



Analysis of One-Person Households Who Is Young's Characteristics in Combination with Social Experience from the Perspectives of Interaction Process in Product Use, Social Situation and Public Space

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Abstract. There is a special group as a product of the times constantly expanding: OPHY. One-person Households who is Young (OPHY), aging between 20 and 35 years old. Combined with the characteristics of the OPHY group, this paper introduces a concept based on multi-dimensional user experience: social experience. This paper will focus on the OPHY, through three methods of design research, with the concept of “social experience”, analyze the deeper characteristics and needs of this group, seeking design directions and concepts that can help these strugglers enhance their interaction with society and improve their social experience. Through research, this paper finds that the living status of OPHY have a great correlation with their salary level, social status, personal mentality and gender. However, no matter what kind of typical participants, the status of living alone would indeed reduce their social interaction, even if they have a strong social tendency. On the one hand, designers should combine the OPHY's characteristics to make change, through product design and interior design. On the other hand, designers should insist on enhancing the attractiveness of the outside world to help OPHY get out of their house, through service design, architecture design and environmental design. Based on the existing research, this paper has carried out a more detailed subdivision of the OPHY group. At the same time, this paper improves the user research methods in design, and innovatively applies them on sociological problems.

Keywords: One-person households who is young · User experience · Social experience · Emotional experience · Product use · Social situation · Social sustainability · Space interaction

1 Introduction

With the development of economy and modern network, coupled with the change of some traditional concepts, such as the change of marriage and love concepts and the enhancement of self-concept, there is a special group that is expanding as a product of the Times: OPHY. They struggle alone in the big city for self-realization, enjoying the

satisfaction of pursuing ideal, but also experiencing the emotional loneliness and the awkward predicament in life. This paper will focus on OPHY, use three design research methods and analyze the characteristics and requirements of this group, with the concept of “social experience”, in products, users and environment three directions. With the combination of product design, service design, architectural design and other related professional knowledge in the field of design, from the perspective of the designer, seek to help the foreign land striver increase social interaction and improve their social experience.

2 Literature Review

2.1 One-Person Household Who Is Young (OPHY)

According to the census bureau, only 7.6% of U.S. households chose to live alone in 1967, but today, more than 35 million Americans live alone, accounting for 14.5% of U.S. households, nearly double the number from 50 years ago [1]. Living alone has become the second largest household registration in the United States, far beyond nuclear family, trunk family, roommate cohabitation and other forms [2]. The number of one-person households has also almost doubled in the Seoul metropolitan region of Korea between 2000 and 2010 [3, 4]. Almost 30 years ago, the one-person household was identified as the fastest growing group throughout most of the developed world [5]. These changes were experienced by the developed countries previously through the so-called second demographic transition [6].

This growth is also evident in some developing countries which promote social culture. Podhisita and Xenos studied the phenomenon of living alone in south and southeast Asia. The research shows that the average level of living alone in Asia, while the lowest in the world, has been on the rise in recent years and young people are most likely to live alone [7]. According to the latest population sampling survey data from National Bureau of Statistics of China, the number of one-person households accounted for 13.15% of total households in 2015, compared with 9.14% a decade ago in 2006 [1].

The situation of living alone is closely related to social environment, wealth, age and other factors. This paper concentrates on the One-person Households who is Young (OPHY), aging between 20 and 35 years old.

In China and some other developing countries, which have a strong family concept and where the project group has only begun to grow substantially in recent years, scholars' researches in the field of the youth who live alone mainly focuses on the following five aspects: Firstly, the cause of this particular group: 1. Frequent social mobility [8, 9, 19, 29] 2. The change of the concept of marriage and childbirth [20–22] 3. Non-traditional lifestyle [8, 20]; Secondly, the group's definition: 1. Age: 20–35 [8, 10, 11] 2. Leave their parents and live alone in big cities [9, 10, 12] 3. Work hard for their dreams [12–14, 21]; Thirdly, the group's characteristics: 1. High level of education [15, 16, 19] 2. Strong sense of independence [23, 24] 3. Strong sense of self-esteem and self-confidence [11, 15, 16]; Fourthly, macro solutions: from the aspect of psychology [14, 25, 26], policy [13, 27, 28] and so forth; Finally, disagreements in the academic community about this group: some argue that the group contains lots of

problems and should be treated with caution [16, 28, 29]. However, other researchers believe that this is a social progress and we should be optimistic [9, 17, 18].

In the developed countries, such as the U.S. and Japan, single solitary living has become a relatively common social phenomenon. In the interview process of the recording of “Nothing to Society”, the recording team of the NHK special program in Japan put forward the concept that “it is now the time to take living alone for granted [30]”. Although the famous American sociologist Eric Klinenberg wrote the book “Going solo” presenting us with a “single society” with richer levels through a survey [2], most researchers only focused on the health [31–33] and diet [34–36] of solitary people and did not subdivide young solitary people for analysis.

However, there are few researches aimed at the OPHY phenomenon, and most of the existing literatures remain at the direct description level of media reports, and many reports lack empirical materials’ support. Only a few researches that have reached conclusions through actual research via interview. And there is a lack of in-depth knowledge and group segmentation.

2.2 Extension of User Experience: Social Experience

User experience: The user’s responses and perceptions that arise from the anticipated use or use of a product, service or system [37]. And the aim of User Experience Design (UXD) is enabling joy and fun, eliciting emotions and satisfying psychological needs, which means creating experiences [38]. And Simon also proposed that incorporation and shaping atmosphere are possible triggers for experience. Human beings are social creatures. Decades of research on human happiness shows that engaging in positive social interactions is critical for well-being [39–41]. Dourish identified the development of social computing through three distinctive “waves”: the first wave concentrated on virtual communities, such as online environment, chat rooms and MUDs; the second wave concentrated on large-scale collaborative actions, such as micro-blogging, virtual worlds, online games and social networking platforms; and the third wave concentrated on the integration of everyday life and social and collaborative digital [42]. The need for designing the interaction experience between individuals and the society is increasing and unstoppable.

Hence, it is natural that the concept of user experience needs to be expanded to encompass not only the individual side of experience, but also to take the social side into account. This paper will concentrate on the interaction of the special group OPHY with society, searching for the way to help them to engage into the society better and improve their sense of social belongings.

Here, this paper introduces another concept: the social experience (SX).

The term social is “*multi-faceted and used with different viewpoints. It means interpersonal, ceremonial, informal, public, non-profit, or humanity on a massive-scale. It involves emotion, trust, ties, and norms*” [43].

This paper assumes the social experience to be identical to the experience which generates from the interaction between people and the interaction between people and the society, such as the public utilities and the public open spaces, such as parks and public architectures.

Table 1. Summary of related studies on social experience.

Top-ics	Con-tent	Studies	Aim	Research Method					Outcome
				Experiment	Case Studies	Interviews	Questionnaire	Literature Review	
Product design	Commerce	Express Yourself: Designing Interactive Products with Implications to Improve Social Interaction [51]	The aim of this paper is to simplify the interaction between users within the system and encourage users to have more physical social interaction in their daily life. To discuss the interaction design's objective, principle and design process, a product interaction design is the development direction of the future products. In view of interaction design of content and category to very wide.	✓					1. Identify the possibility of designing interactive products that let users to express themselves with daily behaviors to make their own special experiences, which also encourage them to interact with each other in their daily life. 2. users would be much expressive when interacting with physical objects. Therefore, we suggest designers to utilize physical form while designing computational products with this concept.
		Based on the Experience of Product Interaction Design [52]	To provide designers with a framework and a particular methodology for designing products with social behaviors.		✓				To establish the user experience of product interaction design goal is to grasp the interaction design positioning. At the same time, in the product interaction design it should follow the next several design principles: 1. pleasure principle; 2. differentiation principle; 3. personalized principle; 4. continuity principle; 5. innovative principles; flow chart of product interaction design
		An Empirical Framework for Social Products [53]	To find how should we design the visual attentive interface in physical world.	✓					designers of social products should ascertain in advance that the interaction style of the product fits the social context of use as well as individual attributes of the users.
		Shop+ Gaze based Interaction in the Physical World for In-Store Social Shopping Experience [54]	To consider the context of social media platforms for promoting niche cultural products to investigate if user interaction patterns could promote online user participation and loyalty in content generation to allow commercial value to be better derived in this context.	✓				✓	Most people particularly thought the product comparison feature was useful. Also users felt that using the physical environment as a display was more natural than using an additional wearable device, such as Google Glass, to accomplish the same goal.
Service design		The influence of user interaction in social media on the participation intention of niche products[55]	To explore the experience design based on tangible and intangible and interaction of Generation Y.	✓	✓			✓	provide support for the hypothesis that user participation in such a platform (e.g. in generating content such as product reviews) can indeed lead to favorable commercial benefits. Given the importance of attaining a high level of user participation in content generation, it makes sense for the hosting firm to encourage greater interaction among users, with the hope that they can stimulate one another to contribute more content to the social media platform. However, not all types of interaction could lead to higher participation in content generation. Our findings indicated that in the context of discussions on niche cultural products, although inclusiveness and heterogeneity centralization can promote overall participation, out-degree centralization and core-periphery structures have a detrimental effect.
		Experience Design of Social Interaction for Generation Y Based on Tangible Interaction [56]	Aim at exploring relationship between culture and a social aspect of user experience.	✓	✓			✓	The design principle of their chameleon installation is appropriate. Provide a framework of ideas and methods for them to determine design principles for specific groups of people.
Experience design		Culture and Co-experience: Variation of User Experience in Social Interaction and its Implications for Interaction Design [57]	To presents a critical view of existing models of user experience.	✓					1. The paper brings important implications for interaction design in two aspects: "cultural aspect of co-experience" as a scrutinizing concept for design and an evaluation tool for cultural fitness. 2. Designed a novel interactive technology called "Visualtalk table" inspired by the concept of role-taking, which make convincing contributions in studies on cultural aspects in tangible and ubiquitous interaction.
		Co-experience: The Social User Experience [58]	The aim of our experimental study is to identify and analyze the interplay of contextual conditions in a web-based, a co-located multi-player game [59]			✓			The definition of co-experience: social, multi-modal, creative, for fun.
Applica-tions	Game design	Design Implications of Social Interaction in Online Games [60]	To establish a research model for social player interaction and highlight the impact of the game design, the player groups, and the gaming setting.	✓	✓			✓	1. The key opportunity of this MagicDuel game is to establish, understand and evaluate the symbiotic relationship between the players who are immersed in the game and the audience engagement. 2. The socio-spatial inter-dynamics between player-game system-ambiance engagement contexts are areas that influence gameplay experiences. The study of social interaction aspects of the younger demographic, defined by social experience (SX) as a domain that would lead to creation of digital games reflecting the enhancement of human lifestyle, creation of memorable and motivated human experiences for any specific demographic in public spaces.
		The Impact of Game Patterns on Player Experience and Social Interaction in Co-Located Multiplayer Games [61]	To look into the challenges brought up by social computing, in de-signing for social interaction in public spaces in particular in cities and professional environments.	✓	✓			✓	Game designers could increase the "stickiness" of games by supporting, or even forcing, peer play.
Interaction design		Design for Social Interaction in Public Spaces [62]	To develop a conceptual framework that will make designers able to better discuss design projects in the development phase, and subsequently design systems that are more likely to be successful social systems.	✓					Results indicate that high player interdependence implies more communication and less frustration, whereas shared control results in less perceived competence and autonomy. Moreover, individual player characteristics also impact the social interaction.
		Designing for Social Interaction: An Experimental Design Research Project [63]	while playing, exploring, and being creative alongside a typically developed comparison.	✓					Presented eight design cases of interactive installations for social interaction in public spaces. The targeted spaces and user groups, design concepts and implementing technologies vary, aiming at different social experiences.
Architect-ural design		Typologies of Architectural Interaction: A Social Dimension [65]	To explore interactive architecture's potential role as catalyst for social activity.	✓					The outcome of the project is one or more conceptual frameworks that will enable designers to better describe and design technologies supporting social interaction.
		Social Theatres: A Web-Based Regulated Social Interaction Environment [66]	To propose a model for interaction regulation and control for virtual social interaction spaces, called Social Theatres.	✓					The slow introduction of richer interactions has proven to be positive for helping children get comfortable with the system and gently encouraging socialization and collaboration behaviors.
		Social Interaction Design Patterns for Urban Media Architecture [67]	To offer an overview and analysis of social interaction in media architecture environments.	✓					Proposes a new way of thinking "socially" about interactive systems, expanding on a crucial ongoing discussion about the relationship between interactive buildings, humans, and the environment.
		Design for Social Interaction in Public Spaces [62]	To look into the challenges brought up by social computing, in de-signing for social interaction in public spaces, in particular in cities and professional environments.	✓					This paper discusses the advantages of regulated interaction, addresses the Social Theatre metaphor and presents the software architecture for the implementation of these regulated social interaction spaces.
Physical	Environmental design	Designing urban furniture through user's appropriation: teaching experience teaching social interaction design [68]	Analyze needs of persons in their role of users with the objective of making their experience more enjoyable and simple.	✓					Presented eight design cases of interactive installations for social interaction in public spaces. The targeted spaces and user groups, design concepts and implementing technologies vary, aiming at different social experiences.
		Social interaction and cohesion tool: A dynamic approach for Barcelona's public [69]	The purpose of the methodology is to use a Grasshopper-based platform to collect social data from sensors, modify it, develop responsive, scales and "media" visualizations, and iteratively design a language of visualization.	✓				✓	The results of combining technical tools and interpreting emotions is attractive and leads to significantly improved designs, can be used to support interaction for other design tools (OPD, Concept Visualization and Selection Matrix, etc.), as well as submitting these design to real users' experience.
Environmental design		Influence of Interactivity on Social Connectedness: A Study on User Experience in an Interactive Installation [70]	To find out how interaction with public installations affects evaluating the experience of social connectedness.	✓	✓			✓	Firstly, a framework outlining six different modes of social interaction in relation to media architecture: appreciation, self-expression, playfulness, collective narratives, translation, and negotiation of space, secondly, a set of seven social interaction design patterns for media architecture, which represent different strategies for designing media architecture to achieve specific types of social interactions: shadow playing, remote control, smooth operator, asoobos, amusement park, swarm, and automatic gate.
				✓					The experiment was successful in providing evidence that if a public installation is interactive, having the users interact simultaneously increases the level of social connectedness significantly compared to a single user interaction. However, there was no significant difference in the level of social connectedness between having a non-interactive installation and having an interactive installation. Therefore, in conclusion can be drawn from this experiment and this would be a topic for further investigation.

Yamakami used the metaphor of user experience design in social contexts and proposed the concept of social experience design [44]. He assumed the social experience to be identical to multi-user experience. He concentrated on the interaction between people and ignored the influence of the social objective material environment. However, living in the society, the social environment and social equipment play a significant role in our interaction experience. This paper focuses SX on the following

two aspects: firstly, the relationship of social experience design and user experience design [45–47]; secondly, the application of social experience design in virtual network world [48–50]. Combined with the definition of SX in this paper, literature in relevant fields has been screened, as shown in Table 1.

The above-mentioned studies contribute to our understanding of social experience. However, they also have limitations. First, the definition of social experience is too narrow. The social experience should be extended to the experience of personal involvement in a society, the interaction with the society. The society can be considered as a system or an environment, which contains not only human beings but also the material facility and cultural conditions. The spatial arrangement of residential area has been found to enhance social interaction among residents and influence their activity patterns. To achieve the social interaction must provide physical space, such as parks. Second, as this is still a new emerging field of research, it focused on the introduction of concepts and models about SX, being lack of research data.

Therefore, based on the existing literature, this paper will use the relevant methods of design research to describe the social experience of this special group in depth. From the perspective of the group's daily social habits, living habits and emotional changes to define the following questions:

What problems exist in social construction make the number of solitary people increase?

How can we help them to improve their social experience and their sense of social belongings?

3 Methods

In order to better understand the OPHY group's interaction experience status quo, this paper, from the aspects of their product use, social interaction and interaction with public spaces, such as public buildings and city parks, chooses three specific design methods combining with the special group's feature: "Personal Belongings", "A Day In The Life" and "Map". In-depth research is carried out from the perspectives of user with products, user with user and users with environment to explore the status and potential design points of OPHY in these three dimensions.

3.1 Personal Belongings

Purpose. By recording the items that participants carry under different scenarios (weekday and weekend), the product usage habits and internal demands of OPHY group are analyzed. From the perspective of interaction between user and products, this paper explores the phenomena and potential design points existing in the use of products by this group.

Materials. Sticky paper for personal belongings (2 sheets), camera.

Executive Routine. *Step 1-Record.* Take out all the items in bag in the morning and evening and put them in order for a group photo. *Record Twice.* on the weekday (blue sticky paper) and weekend (red sticky paper). *Step 2-Return Visit.*

3.2 A Day in the Life

Purpose. By recording social situations in different scenarios (weekday and weekend), the social habits and psychological state of OPHY group are analyzed. From the perspective of interpersonal interaction, this paper explores the phenomena and potential design points in the social interaction of this group.

Materials. Booklets (2 copies, as shown in Fig. 1), Emoji stickers (1 copy), Pens.



Fig. 1. The digital demo given by the researcher about how to complete the booklet (left). The inside pages of the booklet which need to be filled in according to the listed items (middle). The booklet: blue for weekday, pink for weekend (right). (Color figure online)

Executive Routine. *Step 1-Record.* Make detailed records of effective social contact during the day by combining with the demo given. Effective social contact is defined here as “effective social contact with others regardless of online or offline contact and communication. Items to be recorded: time, place, interlocuter, method, trigger point, content and feelings (transcript and emoji graphical expression). *Record Twice.* on the weekday (blue booklet) and weekend (red booklet). *Step 2-Return Visit.* Open questions.

3.3 Map

Purpose. By recording the locations of different scenarios (weekday and weekend) to work and live, the living habits and living conditions of OPHY group are analyzed. From the perspective of interaction between users and environment, this paper explores the phenomena and potential design points existing in the interaction with public space, such as public architectures and urban parks.

Materials. Map of different provinces, Markers (2, red/blue).

Executive Routine. *Step 1-Record.* Mark the locations on the map and mark the names of the locations. *Record Twice.* on the weekday (blue marker) and weekend (red marker). *Step 2-Return Visit.*

3.4 Additional Materials

Commitment (2 sheets), Personal information form, Task Table (2 sheets), Demos.

4 Conduct

4.1 Participants

Basis for Selection. *Basic Requirements.* Age: 20 to 35 years old; Residence: China's first and second tiered cities; Living alone.

Additional Requirements. At the same time, in order to ensure the sociality and typicality of the survey, this paper selected a total of 5 survey subjects for analysis based on the two important factors affecting the living state of OPHY group: gender and characteristics (extravert/introvert).

Participants' Information (as shown in Table 2).

Table 2. Participants' information.

Participant	Age	Residence	Gender	Characteristics (extravert/introverted)	Conduct time
M1	27	Shijiazhuang, Hebei	Male	Introverted	June 18 2018 (June 16 2018)
M2	30	Shijiazhuang, Hebei	Male	Extraverted	June 14 2018 (June 16 2018)
F1	21	Shanghai	Female	Extraverted	June 12 2018 (June 16 2018)
F2	25	Changsha, Hunan	Female	Introverted	June 12 2018 (June 16 2018)
F3	32	Beijing	Female	Introverted	August 15 2018 (August 12 2018)

Note: The determination of extroverted or introverted is derived from the self-statement in the personal information form.

4.2 Timetable

The following (as shown in Fig. 2) is the specific execution time of each task of the participants (24-h system):

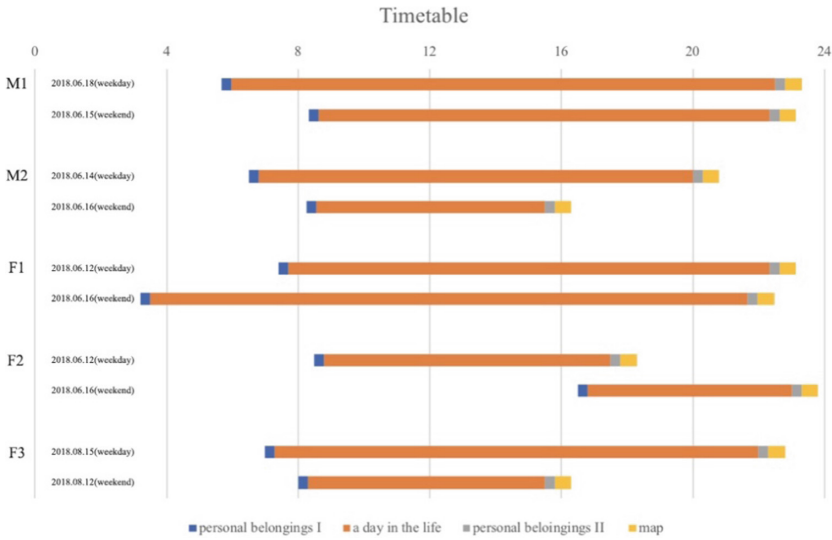


Fig. 2. Timetable about when the participants completed the tasks (in 24-h system).

5 Consequence

5.1 Personal Belongings

- (1) Carry-on items: keys, mobile phones (as shown in Figs. 3 and 4).
- (2) Items with gender differences: bags, lipsticks, tissues (as shown in Figs. 3 and 4).
- (3) Items with age differences: earphones (as shown in Figs. 3 and 4). (Participants under 30 years old tend to carry earphones)
- (4) Items with different personality differences: wallet, cash, bank card (as shown in Figs. 3 and 4).
- (5) Items on weekdays and weekends are different from: lipstick and earphones. It can be obtained from the later interview of F2 that don't carry earphones on weekends is a kind of performance that is more relaxing and tends to communicate with friends (as shown in Figs. 3 and 4).
- (6) Many items with more individualized features are not listed in the chart because they are not universal. In general, the number of items that women need to carry is: 10+, while that of men is: 5-, the gap is large. According to the later interviews M1, F1, F3: women will carry what they might use when they leave home (even though they admitted that these things in the bag were never used), such as emergency medicine; on the contrary, men pursue a "simple" lifestyle.

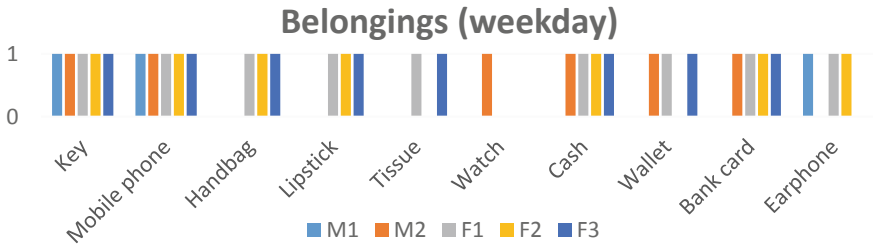


Fig. 3. On the weekday, items which the participants carry.

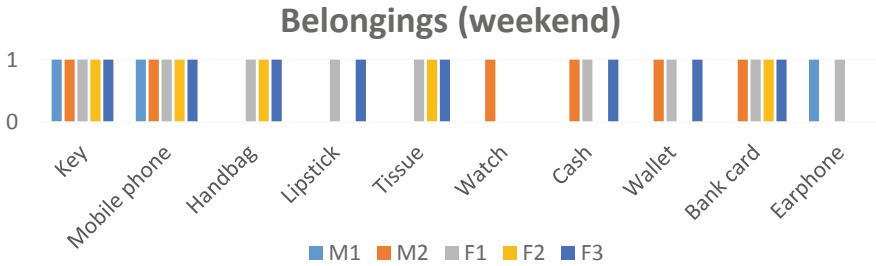


Fig. 4. On the weekend, items which the participants carry.

5.2 A Day in the Life

- (1) **Quantity:** The number of social interactions happened on weekdays is much higher than on weekends. The number of social interactions is not necessarily related to their personality and gender, but has a great relationship with the nature of work (as shown in Fig. 5).
- (2) **Location:** Social places are concentrated in companies and consumer places, and some exist in home which are acquaintances and required passive social interaction. Extroverted personality has more active social interactions in public places. For the younger participants, weekend time would also be occupied by work (as shown in Fig. 6).
- (3) **Interlocutor (as shown in Fig. 10):** Weekday socializing focus on communications with colleagues (most of the contents are about work and some are entertainment), and weekend socializing is concentrated with friends. On weekends, the number of interactions with strangers is zero. There is less communication with parents, even less than the number of interactions with practitioners of service industry. Extroverted personality loves to communicate with parents. The number of friends the five participants keeping communicating with is maintained at 1 or 2. In addition, the older the age, the greater the correlation between the source of friends and work (as shown in Fig. 7).
- (4) **Media:** On weekdays, men tend to socialize face to face, women tend to socialize online (related to the nature of work); on weekends, they all tend to socialize face to face. On weekends, both social medias would be reduced to a certain extent (as shown in Fig. 8).

- (5) **Emotional changes:** The mood changes on weekdays are more abundant. On workdays, men have more positive emotions and women have more negative emotions: on weekends, positive emotions dominate for both men and women. Among them, positive emotions mainly arise from interactions with colleagues and friends. Negative emotions mainly come from difficulties in work (female negative emotions also come from interactions with friends: such as they do not get positive feedback or they do not receive friends' full attention). Introverted personality is more likely to produce negative emotions than extroverted personality, whether it is workday or weekend (as shown in Fig. 9).
- (6) **Content:** From the conversations of private socially interactions other than work interactions, it can be seen that people with introverted personality are more eager to be recognized and willing to give and women prefer sharing more than men.

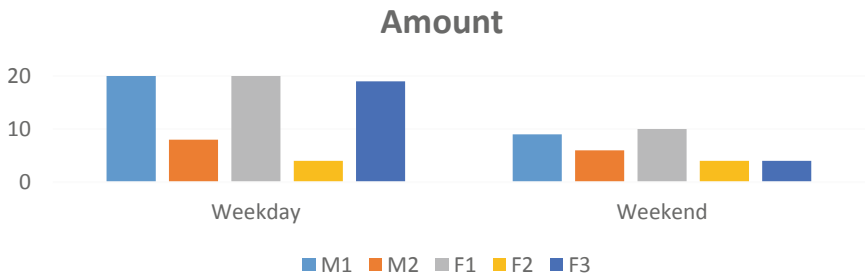


Fig. 5. The amount of social intercourse in a day.

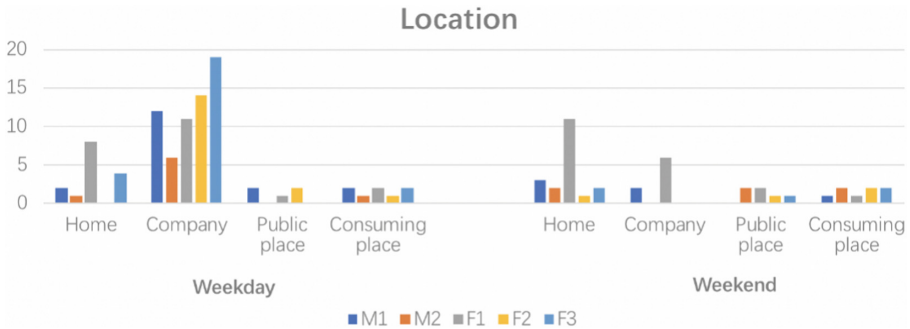


Fig. 6. The places where social intercourse took place.

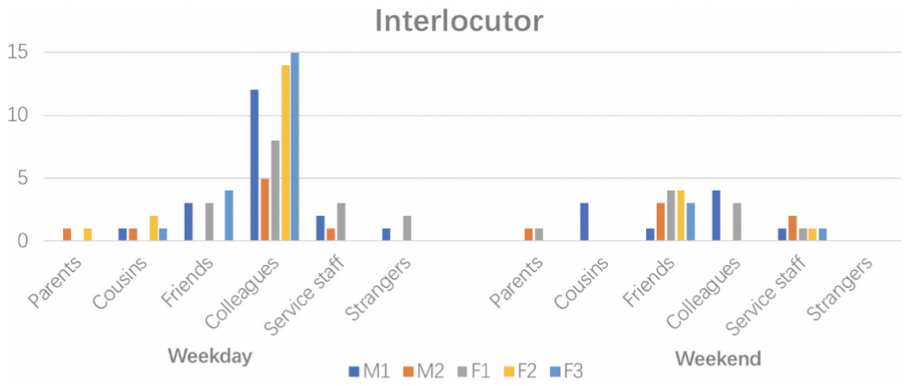


Fig. 7. The people who the participants talked with.

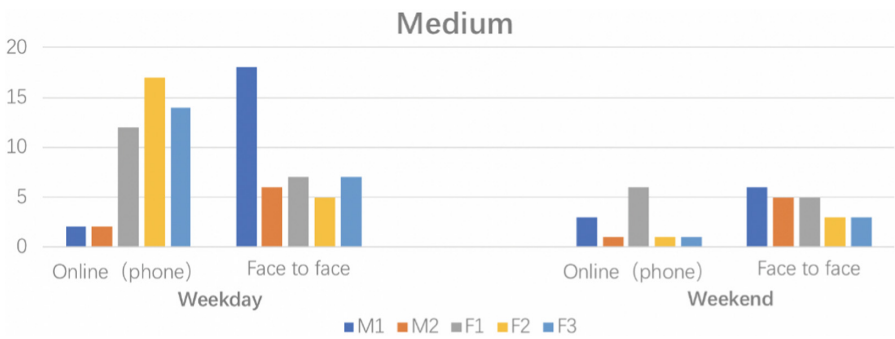


Fig. 8. The medium used to have social intercourse.

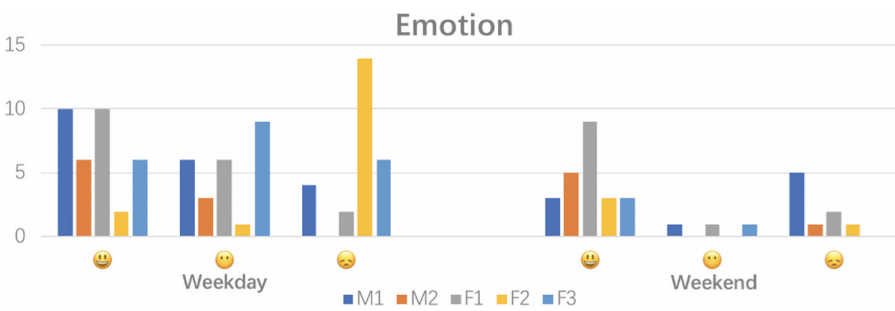


Fig. 9. Participants' feelings when they were socializing.

Social intimacy

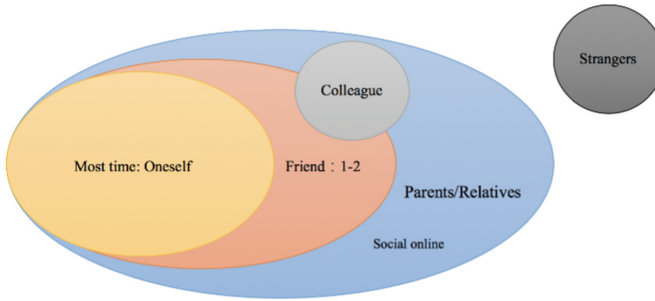


Fig. 10. Social intimacy model.

5.3 Map

- (1) In addition to the company, OPHY stay at home most of time (as shown in Figs. 11 and 12).
- (2) Eating out is not their only choice. In most cases, they will choose to cook, order take out or take the dishes home. The specific situation is affected by the income level.
- (3) Men have the habit of exercise, but women do not (as shown in Figs. 11 and 12).
- (4) Women are more inclined to stay at home, whether it is after work or on weekends (as shown in Figs. 11 and 12).
- (5) On weekends, work would deprive men’s holiday time (as shown in Fig. 12).
- (6) The idle time mode that OPHY spends tends to stay at home, go hiking, and rarely appear in cultural venues such as cinemas, museum and libraries (as shown in Figs. 11 and 12).
- (7) Urban public spaces such as parks and plazas do not appear in their lives (as shown in Figs. 11 and 12).

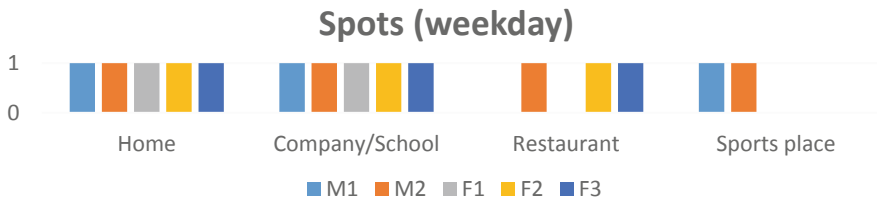


Fig. 11. On the weekday, places that have been visited.

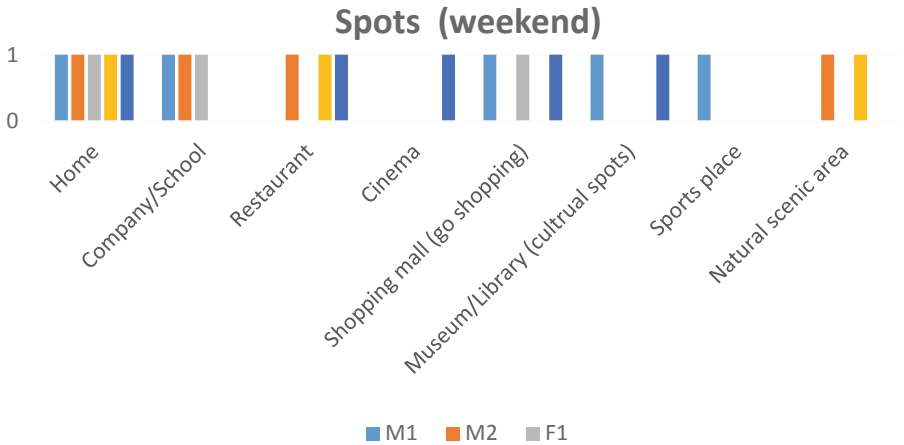


Fig. 12. On the weekend, places that have been visited.

6 Discussion

Through investigation and research, this paper finds that the phenomenon and the survival status of the OPHY group are closely related to their personality characteristics and income levels, and the individual differences are very large. It is not possible to view the survival status of this group only through the overall trend and changes of the society. The literature [8, 15–17, 27, 28] did not pay enough attention to independent individuals in the process of examining this group.

6.1 Product Use

Chang and Liang [51] pointed out in the study that users should be encouraged to express their emotions by designing some physical interaction products to enable users to create experiences in their daily lives. However, this paper did not find products with interactive feature from the user's personal belongings. There may be two situations: First, the research case of Chang and Liang is in a larger private space, such as bedroom, and this paper focuses on the items that are carried around, with a smaller scope, more functional purposes, and less interactive scenarios. Second, the current interactive products (especially physical products) do not combine portability, functionality and emotional interactivity, and the emotional interactivity of portable products (such as headphones) is almost zero. In combination with the product user experience proposed in Hu and Huang [52], in addition to the usability, the product should be interesting, creative, personalized. We can draw a conclusion that the existing portable products have problems in this aspect of design. At the same time, because users will inject a lot of personal emotions and experience memories on such products, how to design the life cycle of such products more effectively, to make the products from the purchase, use to discard or collection become more elegant need to be carefully considered by the designers. For some daily necessities, the product life

cycle is generally very short. While optimizing the user experience, it is necessary to pay attention to the sustainability and green environmental protection of the product.

This paper shows that the OPHY group has a willingness to talk and communicate, and most of the positive emotions in their lives come from the communication experience with others, such as share gets positive responds). Lee [57] and Battarbee [58] proposed a new concept: co-experience, which emphasizes that different individuals create experiences together when using a certain product to gain happiness. This paper shows that this concept is established, and the experience created by people in the process of using mobile phones (or social software) far exceeds the value brought by the product's own functional value. However, OPHY is limited by its own environment (often alone), their co-experience is mainly generated by mobile phones (virtual social networks). How to help them create more and more diverse co-experience need more products to enhance user engagement and self-motivated, not just mobile phones.

6.2 Social Situation

Kim et al. [54] pointed out that user interaction on the social platform, such as product reviews, can indeed bring good social benefits, but the research in this paper shows that young female users (F1, F2) are willing to interact on the platforms. The male research users and the older female users (M1, M2, F3) rarely interact on the public network platform. How to mobilize their social interaction (social experience) online should be concerned in service design field and information design field.

Among the five respondents, only the young male M1 has the habit of playing games. Game is the way he spends his free time, and it is also a medium for him to maintain friendship. But he is only limited to playing games with old friends. At the same time, he will gain a sense of accomplishment in the game (M1 became much more excited about the topic of the game in the interview). Chen and Lei [60] emphasized the importance of teamwork for game viscosity, but how to improve the viscosity between users, increase their communication and personal relationship development to maintain the stability and continuity of teamwork, which game designers need continue thinking about. In addition, the OPHY group's private time is actually quite long and boring, at the same time, they are eager to be recognized (playing games can quickly achieve a sense of accomplishment to meet their needs), so how to make female users and older male users involve in games and fulfill their social needs in the game (the lower threshold for communicating with strangers in games) is also the possible direction of game design.

6.3 Public Space Interaction

Oh et al. [65] indicated that the experience and participation of buildings that users can participate in is far greater than that of ornamental buildings with a sense of mystery. Although ornamental buildings create subtle social connections between designers and users, they rarely trigger social activities and people are less curious about them. In contrast, by creating surprises, happiness, and communication with people, a building that is interactive is a temporary re-adjustment of the social atmosphere. This paper

finds that the buildings mentioned by OPHY are all related to functions (such as cinemas). There is no conflict between the functionality of the interior of the building and the entertainment on the exterior wall. Enhancing the interactive design of the architecture is a good way to increase social experience and promote social interaction between strangers. However, in this process, the construction of interactive facilities is an additional function and is easy to produce burnout, high cost, and fast update speed, so how to effectively use the easy-to-assemble, easy-to-move sustainable materials and modules for flow assembly between different buildings' display is a problem that the designers should pay attention to.

This paper shows that public space (such as parks and squares) has a small chance of appearing in the daily life of the participants. On weekdays, most of them went home directly after work (only M2 went to the park for a walk in the evening), there is not much interaction with the outside world; on weekends, they were more inclined to stay at home or go to nature with two or three friends, such as mountains, but not the public spaces in the city. These reflect some of the problems that may exist in the design of public environment: First, public spaces in urban areas such as parks generally have special areas for children to have fun and sports venues for the elderly. Only some of the larger amusement facilities are set up for young people. However, when OPHY has time, specifically after work, these facilities have been closed, and the public spaces lack a relaxing entertainment program and atmosphere that meets the needs of the crowd; second, the public space are never showed up in female participants' lives and at the same time they do not have the habit of exercising. In return visit, the reason for this phenomenon is not only the participants' laziness but their concerns about safety issues. Therefore, how to strengthen the attractiveness and security of the public space in the evening, that is, to better combine the characteristics of the work-in-the-jobs to make the public space of the night rejuvenate is an issue that environmental designers could consider. Van and Hu [70] gave some good examples and methods for enhancing the social function and fun of public spaces through user collaboration.

7 Conclusion

This paper aims to explore the characteristics and needs of the OPHY group, and combines the characteristics of this group (basing on literature review) to select three design research methods: Personal Belongings, A Day In The Life and Map. Five typical users from four cities were selected for in-depth research based on gender and personality characteristics. Through research, this paper finds that the living status of this group has a great correlation with their income level, social status, personal mentality and gender. But no matter what kind of typical users, the status of living alone would indeed reduce their social interaction, even though they have a strong social tendency. Therefore, from the designer's point of view, how to expand their communication range, help them maintain stable communication and improve their social communication experience is the direction should be worked hard. On the one hand, designers should combine the special group's own characteristics, such as more time at home, from their living environment or from the game they love to play, find the direction of improvement to help them experience social and interactive pleasure at

home. On the other hand, designers should continue to enhancing the attractiveness of the world outside the house to help them get out of the house by improving the services they receive, the buildings they pass by and the public spaces they have been neglecting to. Make integrating more actively and simply to help them make more new friends and create more interesting experience in society.

Based on the existing research, this paper has carried out a more detailed subdivision of the OPHY group, and a broader survey on the three dimensions of user with products, user with user, users and environment, and found out more specific needs and survival of this group in some specific scenarios. At the same time, this paper flexibly applies the user research methods in design, and applies them in solving sociological problems innovatively. The typical users replace the big data statistics to conduct more in-depth user research, which makes the user image more vivid, the research level more diverse, and to some extent, it expands a new idea of user research.

In addition to more specific research on enhancing the interaction of the external environment, future research can also explore the concept of “home” from the existing living habits of OPHY. How to better help OPHY integrate into the society through the design of interior design, product design or virtual product design. And how to integrate the relationship of “being at home” and “entity social” which are seemingly contradictory.

OPHY is a growing population and is a social phenomenon that cannot be ignored. Researchers can't simply define the good or bad of their lives, but the designers can use the power of design to enhance their social experience to help the young people who are struggling between dream and reality gain a stronger sense of social integration and cultural belonging.

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References

1. A solitary person in a foreign land. <http://kreader.cnki.net/Kreader/CatalogViewPage.aspx?dbCode=cdmd&filename=1017096171.nh&tablename=CMFD201702&compose=&first=1&uid=>. Accessed 10 May 2017
2. Eric, K.: *Going Solo*. Penguin Press HC, London (2012)
3. Chae, J., Park, S., Byu, B.: An analysis of spatial concentrated areas of single person households and concentrating factors in Seoul. *Seoul Stud.* 1–16 (2014)
4. Yi, C., Lee, S.: An empirical analysis of the characteristics of residential location choice in the rapidly changing Korean housing market. *Cities* **39**, 156–163 (2014)
5. Sorrentino, C.: The changing family in international perspective. *Mon. Labor Rev.* **113**(3), 41–58 (1990)
6. Yi, C.: Relationship between the formation conditions and durations of one-person households in the Seoul Metropolitan Region. *Demography* **53**(3), 675–697 (2016)
7. Chai, P., Peter, X.: Living alone in South and Southeast Asia: an analysis of census data. *Demogr. Res.* **32**(41), 1113–1146 (2015)

8. Yu, A.: Phenomenon of empty nesters: expression, cause and cognitive attitude. *Forw. Pos.* **7**, 78–82 (2017). (in Chinese)
9. Li, C., Ma, F.: “Empty nest youth”: a group that walks between “survival” and “dream”. *Thoughts Public Opini.* **4**, 118–119 (2017). (in Chinese)
10. Guo, L., Zhu, L.: “Empty nest youth”: “nest space” does not mean “heart empty”. *Dec. Explor.* **3**, 12–13 (2018). (in Chinese)
11. Dou, X.: Psychosocial diagnosis and support of the “empty nest youth” group image. *Gansu Soc. Sci.* **1**, 179–185 (2018). (in Chinese)
12. Wu, G., Yang, X.: “Empty nest youth”—dream catcher of rootless duckweed. *Reform Open. Up* **4**, 101–102 (2018). (in Chinese)
13. Xia, C.: Perspective and guiding strategy of “empty nest youth” phenomenon. *J. Shanxi Youth Vocat. Coll.* **30**(2), 8–10 (2017). (in Chinese)
14. Chang, J.: What makes empty nest youth’s nest empty—an interpretation of time and space sociology. *Chin. Youth Res.* **5**, 79–83 (2017). (in Chinese)
15. He, S.: Multidimensional interpretation of the “empty nest youth” group. *Chin. Youth Res.* **3**, 40–45 (2017). (in Chinese)
16. Dou, X.: The psychosocial problems of “the empty nest youth” and the counter measures. *Chin. Youth Res.* **2**, 89–95 (2018). (in Chinese)
17. Yang, H.: “Empty nest youth” is a false proposition. *New Compos. Coll. Entr. Exam. Online* **1**, 108 (2017). (in Chinese)
18. Ling, B.: “Empty Nest Youth” becomes stronger in loneliness. *China Labor Secur. News* **9**(2), 1 (2016). (in Chinese)
19. Hu, Y., Qi, B., Zhu, X.: From the “empty nest” mentality to the “cluster” behavior: “empty nest youth” phenomenon perspective and network mapping. *Chin. Youth Res.* **8**, 36–43 (2017). (in Chinese)
20. Li, R.: Incomplete reversal of group: the social connection of “empty nest youth”. *Contemp. Youth Res* **1**, 85–91 (2018). (in Chinese)
21. Zhu, Y., Wang, F.: An isolated island in the city: a study on the relationship network construction of “empty nest youth. *Res. Trans. Competence* **10**, 217–218 (2017). (in Chinese)
22. Huang, S., Li, Q.: Study on the life and mentality of young people living alone in big cities. *Youth Explor.* **4**, 75–87 (2018). (in Chinese)
23. Lin, J., Xian, Y.: Research on the construction of social network model of “empty nest youth” under the “micro age”. *Educ. Fine Arts* **2**, 16–17 (2018). (in Chinese)
24. Zhang, Y.: Freedom or risk: the dual face of “empty nest youth” from the perspective of individualization. *Soc. Sci. Ningxia* **7**(4), 141–146 (2018). (in Chinese)
25. Nie, W., Feng, X.: Empty nest is “hollow”?—Analysis and countermeasures of the living state of “empty nest youth. *Chin. Youth Res.* **8**, 57–63 (2017). (in Chinese)
26. Wang, J.: How to make “empty nest youth” not “hollow”. *Thoughts Public Opini.* **4**, 124–125 (2018). (in Chinese)
27. Bao, H.: From “nest space” to “heart reality”: re-discussing the problem of “empty nest youth” in china in the new era. *Chin. Youth Res.* **4**, 40–46 (2018). (in Chinese)
28. Xie, L.: Talking about the phenomenon of empty nest youth and its guiding method. *Law Soc.* **5**, 142–143 (2018). (in Chinese)
29. Yang, L., Ji, H.: Exploring the problem of solving the problem of empty nest youth. *Res. Trans. Competence* **6**, 230–231 (2017). (in Chinese)
30. NHK Special Program Recording Group: *Missing Society* (2010) (in Japanese)
31. Stahl, S.T., et al.: Living alone and depression: the modifying role of the perceived neighborhood environment. *Aging Mental Health* 1–7 (2016)

32. Haw, C., Hawton, K.: Living alone and deliberate self-harm: a case-control study of characteristics and risk factors. *Soc. Psychiatry Psychiatr. Epidemiol.* **46**(11), 1115–1125 (2011)
33. Aoun, S., Breen, L., Skett, K.: Supporting palliative care clients who live alone: nurses' perspectives on improving quality of care. *Collegian* **23**(1), 13–18 (2016)
34. Yukako, T., et al.: Combined effects of eating alone and living alone on unhealthy dietary behaviors, obesity and underweight in older Japanese adults: results of the JAGES. *Appetite* **95**, 1–8 (2015)
35. Wakako, T., Melissa, K.M.: Spatial, temporal, and health associations of eating alone: a cross-cultural analysis of young adults in urban Australia and Japan. *Appetite* **118**, 149–160 (2017)
36. Sellaeg, K., Chapman, G.E.: Masculinity and food ideals of men who live alone. *Appetite (APPET)* **51**(1), 120–128 (2008)
37. Mashapa, J., Chelule, E., Van Greunen, D., Veldsman, A.: Managing user experience – managing change. In: Kotzé, P., Marsden, G., Lindgaard, G., Wesson, J., Winckler, M. (eds.) *INTERACT 2013*. LNCS, vol. 8118, pp. 660–677. Springer, Heidelberg (2013). https://doi.org/10.1007/978-3-642-40480-1_46
38. Kremer, S., Lindemann, U.: Extracting insights from experience designers to enhance user experience design. In: Marcus, A. (ed.) *DUXU 2016*. LNCS, vol. 9746, pp. 304–313. Springer, Cham (2016). https://doi.org/10.1007/978-3-319-40409-7_29
39. Baumeister, R.F., Leary, M.R.: The need to belong: desire for interpersonal attachments as a fundamental human motivation. *Psychol. Bull.* **117**(3), 497–529 (1995)
40. Epley, N., Schroeder, J.: Mistakenly seeking solitude. *J. Exp. Psychol. Gen.* **143**(5), 1980–1999 (2014)
41. Sandstrom, G.M., Dunn, E.W.: Social interactions and well-being: the surprising power of weak ties. *Pers. Soc. Psychol. Bull.* **40**(7), 910–922 (2014)
42. Giaccardi, E., et al.: Explorations in social interaction design. In: 31st Annual CHI Conference on Human Factors in Computing Systems, pp. 3259–3262. Association for Computing Machinery, Paris (2013)
43. Yamakami, T.: Relationship models of social experience design and user experience design. In: *IEEE International Conference on Computing, Management and Telecommunications*, pp. 36–40. IEEE Computer Society, Shenzhen (2014)
44. Yamakami, T.: From user experience to social experience: a new perspective for mobile social game design. In: *IEEE International Conference on Ubiquitous Intelligence and Computing, UIC 2012 and 9th IEEE International Conference on Autonomic and Trusted Computing, ATC 2012*, pp. 792–796. IEEE Computer Society, Brussels (2012)
45. Yamakami, T.: Exploratory analysis of difference between social experience design and user experience design. In: *16th International Conference on Advanced Communication Technology: Content Centric Network Innovation!*, pp. 769–773. Institute of Electrical and Electronics Engineers Inc., PyeongChang (2014)
46. Yamakami, T.: An evolutionary path-based analysis of social experience design. In: Park, J., Ng, J.K.-Y., Jeong, H.Y., Waluyo, B. (eds.) *Multimedia and Ubiquitous Engineering*. LNEE, vol. 240, pp. 69–76. Springer, Dordrecht (2013). https://doi.org/10.1007/978-94-007-6738-6_9
47. Yamakami, T.: A layered view model of social experience design: beyond single-user user experience. In: Jeong, H.Y., SO, M., Yen, N.Y., Park, J.J. (eds.) *Advances in Computer Science and its Applications*. LNEE, vol. 279, pp. 35–41. Springer, Heidelberg (2014). https://doi.org/10.1007/978-3-642-41674-3_6

48. Lei, T., Zhang, S.: Research on the social experience of mobile internet products. In: Meiselwitz, G. (ed.) SCSM 2017. LNCS, vol. 10282, pp. 84–93. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-58559-8_8
49. Crenshaw, N.: Social experience in world of warcraft: technological and ideological mediations. In: 3rd ACM SIGCHI Annual Symposium on Computer–Human Interaction in Play, pp. 1–4. Association for Computing Machinery, Inc., Texas (2016)
50. Qin, H., Rau, P.-L.P., Gao, S.-F.: The influence of social experience in online games. In: Jacko, Julie A. (ed.) HCI 2011. LNCS, vol. 6764, pp. 688–693. Springer, Heidelberg (2011). https://doi.org/10.1007/978-3-642-21619-0_81
51. Chang, H.-M., Liang, R.-H.: Express yourself: designing interactive products with implicitness to improve social interaction. In: Jacko, Julie A. (ed.) HCI 2011. LNCS, vol. 6763, pp. 175–184. Springer, Heidelberg (2011). https://doi.org/10.1007/978-3-642-21616-9_20
52. Hu, J., Huang, X.: Based on the Experience of Product Interaction Design. In: 2nd International Conference on Intelligent Systems Design and Engineering Applications, pp. 175–180. IEEE Computer Society, Taiwan (2012)
53. Mutlu, B.: An empirical framework for designing social products. In: 6th ACM Conference on Designing Interactive Systems, pp. 341–342. Association for Computing Machinery, PA (2006)
54. Kim, M., Lee, M., Dabbish, L.: Shop-i: gaze based interaction in the physical world for in-store social shopping experience. In: 33rd Annual CHI Conference on Human Factors in Computing Systems, pp. 1253–1258. Association for Computing Machinery, Yonsei University, South Korea (2015)
55. Phang, C., Zhang, C., Sutanto, J.: The influence of user interaction and participation in social media on the consumption intention of niche products. *Inf. Manag.* **50**(8), 661–672 (2013)
56. Shi, Y., Guo, Y., Gong, Z., Yang, B., Zhou, L.: Experience design of social interaction for generation y based on tangible interaction. In: Streitz, N., Markopoulos, P. (eds.) DAPI 2017. LNCS, vol. 10291, pp. 192–202. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-58697-7_14
57. Lee, J.-J.: Culture and co-experience: cultural variation of user experience in social interaction and its implications for interaction design. In: Aykin, N. (ed.) IDGD 2009. LNCS, vol. 5623, pp. 39–48. Springer, Heidelberg (2009). https://doi.org/10.1007/978-3-642-02767-3_5
58. Battarbee, K.: Co-experience: the social user experience. In: Conference on Human Factors in Computing Systems—Proceedings, pp. 730–731. Association for Computing Machinery, Fort Lauderdale (2003)
59. Kappen, D.L., et al.: Exploring social interaction in co-located multiplayer games. In: Conference on Human Factors in Computing Systems—Proceedings, pp. 1119–1124. Association for Computing Machinery, Paris (2013)
60. Chen, K.-T., Lei, C.-L.: Design implications of social interaction in online games. In: Harper, R., Rauterberg, M., Combetto, M. (eds.) ICEC 2006. LNCS, vol. 4161, pp. 318–321. Springer, Heidelberg (2006). https://doi.org/10.1007/11872320_41
61. Emmerich, K., Masuch, M.: The impact of game patterns on player experience and social interaction in co-located multiplayer games. In: CHI PLAY 2017—Proceedings of the Annual Symposium on Computer–Human Interaction in Play, pp. 411–422. Association for Computing Machinery, Inc., Amsterdam (2017)
62. Hu, J., Frens, J., Funk, M., Wang, F., Zhang, Yu.: Design for social interaction in public spaces. In: Rau, P.L.P. (ed.) CCD 2014. LNCS, vol. 8528, pp. 287–298. Springer, Cham (2014). https://doi.org/10.1007/978-3-319-07308-8_28

63. Ludvigsen, M.: Designing for social interaction: an experimental design research project. In: Proceedings of the Conference on Designing Interactive, pp. 348–349. Association for Computing Machinery, Tsukuba (2006)
64. Mora-Guiard, J., et al.: Lands of fog: helping children with autism in social interaction through a full-body interactive experience. In: Proceedings of IDC 2016—The 15th International Conference on Interaction Design and Children, pp. 262–274. Association for Computing Machinery, Inc, Manchester (2016)
65. Oh, S., et al.: Typologies of architectural interaction: a social dimension. In: 2014 Symposium on Simulation for Architecture and Urban Design, SimAUD 2014, Part of the 2014 Summer Simulation Multiconference, pp. 49–56. The Society for Modeling and Simulation International, CA, USA (2014)
66. Paredes, H., Martins, F.M.: Social theatres: a web-based regulated social interaction environment. In: Haake, J.M., Ochoa, S.F., Cechich, A. (eds.) CRIWG 2007. LNCS, vol. 4715, pp. 87–94. Springer, Heidelberg (2007). https://doi.org/10.1007/978-3-540-74812-0_7
67. Hespanhol, L., Dalsgaard, P.: Social interaction design patterns for urban media architecture. In: Abascal, J., Barbosa, S., Fetter, M., Gross, T., Palanque, P., Winckler, M. (eds.) INTERACT 2015. LNCS, vol. 9298, pp. 596–613. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-22698-9_41
68. Del, R.W., et al.: Designing urban furniture through user’s appropriation experience: teaching social interaction design. In: Proceedings of E and DPE 2006, the 8th International Conference on Engineering and Product Design Education, pp. 39–44. The Design Society, Lund (2006)
69. Speranza, P., Keisler, R., Mai, J.V.: Social interaction and cohesion tool: a dynamic design approach for Barcelona’s superilles. In: Proceeding of the 35th Annual Conference of the Association for Computer Aided Design in Architecture, pp. 468–481. ACADIA, Ohio (2015)
70. van Boheemen, T., Hu, J.: Influence of Interactivity on Social Connectedness. In: Meiselwitz, G. (ed.) SCSM 2014. LNCS, vol. 8531, pp. 59–66. Springer, Cham (2014). https://doi.org/10.1007/978-3-319-07632-4_6