANOVA (parametric) or the Kruskal-Wallis Rank Sum test (non-parametric). Furthermore, we used post-hoc pairwise tests – Pairwise T-Test (parametric) and Wilcoxon Signed Rank (nonparametric) – to examine the differences between individual pairs. We used Bonferroni correction to compute the adjusted p-values as illustrated by Navarro [16].

5.1 App, Time, and Delivery Ratings

Analysis showed there were no significant differences ($p > .05$) between the conditions for the delivery time or driver rating. However, for the App rating, there was a significant ($F(2, 60) = 4.13, p = .02$) difference between the ratings. Post hoc tests showed significant differences between Control and Dynamic ($p = .01$), and Static and Dynamic ($p = .03$), but not Control and Static ($p = .51$).

5.2 Measure of State Empathy

ANOVA tests showed that there was no significant difference between the information a participant viewed and their responses to any question on the MSE. This showed that, contrary to what results from previous studies [4, 11, 14, 22] would imply, information about the delivery person did not change users' empathy.

5.3 Principal Component Analysis

The three dimensions of empathy measured by the MSE are not necessarily independent which can be aggregated to establish a consolidated score of individual empathy. Instead, they are interdependent. In order to examine these inter-dependencies, the relationship of these dimensions with experimental conditions (i.e., Control, Static, and Dynamic), and uncover any latent tendencies in our participants' responses, we conducted a Principal Component Analysis (PCA).

The PCA was performed on all responses to the MSE questionnaire along with the experimental condition as a qualitative supplementary variable ($n = 63$). The first *five* Principal Components (PCs) collectively explained 89.6% variance in the data. Moreover, the first (two) PCs collectively explained 66.4% of the variance (`PC1 = 51.3%; PC2 = 15.1%`), and demonstrated the emergence of meaningful patterns in our data.

Examining the correlation between MSE questionnaire items and principal components, we observed that, although, all questions were strongly and positively correlated to PC1 (see Table 1). However, PC2 was observed to discriminate across the the Affective and Compassionate dimensions of MSE questionnaire. PC2 was found to be positively correlated to Compassionate Q1 and moderately correlated to Compassionate Q3. Contrarily, PC2 was found to be negatively correlated to Affective Q2 and Affective Q3.

Furthermore, mapping all participants' responses to the 9 MSE questions on the new dimensional space, we found that the cluster mean of the Dynamic condition differed significantly from the cluster means of Control and Static conditions along PC2. The

Dimension	Questions	Principal Components	
		First	Second
Cognitive	#1. I *understood* how the person I was interacting with was feeling	0.817	–
Cognitive	#2. The person's feelings were *transferred* to me	0.749	–
Cognitive	#3. I had feelings of concern for the person I was interacting with	0.842	–
Affective	#1. I *knew* what the person I was interacting with felt emotionally	0.764	–
Affective	#2. I *felt* the same way as the person I was interacting with	0.717	-0.544
Affective	#3. I *experienced* feelings of sympathy towards the person	0.737	-0.566
Compassionate	#1. I could *identify* the feelings the person was having	0.363	0.733
Compassionate	#2. I *experienced* the same emotions as the person	0.719	–
Compassionate	#3. I *felt* a sense of compassion for the person	0.626	0.377

Table 1: The statistically significant correlation values between the different attributes of the Measure of State Empathy and the first two principal components (PCs). The first two factors collectively explain 66.41% of variance in the data. Please note that the table contains correlation values which are statistically significant.

clusters of the Control and Static conditions were also observed to overlap significantly (see Figure 2).

In other words, our results demonstrate that displaying real-time heart rate of the delivery person evoked compassionate empathy (e.g. positive on dimension 2), and did not influence the cognitive and affective dimensions of empathy. These findings should be interpreted cautiously since PCA depicts tendencies and patterns in our data and does not inform us about causalities.

6 DISCUSSION

6.1 Expressive Biosignals Improve App Rating

The ratings for the delivery time and delivery person did not change significantly between the conditions, however the overall rating for the app did. This implies that, besides a possible increase of empathy, adding real time information to an app can positively impact user experience. Future studies comparing the source and presentation of information could help HCI practitioners understand this intervention.

6.2 Lack of Definitive Impact on Empathy

The findings of our study do not align with the findings of previous studies on the impact of a smiling photo of a person [22] as well as the impact of including expressive biosignals [4, 11, 14]. This implies that there is a difference between the contexts where expressive biosignals have been shown to be effective (remote didactic communications [11, 14] and observations [4]) and delivery services . Further research can explore if this is the case for other biosignals and expressions, since their selection and representation has *some* effect on their impact [11].

6.3 PCA and New Empathy Definitions

The post-hoc PCA (Section 5.3) indicated that, while there is significant difference in the ratings for a single question on the MSE, there is a difference over the whole MSE. The study as it stands now does not help highlight the causality of this difference, which is a clear way to expand this work. However, this analysis helps demonstrate that, while short and quantitative tools such like the MSE have value, they only capture specific slices of the multifaceted concept of empathy [2]. Alternative measures of empathy could be based on the desired behavioral change: i.e. more positive interactions between delivery workers and users. This could be measured with analysis of the interactions, either qualitatively or by using Natural Language Processing models [20]. Future work could align these measures.

Finally, in this study the dynamic condition shifted the empathy of participants from greater Affective empathy to greater Compassionate empathy. Our initial goal was to "increase" the measures of empathy; instead the results point to a change in the *type* of empathy. This raises the question of if this shift in empathy is beneficial for delivery personnel, and points to the need to holistically study empathy in different interpersonal interactions.

6.4 Limitations

The participants were recruited from a large university; this means that the participants were primarily well educated, young, and familiar with technology. Furthermore, the social pressure to seem empathetic could have increased the chance participants engaged in socially desirable responding [18]; evening out the empathy measures between conditions.

Additionally, participants were biased as they were given a free drink. The decision to give participants a drink was made to keep the study in-line with the target context (instant delivery services), and it was made free in order to reward participation. We tried to counter-act this reward by delaying deliveries; however the effectiveness and impact of this method are untested and could have impacted overall empathy ratings. Further evaluation of expressive biosignals would benefit from a more realistic scenario where participants pay money and delivery times are more realistic.

7 CONCLUSION

In this paper we explored the impact of different sources of information on the interpersonal empathy a customer develops for a delivery person. We showed that, contrary to previous research, adding information such as the face of the delivery person and their heart rate does not significantly impact measurement of empathy.

However, through a follow up analysis using a PCA (Section 5.3) we noticed a difference between combinations of responses to the

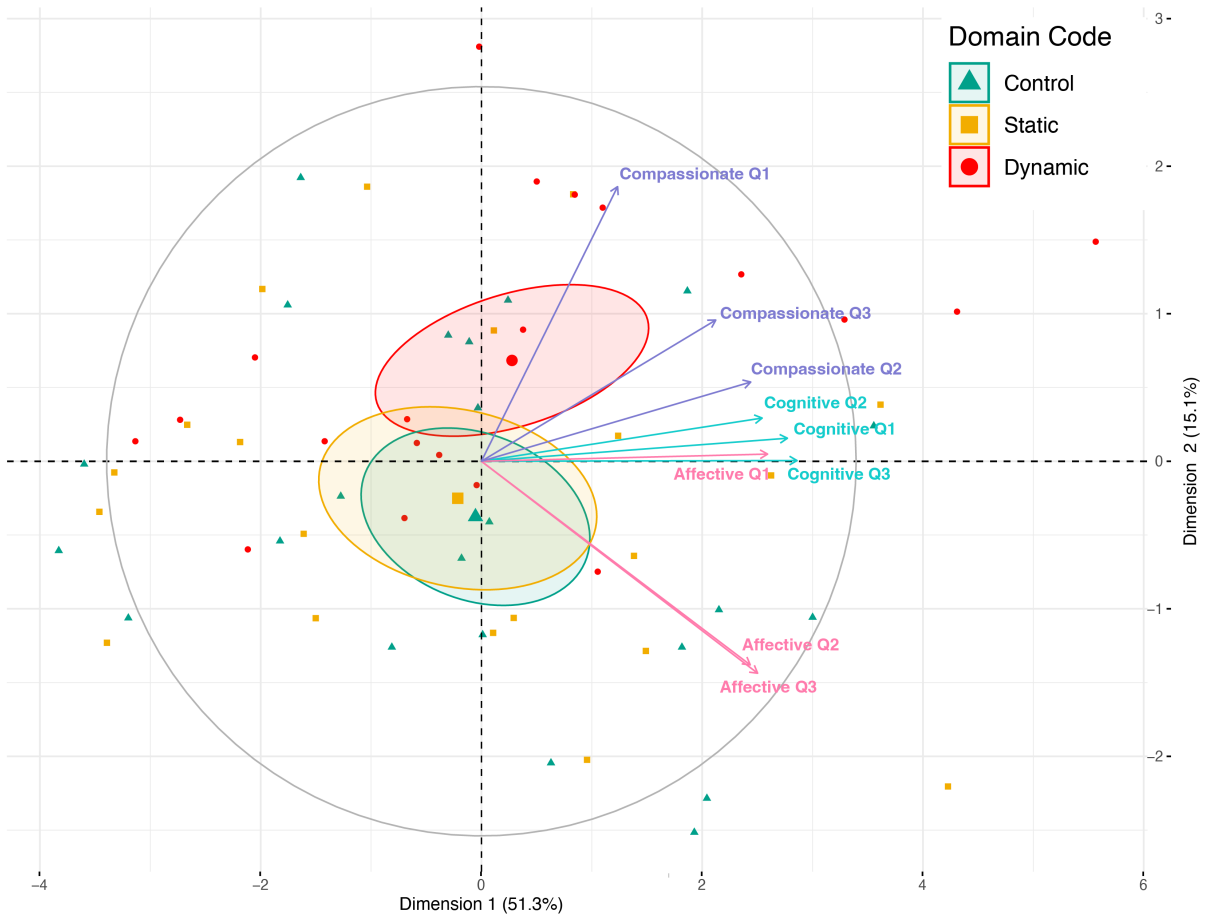

Figure 2: Participant responses and mean distributions as well as the loadings of the 9 MSE questions plotted on the first and second dimensions of the PCA. Note how the centroid of the "Dynamic" condition is higher on the second dimension, which is primarily driven by the difference between the Affective and Compassionate questions of the MSE (see Section 5.3).

MSE between the Dynamic and other conditions. This difference is pronounced on second dimension of the PCA; largely defined by the difference between Affective and Compassionate empathy. This implies that the Dynamic condition formed more Compassionate empathy and less Affective empathy than the other conditions.

This challenges the idea that HCI interventions could be used to "increase" interpersonal empathy; rather they can influence the type of empathy developed. This insight points to the necessity of refining the definition and types of empathy in brief interactions; both in how they impact the interaction and how to measure the changes in empathy. By looking at behavioral measures analyze descriptions of delivery personnel by users it is possible to refine and validate our analysis of the MSE.

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