Demo: iSNoW: User Perceptions of an Interactive Social Novelty Wearable

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ABSTRACT

We developed a highly-visible head-mounted novelty wearable to be used in social settings. We tested our Interactive Social Novelty Wearable (iSNoW) prototype in a partner-based user study to see if perceptions of the experience would change if the information displayed on the wearable was contextually relevant. Thematic analyses revealed important considerations for the design of future devices, regarding distraction and pressure to understand the rules of the game. Participants wearing contextually relevant information were more likely to recommend the device to their friends. We highlight future opportunities for exploration in this relatively untouched space.

CCS CONCEPTS

• **Human-centered computing** → *Empirical studies in interaction design.*

KEYWORDS

wearable, novelty wearable, social factors, interactive technology

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Figure 1: Participant Wearing iSNoW

1 INTRODUCTION

Novelty wearables are quickly becoming the customer engagement means of choice by coordinators of concerts and sporting events. Wrist-worn devices such as those by PixMob [9] and Xyloband [11] change colour based on an event's lighting design, but do not offer the wearer any form of interaction. Though studies of novelty or interactive wearables are often focused on functionality and usability, such devices also carry compelling social implications [1].

We explore people's experiences wearing a highly-visible novelty wearable in a social setting. We developed head-mounted prototype iSNoW (Figure 1) and tested it in a partner-based user study to see if player perceptions of a tabletop game would change based on whether the wearable displayed the current game score, or whether it displayed random patterns. We reflect on our work and consider what steps are important for expanding on this less considered area of research.

2 BACKGROUND

Increased sociability and interaction demonstrated by 'physical' social media wearables [6, 8] are preliminary evidence of interesting social connotations for novelty wearables. Gupta et al. [6] found that participants would be more willing to

wear the prototype if others had it on as well. Li et al. [7] suggested that their interactive head-mounted fashion wearable could 'amplif[y]' interactions between the wearer and their environment. Yet, in evaluating a high-visibility wearable, participants showed a preference for a low resolution, non-light-emitting form of wearable that did not attract much attention in day-to-day wear [4]. We see a gap in exploring highly-visible and wearable devices where wearers may *want* to draw attention to themselves or others.

Previous work in other areas of HCI suggests interactive experiences may be impacted by personality. Gajos and Chauncey [5] discovered a negative correlation between extroverted personality and adoption of an adaptive interface. Chan et al. [2] found that pairing extroverted participants with one another increased overall enjoyment of an interactive simulated exercise experience. Chandra et al.'s [3] work on technostressors found that personality differences affected the effectiveness of mitigating strategies on a person-to-person basis.

3 STUDY

We aimed to understand how wearing a highly visible, head mounted, novelty wearable affects a user's perceptions in social settings. We compared tasks where participants' head band displayed contextually relevant information (opponent's score) or random information.

Prototype

Our prototype is composed of two wearable headpieces made from RGB addressable LED strips and two control panels, utilizing a single Arduino Uno microcontroller (Figure 2 & 3). We developed two software modules. One allowed for us to independently control the number and colour of LEDs lit up on each headband, used for the experimental group (Figure 4). The other caused iSNoW to display a 'party mode' chasing-lights animation, based on the standard 'Strandtest' sketch provided by Adafruit. The latter module was used both for the control group and as a winning animation for both groups.

We asked participants to wear the headband-like device with the LEDs facing forwards in a 'tiara' orientation in order for the researchers and opponents to more easily see the number of LEDs lit up (Figure 1).

Task

In pairs, we asked participants to play a round of tabletop game Pickup Sticks while each wearing iSNoW in a social setting on campus. Each stick colour was assigned by the researchers a negative or positive point value between 1 and 5. Participants had to deduce the point value of each stick colour based on their revealed score: in the experimental group, iSNoW displayed opponent's score (Figure 4); in the control group, iSNoW displayed random patterns and casino chips represented score. The game ended when one player had reached 10 points or all sticks had been removed.

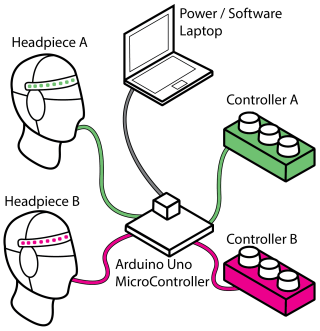

Figure 2: Conceptual prototype architecture

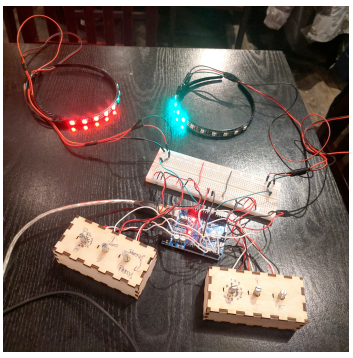

Figure 3: Actual prototype

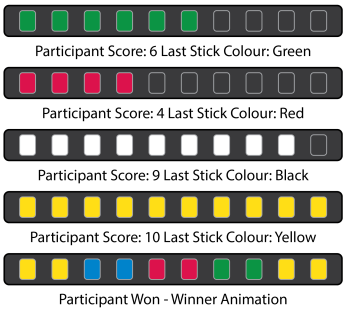

Figure 4: iSNoW's Headband Interaction Example for the experimental group

Data Collection

We collected Likert and long-answer questionnaire data through a Google Forms survey accessed on the participants' smartphones and manually noted visual observations and verbal comments. We collected demographic information,

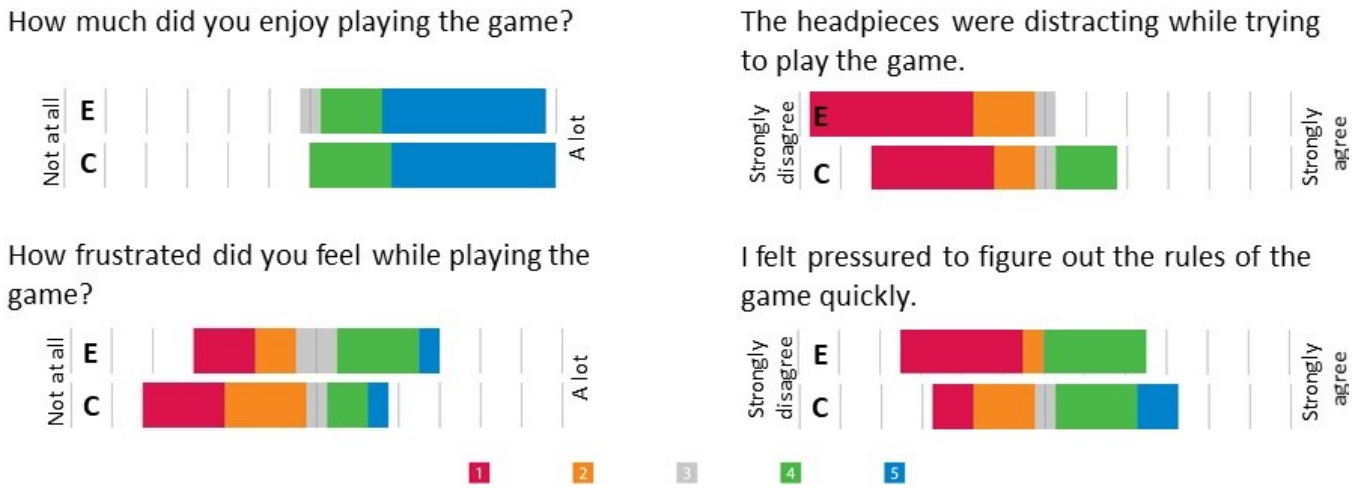

Figure 5: Subset of Likert-scale responses from device perception questionnaire. For each question, the top figure shows the experimental (E) group, while bottom shows the control (C) group.

the Big Five Inventory (BFI-10) questionnaire [10] and questions relating to their experience such as comfort level, enjoyment, and satisfaction while completing the task. Asking participants to fill out the BFI-10 allowed us to factor personality differences into our data analysis, particularly extraversion level, which we believed might affect participants' experiences with a highly visible wearable. We received approval from our institution's Research Ethics Board.

Participants

We recruited 24 university students for a between-subjects partner-based study (6 sessions per condition). All participants were between 19-35 years old, with 92% between 19-24. Inclusion criteria included being over the age of 19, being comfortable conversing in English, and having the fine motor control required to play tabletop games.

4 RESULTS & DISCUSSION

Responses between groups were similar when it came to enjoyment, level of focus, and pressure to score highly (Figure 5). A Mann-Whitney test did not find these differences between groups to be statistically significant. Based on past HCI research demonstrating effect of extraversion on users' experience [2, 3, 5], we wanted to know if extraversion affected users' perceptions of iSNoW, using an extraversion score calculated from the BFI-10 [10]. Correlations between extraversion and affective outcomes were not significant.

Overall, the short-term nature of our study, the small sample size (6 teams per condition) and iSNoW's novelty factor might have overridden personality-based tendencies which might have emerged in a longitudinal study. It is also possible that extraversion interacts with other personality factors to affect a user's perceptions of a highly-visible wearable.

Thematic Analysis

We asked participants how else they could imagine themselves using iSNoW, and for further comments or suggestions. Qualitative evaluations of these items showed participants in both groups envisioned primarily social uses for the device, though control group participants exhibited a greater variety of imagined applications. Our thematic analysis also revealed two defining factors for our prototype, physical comfort and the visual communication of information.

Recommendations to a friend. 92% of participants in the experimental group said they would recommend iSNoW to a friend, compared to 42% of participants in the control group. An independent-samples t-test found this difference to be significant, $t(17.293) = 2.934$, $p = .009$. This suggests users enjoyed a headband that provided an interactive experience more than a noninteractive experience.

Distraction. Comments from several control group participants (e.g., *"Did [the lights] change during the game? I don't remember."*) denoted a lack of awareness of the presence of the headband. Another said, *"Were these [the headbands] supposed to be distracting? I didn't find it distracting 'cause I was so focused on the game."* This suggests participants ignored the headbands because they considered the patterns to be unrelated to the game, and thus were less distracted by them. Meanwhile, experimental group participants were aware that their scores were displayed on iSNoW. Keeping track of score for this group involved shifting position to ensure full view

of the headband, which might have distracted them from the game.

Pressure to understand the rules of the game. Experimental group participants felt more pressured to figure out the rules of the game quickly. Control group participants had fewer issues understanding the scoring system and were quicker to catch on to the point values of each stick colour. Time delay in Wizard-of-Oz technique and unfamiliarity with the score display in the experimental group, and persistence of information with the chips in the control group may have contributed to this result.

Limitations

Primary factors limiting our results included a lack of explanation about the purpose of the wearable to the control group, which may have increased confusion; partners consisting primarily of participants who already knew each other; and a limited sample size restricting statistical analysis.

5 CONCLUSION

We developed a between-subjects study to examine how a highly-visible head-worn wearable that reacts to its environment is perceived by users. Participants wearing contextually relevant information were more engaged with the iSNoW wearable and were more likely to recommend it to a friend. Thematic analyses revealed important considerations for the design of future devices, regarding distraction and pressure to understand the rules of the game. Plans for future work include a higher-fidelity prototype with wireless capabilities, more sensory inputs, scalable infrastructure and ergonomic considerations, as well as a longer-term study. Our results facilitate further investigation of how novelty and high-visibility play a part in user perceptions of wearables, informing study of human-computer interaction and product design.

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