An Eye Tracking Study of Attention Distribution during Person Perception

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Abstract: *Interactions between individuals are common and important scenarios in humans' life. During this process person perception happens. Person perception is a cognitive process when people forming impressions of others. People leverages various methods to generate social cures. Non-verbal visual observations are important ways to collect relevant clues. This study investigates people's gaze distribution when they observe other individuals and form person perception correspondingly. The specific task in this study is to evaluate others' occupations. An eye-tracking experiment of 20 participants was conducted. The eye tracker could generate quantitative data and capture subjects' gazing pattern when they are doing tasks, Participants were divided into two groups. One group viewed a series of photos of females and males. At the same time, they were informed beforehand that they needed to identify the occupations of individuals in the photos demonstrated. The other group was not informed. Participants' visual attention was recorded by an eye tracker. The results indicate that people pay more initial attention (first fixation duration) to faces when judging occupations. And people pay more attention to faces and outfits in terms of total fixation duration in both groups. Comparing the two groups, people pay less attention to detailed information like accessories when they are forming person perception consciously. The results help improve the understanding of person perception.*

Keywords: *Eye-tracking, person perception, accessories, face, outfit, gaze, attention*

1. Introduction

Social interactions play important roles in humans' daily life, as humans are social beings. It could happen between two or among more people. There are needs and drives for humans to interact with each other [1]. Many goals could be achieved via social interactions, i.e., exchanging information, making friends, influencing others, and getting emotional satisfaction. It's the corner stone of human society. There are many types of social interaction, including face to face communication, writing emails, observing others, phone calls etc. Consciously or subconsciously, people collect social cues during these interactions and form impressions on others consciously or subconsciously. For instance, after talking with a new friend, one will quickly make preliminary judgements on that individual. This process is called person perception. Person perception is a common phenomenon happening during social encounters, which refers to the cognitive process when people form impressions of others [2]. People selectively gather information when forming impressions and judgments about others [3]. Not only the common verbal interactions but also non-verbal interactions could provide people with information, which helps the latter judge, categorize and identify others. Observation is a crucial one of non-verbal communication. Most of the time, people are observing each other. It could happen along with other interaction behaviors. Though sometimes, it is unconscious. Through observing others' appearances (i.e., facial expressions and outfits), people could collect useful social cues and then interpret them to form impressions on others [4] [5] [6]. Appearances could release abundant information to help people creating person perception. It's also one of the most commonly used non-verbal cues. As a crucial behavior for human society, it is important to have a deeper understanding of person perception.

Some previous studies have discussed appearance as non-verbal cues for person perception, such as faces [7], clothing [8], and accessories [9] [10]. Researchers investigated how people perceived these elements when forming person perception. However, most studies focused only on one single element. In real case scenarios, one individual would have various elements, and they would appear simultaneously. It's important to investigate how people process different elements at one time. In this study, various elements of appearance are discussed comprehensively, including faces, accessories and outfits. At the same time, those elements are also compared to each other. This approach gives a more comprehensive understanding of appearance as social clues. Moreover, different from previous research, eye tracking is

introduced in this study. An eye tracker could capture people's gaze and record the corresponding gazing behavior. The quantitative results could provide more concrete conclusions. Parameters like first fixation duration and total fixation duration could reveal how people process these elements visually during person perception. The conclusion could facilitate developing further understanding of person perception.

2. Materials and Methods

2.1. Participants

The study included a total sample of 20 participants ($M_{age} = 25.7$, $SD = 11.23$) of which 10 females and 10 males. All participants were randomly recruited from a mall in Shanghai, China. Participants were told that this was a social experiment beforehand and they needed to view a series of photos. They were also informed that desserts or snacks would be provided as gifts after they completed the experiment. All participants agreed to attend the experiment voluntarily.

2.2. Stimuli

Four images of four people were chosen as stimuli in this experiment, among which 2 were females and 2 were males (referred to as P1, P2, P3, and P4 respectively). To avoid age bias, the four stimuli were of a similar age. All of them had accessories (e.g., watches, jewelry, ties, and bags). The four stimuli were all in daily scenes like in the supermarket or on the street. At the same time, they have various types of outfits (e.g., formal or casual).

2.3. Design and Procedure

The study adopts a between-subjects design. There are two experimental groups in total. In the first group, participants were informed beforehand that they needed to figure out the occupations of the 4 stimuli (C1 Group). In the second group, participants were not informed the previous information. They viewed images directly instead (C2 Group).

The experiment took place in a café. Participants signed the consent form first and agreed to participate in the experiment voluntarily. The corresponding personal information including gender and age was collected. Then participants were asked to sit in front of a screen with an eye-tracker (Tobii 4C) placed at the bottom. The eye tracker and the screen were connected to a laptop in which Tobii Pro Lab software was installed. Participants were asked to complete a nine-point calibration procedure first to ensure the gaze would be captured. Following the successful calibration, the experiment started. Participants were told to stare at the screen without moving their heads and body throughout the experiment. 4 images were displayed automatically on the screen in sequence. The duration of each image was 6 seconds, and the display sequence was the same for all participants.

AOIs in each image were classified into three categories, Detail (including accessories such as watches, phones, bags, jewelry, and ties), Face, and Outfit (excluding Detail). Eye tracking parameters including total fixation duration (TFD) and first fixation duration (FFD) were used to analyze participants visual attention when viewing stimuli.

2.4. Data analysis

To compare the subjects' gazing behaviors on each AOI between C1 Group and C2 Group, the following between-group t-tests of TFD were carried out, C1 Detail vs. C2 Detail, C1 Face vs. C2 Face, and C1 Outfit vs. C2 Outfit. Within-group ANOVA tests of TFD among Face, Detail and Outfit were conducted, including C1 Face vs. C1 Detail vs. Outfit and C2 Face vs. C2 Detail vs. C2 Outfit, which was to analyze the subjects' gazing patterns when view stimuli in C1 Group and C2 Group, respectively. T-tests were carried out afterward to identify the statistical differences further. Within-group ANOVA analyses of FFDs among Face, Detail, and Outfit were also conducted. This aims at investigating people's initial attention distribution in C1 Group and C2 Group. Further t-tests were carried out to identify the statistical differences between each AOI.

3. Results

3.1. TFD analysis between C1 and C2

As shown in Table 1, T-test results showed that participants in C1 Group ($M_{detail} = 0.56, SD_{detail} = 0.63$) focused on Detail significantly less than participants in C2 Group ($M_{detail} = 0.98, SD_{detail} = 0.95; t = -2.29, p = 0.01$). The rest of the Face and Outfit tests between C1 Group and C2 Group didn't show a significant difference.

3.2. TFD analysis within C1 and C2

In C1 Group, a single factor ANOVA test showed a significant difference between participants' attention to Detail, Face and Outfit ($p < .001, F = 12.00$). A further two-sample t-test revealed that participants paid more attention to Face ($M_{face} = 1.60, SD_{face} = 1.27$) and Outfit ($M_{body} = 1.20, SD_{body} = 0.85$) than that of Detail ($M_{detail} = 0.56, SD_{detail} = 0.63; t = 4.62, p < .001; t = 3.82, p < .001$). However, Face and Outfit had no significant difference ($t = 1.65, p = 0.05$). In C2 Group, a single factor ANOVA test revealed significant differences among Detail, Face and Outfit ($p < .001, F = 19.81$). A two-sample t-test revealed that participants focused on Face ($M_{face} = 1.44, SD_{face} = 0.98$) and Outfit ($M_{body} = 1.25, SD_{body} = 0.90$) significantly more than Detail ($M_{detail} = 0.98, SD_{detail} = 0.95; t = 2.16, p = 0.017; t = 3.84, p < .001$). Above results are shown in Table 1.

3.3. FFD analysis within C1 and C2

FFD results are summarized in Table 1. A single factor ANOVA test of C1 revealed significant differences among Detail, Face, and Outfit ($p < .001, F = 7.88$). A two-sample t-test revealed that participants in C1 paid initial attention to Face ($M_{face} = 0.54, SD_{face} = 0.68$) significantly more ($t = 1.68, p > .05$) than Detail ($M_{detail} = 0.34, SD_{detail} = 0.33$) and Outfit ($M_{outfit} = 0.15, SD_{outfit} = 0.073; t = 3.60, p < .001$). Similarly, a single factor ANOVA test also revealed a significant difference for C2 among Detail, Face, and Outfit ($p < .001, F = 7.80$). However, the result showed that participants in C2 focused on Detail ($M_{detail} = 0.58, SD_{detail} = 0.64$) significantly more ($t = 2.01, p < .05$) than Face ($M_{face} = 0.35, SD_{face} = 0.33$) and Outfit ($M_{outfit} = 0.21, SD_{body} = 0.18; t = 3.57, p < .001$) initially.

Table 1: The total TFD and FFD of Detail, Face, and Outfit

				TFD(s)FFD(s)
	C1	C2	C1	C2
Face	1.60	1.44	0.54	0.35
Detail	0.56	0.98	0.34	0.58
Outfit	1.20	1.25	0.15	0.21

4. Discussion

The purpose of this research is investigating people's gazing behaviors when forming person perception of other individuals. Making judgements on stimuli's occupation is the task of person perception in this study. Four photos of four individuals were chosen as stimuli. There are two experimental groups in total, one group was informed the task before viewing photos, and the other group was not informed. The first group was making person perception consciously. The results suggest that people tend to focus on others' faces and outfits when viewing other individuals. This applies to both groups. FFD reflects people's initial attention, which indicates the part they consider the most important at first glance. When people form person perception, the part they initially pay the most attention to is also the face. The conscious group pays less attention to detailed information like bags, jewelry, and ties than those who are unconsciously viewing others.

Based on the initial fixation duration and total fixation duration results, people pay more attention to faces when forming person perception. The potential reason is that people consider the face, especially the eyes, to be highly expressive, which in turn could provide much information about the subjects. Hence, faces can easily capture people's attention quickly and dominantly. When talking to each other, people tend to make eye contact to capture subtle but important information, like emotions. This is consistent with previous studies [11] [12]. Clothing is another part that people consider could provide social cues.

Different occupations typically have corresponding dress codes (e.g., doctors, bankers, and firefighters). People may easily find clues from clothing to identify others' works. Though stimuli in this study were not in uniforms, subjects may still try to seek for details from outfits to identify their occupations, i.e. pins and logos. Some studies also concluded that clothing is a crucial element people will pay attention to when viewing others [13] [14] [8]. Compared to people who are unconsciously viewing other individuals, the conscious group pays less attention to accessories when figuring out occupations. That suggests people consider accessories are less relevant to professions. Accessories may reflect other types of social information, i.e. social status, income level. And the price of different types of accessories or brands varies in a big range. For instance, if someone wears a watch of a luxury brand, if help identify that individual's social status. While accessories can release limited information about people's occupations

This study can be further improved for further research. This study used photos as stimuli. Participants' responses might be different in face-to-face interactions. Further studies could investigate if the attention distribution pattern identified in this study remains the same in face-to-face interactions. Secondly, there are various forms of person perception (e.g., income level, occupations, and personalities). As mention in above discussion parts, participants might have different attention distribution patterns for forming different judgments. Future research may explore other types of person perception. Since different elements could provide different social cues to facilitate making judgements on others. Moreover, the participants in this study are all Chinese. According to previous research, cultures have a significant impact on person perception [15][16]. Chinese culture is different from those of some other countries [17]. That may lead to different approaches to person perception. Further research could recruit subjects with different cultural backgrounds and compare the gazing behavior when doing perception. More investigations across cultures could yield a more comprehensive understanding.

5. Conclusion

The present research used judging stimuli's occupations as the person perception task. The subjecs were ask to view a series of photo and to identify people's occupations in the given photos. An eye tracker was used to recored subjects' gazing behaviors during the process. Quantitative eye tracking results suggests, when forming person perception, people initially pay more attention to faces. This also happens to the scenario when people view other individuals unconsciously. As measured in terms of the total fixation duration, faces and outfits are visual elements people care about. People believe looks and outfits can provide more clues to identify other individuals' occupations. Compared to people who unconsciously view other individuals, people pay less attention to details, i.e. phones, jewelries, and glasses, when consciously doing person perception tasks.

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