Envy Sensitivity on Twitter and Facebook among Japanese Young Adults

Shogoro Yoshida, Osaka University, Japan

Yoshinori Hijikata, Kwansei Gakuin University, Japan

Abstract

Social media such as Facebook and Twitter have grown to be popular communication tools that, ironically, have a negative aspect of increasing users' opportunity to feel envy. In this study, we examine the difference in the envy sensitivity people feel when online using several different social media and offline from social media (Study 1) and the types of people who are sensible to envy (Study 2), analyzing data gathering through questionnaire survey. We target Facebook and Twitter in this survey. As the results, Study 1 shows that people's envy sensitivity differ between offline from social media, on Twitter and on Facebook. Study 2 shows that people's envy sensitivity when on social media differed by their demographic categories. We also find that some types of usage objectives and user actions on social media are correlated with envy sensitivity. We hope that our findings will contribute to understanding the envy on social media and will help people avoid or cope with their envy.

Keywords: envy; social media; demographics; usage objective; user behavior

Social media such as Facebook and Twitter have been widely used in people's daily lives. People can register other users as their friends or follow other users to obtain their updates on social media. They can know how other users spend their lives or what other users are interested in these days. While social media has helped people to know others' information and status updates, it has brought a negative aspect for them to feel unpleasant emotions like stress and depression while using social media (Boyd, 2006; Maier, Laumer, Eckhardt, & Weitzel, 2012; Muise, Christofides, & Desmarais, 2009; O'Keeffe & Clarke-Pearson, 2011).

It is well known that people tend to post their positive events and self-presentational contents on online networks (Ellison, Heino, & Gibbs, 2006), especially on social media (Bazarova, Taft, Choi, & Cosley, 2012; Page, 2012). This might cause people's envy to others while browsing those contents. Envy is a negative feeling felt when people watch other people's success and happiness. Smith and Kim (2007) said that "envy, the unpleasant emotion that can arise when we compare unfavorably with others, is a common experience for most people regardless of culture."

Importance of understanding envy on social media

Many psychologists have conducted studies to understand envy until now. Because envy often appears as a hostile emotion prompting aggressive behaviors such as hating, avoiding, and insulting the targeted person (Foster, 1972; Smith & Kim, 2007), they consider that it is important to examine why people feel envy. An important process of feeling envy is social comparison in which people compare themselves with others for self-assessment (Festinger, 1954). The negative feeling felt in social comparison is envy (Collins, 1996; Alicke & Zell, 2008). In the social comparison process, social relationship with the people targeted by comparison is important (Goethals & Darley, 1977). Concretely, it has been reported that people

tend to compare themselves with those who spend lives similar to theirs (Schaubroeck & Lam 2004; Tesser, 1991). As a result of social comparison process, people feel envy more sensitively toward similar ones than toward others (Parrott, 1991; Smith & Kim, 2007). It has also been reported that people feel envy sensitively if they make a social comparison considering the domain that is important or interesting for them (Tesser, 1991; Smith & Kim, 2007).

Studies about envy on social media have been started recently. The most of them targeted Facebook, which is the most popular social media, in their examination. Chou and Edge (2012) supposed that other users appear happy to many users on Facebook, which might evoke envy on other people. Furthermore, Krasnova, Wenninger, Widjaja, and Buxmann (2013) reported that many users feel stress from the envy they experience from Facebook use and that browsing updates on Facebook with envy negatively correlates with users' life satisfaction. Tandoc, Ferruchi, and Duffy (2015) examined the relationships among Facebook usage frequency, envy, and depression. They also found that browsing updates on Facebook with envy causes depression in the user and that browsing without envy diminishes the user's depression. Panger (2014) examined social comparison on Facebook and Twitter. He clarified that Facebook users do social comparison more frequently than do Twitter users. This result shows that users may feel envy differently between different social media

While many studies have been conducted on envy on Facebook, there exists no study examining envy on other social media as far as we know. In these days, many kinds of social media are used in our lives. More studies about envy should be conducted not only on Facebook but also on other social media, which is important to understand the envy people feel on social media. Although there exists a study on social comparison between Facebook and Twitter, it is unknown that people feel more envy on Facebook than on Twitter. Facebook is a social media

where a user has to ask another user to connect. They cannot be friends on Facebook unless the other user admits the offer. On the contrary, a user on Twitter can make a directed link to another user for checking his/her daily updates. The difference on connecting to people might influence how users feel envy on each social media.

While many studies traditionally had been conducted on envy before social media grew, there exists no study examining how differently people feel envy between on social media and offline from social media. A user can know others' lives in detail and timely from their posts on social media. The words, images, or movies included in the posts may have more reality and impacts than gossip or talk in the real world. A user can also know others' lives on social media even if they live far away or have never been seen by the user. Due to these differences, people feel envy differently between on social media and offline from social media.

As described above, methods of connection with other person differ between Facebook and Twitter. They are also different from the people's connection offline from social media. Due to these differences, the type of people connected with a user might differ between Facebook, Twitter and offline from social media. Type of person targeted by envy might also differ between the three circumstances. As the traditional studies clarified, people tend to feel envy to a specific type of people (Tesser, 1991; Smith & Kim, 2007). This might cause the difference in envy sensitivity between the three circumstances.

In this study, first, we aim to know how differently feel envy between Facebook and Twitter and between on social media and offline from social media (Study 1). To examine this, we analyze how users' envy sensitivity differ between the three circumstances. We also examine the type of people targeted by envy. The people type might derive the reason for the difference in envy sensitivity between the three circumstances.

Research questions in Study 1 are as follows.

- RQ1-1 (Circumstance difference): Does people's envy sensitivity differ between on Facebook, on Twitter and offline from social media?
- RQ1-2 (Target people): Do the people targeted by envy differ between on Facebook, on Twitter and offline from social media?

Estimating users mind through social media

Recently, researchers have conducted studies that aim to estimate a user's mind such as personality and depression through social media. It has been reported that a user's action logs on social media (Facebook and Twitter) can be used to predict the user's personality called Big Five (Golbeck, Robels, & Turner, 2011; Golbeck, Robels, Edmondson, & Turner, 2011). Some researchers have attempted to predict a user's depression from user information or action logs on social media (Park, Lee, Kwak, & Jeong, 2013; De Choudhury, Gamon, Counts, & Hovitz, 2013). De Choudhury et al. (2013) proposed a method for estimating a user's depression using the user's demographic information and action logs on Twitter. Tsugawa et al. (2015) applied De Choudhury et al.'s examination (2013) to Japanese users and predicted users' depressions with an accuracy of approximately 69%, which is as high as De Choudhury et al.'s result.

The successful results on predicting a user's depression and other personality aspects give us a high expectation for predicting users' envy. However, few studies exist that attempt to predict a user's envy. Tandoc et al. (2015) examined the relationship between envy and several types of users' actions on Facebook. They examined the frequency of posts, comments, and "likes" but reported that there exists no relationship between them and users' envy.

In this research, we aim to know what kind of users (in terms of users' information and action logs) feel envy on Facebook, on Twitter, and offline from social media respectively

(Study 2). For this objective, we examine correlations between users' envy sensitivity and demographic information, usage objectives on social media, and actions on social media. Many Internet services obtain user's demographic information (e.g. gender, age, and academic background) when users registering to the services. The information is useful and convenient to estimate envy if demographic information correlates with envy sensitivity. Some studies on social media have categorized users according to the usage objective: keeping touch with others, releasing emotional stress, and so on (Joinson, 2008; Zhao & Rosson, 2009). This might be related to the user's envy sensitivity. Although Tandoc et al. (2015) used limited types of user actions on Facebook, our study broadens types of actions for the investigation (e.g. including sharing and image attachment). Furthermore, we examine not only actions on Facebook but also those on Twitter. Research questions in Study 2 are as follows.

- RQ2-1 (Demographics): What kind of people in terms of demographic features feel envy on Facebook, on Twitter and offline from social media?
- RQ2-2 (Usage objective): What kind of people in terms of usage objectives on social media feel envy on Facebook, on Twitter and offline from social media?
- RQ2-3 (Action tendency): What kind of people in terms of actions on social media feel envy on Facebook, on Twitter and offline from social media?

This study is the first to examine the difference in envy sensitivity between on several social media and offline from social media. We expect that our findings will help other researchers study envy on social media.

METHOD

Participants

We collected 192 participants who answered our questionnaire through a crowdsourcing service. They are users who use both Facebook and Twitter at least once a month. In our questionnaire, in order to identify our participants reliable, we excluded respondents who inconsistently answered two same questions about his/her usage frequency of each social media (Twitter and Facebook respectively).

Our participants included 56.8% males and 43.2% females. The distribution of age was as follows: 1.6% under age 20, 12.5% in their 20s, 44.8% in their 30s, 30.7% in their 40s, 9.4% in their 50s, and 1.0% over 60. In terms of academic background, the ratios of participants with "junior high school," "high school," "junior college," "university," and "graduate school" education were 3.6%, 17.7%, 17.7%, 54.7%, and 6.3%, respectively.

Questionnaire

In this subsection, we explain the items in our questionnaire. First, we give a concrete definition of "offline from social media" in our questionnaire. Next, we show question items used to ask about demographic statuses. Finally, we introduce question items to ask for information necessary to answer our research questions.

Definition of on social media and offline from social media

We target the two most popular social media (Twitter and Facebook) in this study. "On social media" shows the situation in which people use either of these social media. It is more difficult, on the other hand, to define being offline from social media. Major functions on social media include a timeline in which users can read other users' updates (most of the users are

registered friends or followed users [users registered for obtaining their updates]) in one window and tools for open communication through comments or "likes" (indications of intention to tell other users of the user's good feeling). Social media also generally offer other functions like a closed communication tool (direct message) or a news reader. However, some of these functions are implemented in other Internet services or applications like e-mails or short message services. To define "on social media" and "offline from social media" clearly and separately, "offline from social media" in this study does not include any Internet services or applications. In other words, "offline from social media" is a situation in the real world excluding the above two social media and other Internet applications and services.

Demographic features

We used three kinds of demographic features: age, gender, and academic background. The participants gave their ages by selecting from multiple choices: younger than 20 years old, 20s, 30s, 40s, 50s, and older than 60 years old. We did not ask for their exact age in order to maintain their privacy. The participants also provided their academic backgrounds, selecting from multiple choices: "junior high school," "high school," "junior college," "university," and "graduate school." Student participants answered their current school.

Envy Sensitivity

Referring to previous studies (Panger, 2014; Smith, Parrott, Diener, Hoyle, Kim, 1999), we prepared four question items (indicated in Table 1) to measure the participants' envy sensitivity in each circumstance: on Facebook, on Twitter and offline from social media. The question items are composed of two questions about unsuccessfulness and unhappiness through a social comparison process (Q1 and Q2 in Table 1), a question about frequency of feeling envy

(Q3 in Table 1), and a question about intensity of envy (Q4 in Table 1). Therefore, envy sensitivity indicates participants' feeling of envy in terms of not only frequency but also seriousness.

We selected one phrase from the three phrases represented in parenthesis and segmented by slashes in Table 1 according to the target circumstance of the question. The participants were told that "daily life" (words set to evoke in the participant a situation offline from social media) refers to situations in the real world excluding any Internet applications and services.

We asked these items on a 7-point scale from 1 - strongly disagree to 7 - strongly agree. The reason why we used a 7-point scale rather than a 5-point or a 9-point scale is that a 7-point scale is adequate so that answers will distribute to some extent and the participants can respond to each item easily and intuitively. We calculated a total value of answers to the question items for each circumstance in order to measure the participant's envy sensitivity. Envy sensitivity offline from social media, that on Twitter, and that on Facebook are denoted as *OE (offline-envy)*, *TE (Twitter-envy)*, and *FE (Facebook-envy)*, respectively. The three scales (hereinafter, envy sensitivity scales) indicate the degree of envy sensitivity in each circumstance, ranging from 4 to 28.

To verify the reliability of our envy sensitivity scale, we calculated the coefficient alpha, which is an estimate of the reliability of a psychometric test. Table 2 shows the coefficient alpha and fundamental statistics of the *OE*, *TE*, and *FE*. The coefficient alpha was higher than 0.80 for each envy sensitivity scale, which means that our envy sensitivity scales are reliable to measure a certain psychological factor (Cortina, 1993).

People targeted by envy

We prepared questions to ask what kinds of people are likely to be targets of envy offline from social media, on Twitter, and on Facebook. Respondents were told to select the most appropriate choice from prepared answer choices: “family,” “friend (friend of higher familiarity),” “acquaintance (friend of lower familiarity),” “boss,” “colleague,” “subordinate,” “celebrity,” “stranger,” “whoever,” and “others.” We supposed that a boss, colleague, and subordinate would work at the same company (co-worker) with the participant. The reason we segmented co-workers into the above three categories was that envy sensitivity differs by relational age and social status of the target person (Goethals & Darley, 1977; Schaubroeck & Lam, 2004).

Usage objectives on social media

We prepared questions to ask about participants’ usage objectives for Twitter and Facebook. The participants were told to select all appropriate answers from the prepared response options: “keeping touch with others (hereinafter designated as commPeople),” “gathering useful information (getInfo),” “raising visibility of interesting things to others (showInterest),” “seeking help and opinions (seekHelp),” “releasing emotional stress (releaseStress),” “advertising what they have done (adSelf),” “making new friends (makeFriend),” and “others.” These are common choices on both Twitter and Facebook. The usage objectives other than adSelf have been used in some previous works which categorized them (Ellison, Steinfield, & Lampe, 2007; Zhao & Rosson, 2009). We added adSelf because there exist micro-celebrity or self-branding users on social media (Page, 2012).

Actions on social media

To obtain the participants' action tendencies on social media, we asked about the frequency of using basic functions on social media, that of posting specific types of topics, and that of using optional representations in the questionnaire. Questions about the frequency of using basic functions asked about the frequency of "tweeting," "replying," "liking" and "retweeting" for Twitter and of "posting," "commenting," "liking," and "sharing" for Facebook. Questions about the frequency of posting specific types of topics asked about the frequency of posting "positive information about themselves," "negative information about themselves," "neutral (neither positive nor negative) information about themselves," "positive comments about the world (the event or news occurred in the world)," "negative comments about the world," and "neutral comments about the world." Questions about the frequency of using optional representations asked about the frequency of posting a tweet or update with "images," "photos (taken by themselves)," "URLs," "hashtags," and "affective marks and emoticons" (e.g., "!?", ":-)", and ";-(“). Note that "images" do not include photos taken by themselves.

We prepared response options for these questions so that the participants could answer easily and intuitively. In questions about the frequency of using basic functions and of posting specific kinds of topics, the participants were told to select the most appropriate answer from the prepared options: "0 – never," "1 - once every six months," ..., "10 - several times every hour," and "11 - once every 10 minutes." In questions about the frequency of using optional representations, the participants were told to select the most appropriate answer from prepared options: "0 – never," "1 – rarely," "2 – occasionally," "3 – sometimes," "4 – often," "5 – usually," and "6 - almost always."

RESULTS

Study 1

In Study 1, we examine the differences in envy sensitivity (RQ1-1) and people targeted by envy (RQ1-2) between on Facebook, on Twitter, and offline from social media.

RQ1-1: Does people's envy sensitivity differ between on Facebook, on Twitter, and offline from social media?

To answer RQ1-1, we examine (1) whether or not people who feel envy offline from social media feel envy on social media and (2) in which circumstances people have higher envy sensitivity (on Facebook, on Twitter, and offline from social media).

To examine (1), we performed a correlation test between the *OE* and the *TE* and between the *OE* and the *FE*. As a result, each Pearson's correlation coefficient were significantly high (*OE-FE*: $r = .686$, $p < .001$; OE-TE: $r = .732$, $p < .001$; FE-TE: .763, $p < .001$). According to this, people who are likely to feel envy offline from social media also tend to feel envy on social media.

To examine (2), we compared mean values of the *OE*, *TE*, and *FE* performing a Wilcoxon signed rank test. The mean values of the *OE*, *TE*, and *FE* are shown in Table 2. According to the Wilcoxon signed rank test, the differences between each pair among the three were significant ($p < .001$). Therefore, it was found that people feel envy more sensitively offline from social media than on social media. It was also found that envy sensitivity differs by social media. In detail, people are more likely to feel envy on Facebook than on Twitter.

RQ1-2: Do the people targeted by envy differ between on Facebook, on Twitter, and offline from social media?

To answer RQ1-2, we first examine whether the distribution of target people by envy differ between on Facebook, on Twitter, and offline from social media by performing χ^2 test. Next, we perform residual analysis to examine in which of the circumstances a specific type of target people is significantly selected as the people targeted by envy. Residual analysis are generally used in order to which cell in a cross-tabulation is significantly greater or less than its expected value (Haberman & Shelby, 1973). In this analysis, adjusted residuals are generally used in order to easily calculate and compare each significance level between cells. Each adjusted residual is calculated by normalizing the difference between the observed value and the expected value. The significance (p-value of the value) in each cell can be obtained by observing the point corresponding to the value of an adjusted residual in standard normal distribution.

As a result of χ^2 test, a significant difference was observed ($\chi^2 = 61.025$, $p < .001$). According to this, the people targeted by envy differ between on Facebook, on Twitter, and offline from social media. Furthermore, as a result of residual analysis, some kinds of people type were significantly greater or less in any one or two circumstances than in other circumstances. Table 3 shows the number of people who selected the type of target people (indicated as *N*) and adjusted residuals (indicated as *r*). Significantly high or low values are written in a bold font ($|r| > 2.58$: $p < .01$, $|r| > 1.96$: $p < .05$).

The results show that bosses and colleagues are likely to be the targets of envy offline from social media rather than on social media. People tend to feel envy toward acquaintances on Facebook rather than in the other two circumstances. People are likely to feel envy toward celebrities and strangers on Twitter rather than in the other two circumstances.

Study 2

In Study 2, we examine what kinds of people are likely to feel envy in terms of demographic features (RQ2-1), usage objectives on social media (RQ2-2), and actions on social media (RQ2-3).

RQ2-1: What kind of people in terms of demographic features (gender, age, and academic background) feel envy on Facebook, on Twitter, and offline from social media?

To answer RQ2-1, we examine (1) whether or not each demographic feature is related to people's envy sensitivity on Facebook, on Twitter, and offline from social media and (2) which type of people in terms of demographic features are the most likely to feel envy on Facebook, on Twitter, and offline from social media. Table 4 shows the number of people (*N*) in a certain group in terms of demographic features: gender, age, and academic background. The table also shows mean values of the *OE*, *TE*, and *FE* in each demographic feature group. We analyze the envy sensitivity in each group of demographic features below. Table 4 will be referred to in each analysis.

Gender

To examine gender differences, we compared males and females in terms of mean values of the *OE*, *TE*, and *FE* and performed a Mann-Whitney U test. Each mean value is shown in Table 4. From this table, we can see that the *TE* score is higher in males than in females. From the result of the Mann-Whitney U test, the *TE* scores were found to differ significantly between genders ($p < .05$) while no significant difference between genders existed in *OE* and *FE* scores. Therefore, males are more likely to feel envy than are females on Twitter. To know the difference caused by gender in frequency of browsing each social media, we performed a Mann-

Whitney U test on browsing frequency. However, we did not find a statistically significant difference.

Age

To examine whether or not age differences are related to envy sensitivity, we performed a Kruscal-Wallis test among all age groups. As a result, we found a significant difference in *OE*, *TE* and *FE* scores ($p < .05$). This means that age has a relation with envy sensitivity on Facebook, on Twitter, and offline from social media.

According to Table 4, it seems that envy sensitivity in each circumstance becomes lower as the age of the group becomes older. To verify this tendency, we performed correlation analysis using Spearman's rank correlation coefficient (we considered the age group as an ordinal scale). The result shows a significantly negative correlation for each circumstance (*OE*: $r=-.216$, *TE*: $r=-.234$, *FE*: $r=-.274$, $p < .005$). Thus, we can say that younger people are likely to feel envy on Facebook, on Twitter, and offline from social media.

To examine which pair of age groups has a significant difference for envy sensitivity, we performed a Steel-Dwass test. As a result, we found a significant difference in the *TE* and *FE* between 30s and 40s while no difference was found in the *OE*. From these results, we found that older people are less likely to feel envy; in particular, people tend not to feel envy on social media when they approach 40 years old.

Academic background

To examine whether or not the difference in academic background is related to envy sensitivity, we performed a Kruscal-Wallis test among academic background groups. As a result, we found a significant difference between *TE* and *FE* scores ($p < .05$). This means that academic background has a relation with envy sensitivity on social media.

To examine which pair of academic background groups has a significant difference for envy sensitivity, we performed a Steel-Dwass test. As a result, we found a significant difference in *TE* and *FE* scores between junior high school and graduate school while no difference was found in *OE* scores. Envy sensitivity on social media of people who finished graduate school was lower than that of people who graduated only junior high school, which might suggest that well-educated people do not tend to feel envy on social media.

RQ2-2: What kind of people in terms of usage objectives on social media feel envy on Facebook, on Twitter, and offline from social media?

To answer RQ2-2, we examine whether or not envy sensitivity differed between people with a specific usage objective on social media (Twitter or Facebook) (defined as "Yes-group") and people without the usage objective (defined as "No-group"). We perform a Mann-Whitney U test in the *OE*, *TE*, and *FE* scores between the Yes-group and the No-group to see if there was a significant difference in their mean values. Table 5 shows the mean values of the *OE*, *TE*, and *FE* in the two groups (Yes-group and No-group) for a specific usage objective on Twitter and Facebook. It also shows the number of people in each group. Only the results (of usage objective) with significant differences according to the Mann-Whitney U test are shown in the table. (Values with a significant difference are written in a bold font.)

The results of the Mann-Whitney U test were as follows. First, focusing on the results about usage objectives on Twitter, three objectives are related to envy sensitivity. For "commPeople", "releaseStress", and "showInterest", *OE* and *TE* of the Yes-groups are higher than ones of the No-groups. Next, focusing on the results about usage objectives on Facebook, several objectives are related to envy sensitivity. For "commPeople", and "releaseStress", *OE*

and *FE* of the Yes-groups are higher than ones of the No-groups. For "seekHelp", *FE* of the Yes-group are higher than one of the No-group. Thus, the people, who use Twitter to keep in touch with others, to release emotional stress, and to raise visibility of interesting things to others, feel envy more sensitively than other people. The people, who use Facebook to keep in touch with others and to release emotional stress, feel envy more sensitively than other people. The people who use Facebook to seek help and opinions feel envy on Facebook more sensitively than other people.

RQ2-3: What kind of people in terms of actions on social media feel envy on Facebook, on Twitter, and offline from social media?

To answer RQ2-3, we perform correlation analysis of the frequency of action and envy sensitivity on social media and offline from social media. We note that the frequency of each action was correlated with browsing or posting frequency on social media. For example, the frequency of users posting negative information about themselves is considered to bear a proportional relationship to posting frequency (the frequency of all types of posts). Thus, we perform partial correlation analysis controlling for the frequency of "tweets" (for Twitter) or "posts" (for Facebook). The correlation coefficient for each type of action is shown in Table 6. Note that we list only action types with a significant correlation in either the *OE* or the *TE* (*FE*) in this table. Significant correlation coefficients are written in a bold font.

The results were as follows. When we focused on the *OE*, it was significantly correlated with many kinds of actions on both Twitter and Facebook. In actions on Twitter, the frequencies of "tweeting," "replying," "retweeting," "posting negative information about themselves,", "posting neutral information about themselves," "posting negative information about the world,"

"posting images," and "using marks and emoticons" were positively correlated with *OE* scores. In actions on Facebook, while the frequencies of "posting negative information about themselves" and "posting negative information about the world" were positively correlated with *OE* scores, the frequencies of "posting images" and "posting photos" were negatively correlated with *OE* scores.

When we focused on the *TE*, it was significantly correlated with many kinds of actions on Twitter. The frequencies of "replying," "retweeting," "posting negative information about themselves," "posting negative information about the world," "posting images," and "posting marks and emoticons" were positively correlated with *TE* scores. By contrast to the *OE* and *TE*, the *FE* was correlated with only one action. The frequency of "posting negative information about themselves" was positively correlated with *FE* scores.

DISCUSSION

Study 1

In the result for RQ1-2 (target people), more people felt envy toward their bosses and colleagues offline from social media than on social media. It is considered that people meet their bosses and colleagues in the real world because they work together in the same company. They might have similar social status with each other. Furthermore, the colleagues might be almost equal in age. A previous work showed that people feel envy toward people who are similar to them in terms of gender, age, social status, and so on (Goethals & Darley, 1977, Schaubroeck & Lam, 2004). One of the reasons for the result of RQ1-1 (circumstance difference of envy sensitivity: *OE* > *TE*, *OE* > *FE*, and *FE* > *TE*) might be that people targeted by envy offline from social media are those who have a similar position to the user in the real world.

From the result of RQ1-2 (circumstance difference of target people), we found that people on Twitter tend to feel envy toward celebrities or strangers while people on Facebook tend to feel envy toward acquaintances in the real world. Because creating an account using real names is recommended on Facebook (2015), the service is mainly used for communicating with people known in the real world (Joinson, 2008). On the other hand, it is reported that Twitter is used by many anonymous users and used not only as a communication tool but also as an information acquisition tool (Peddinti, Ross, & Cappos, 2014; Kwak, Park, & Moon, 2010; Wu, Hofman, Mason, & Watts, 2011). Users seem to browse not only tweets of their real-world friends but also those of their favorite celebrities and strangers with common interests for acquiring information. These difference of characteristics might be among the reasons for the above findings.

Study 2

From the result of RQ2-1 (demographics), we found that older people tended to feel less envy in each circumstance. It has been reported that children and adolescents tend to feel more depression on Facebook than adults (O'Keeffe & Clarke-Pearson, 2011). The fact that young people tend to feel envy more sensitively might be a reason for the high probability of Facebook depression in young people. Another finding from the results of RQ2-1 (demographics) is that people whose academic background was junior high school felt envy more sensitively on social media than people who completed graduate school. On the other hand, there was no correlation between academic background and envy sensitivity offline from social media. People who graduated only junior high school might have less income and lower social position (Griliches & Mason, 1972) than others. Social media let them see lifestyles or achievements of people with high income or social position. This might cause their envy on social media.

From the result of RQ2-2 (usage objective), we found that people's envy sensitivity was related to usage objectives on social media. In detail, people who used social media to keep in touch with others felt envy more sensitively than other people. People with this objective might have more occasions to see the daily events of their real-world friends or acquaintances on social media. Because they were similar in social position and age to the target individuals, the people felt envy more sensitively. We also found that people who used social media to raise visibility of interesting things to others and releasing emotional stress felt envy more sensitively than other people. We think that the reasons for the above discovery lie in the intensity of people's psychological factors, such as neuroticism, narcissism, and esteem-needs, which are reported to be related to envy sensitivity (Foster, 1972; Kernberg, 1985; Smith & Kim, 2007). People whose objectives are to raise visibility of interesting things to others might be narcissistic and have high esteem needs. People whose objectives are to release emotional stress might feel stressed more sensitively than other people. It has been reported that many users feel stress from their envy obtained through social media (Krasnova et al., 2013). This might be correlated with neuroticism.

From the result of RQ2-3 (action tendency), we found that envy sensitivity on Twitter and that offline from social media were correlated with actions on Twitter. This is consistent with previous works showing that actions on social media can be used to predict a human's mind (Golbeck et al., 2011a; Golbeck et al., 2011b; Tsugawa et al., 2015). In our result, a user who frequently tweeted (only for offline from social media), replied, and retweeted felt envy more sensitively on Twitter and offline from social media. One of the reasons for this result might be the intensity of a user's esteem needs. In another result, a user who frequently posted a tweet with negative content about the user felt envy more sensitively on Twitter and offline from social

media. This result is considered to be caused by the intensity of neuroticism. As we mentioned before, inferiority and neuroticism are related to envy sensitivity.

While envy sensitivity on Twitter was correlated with actions on Twitter, we could not find the correlation between actions and envy sensitivity on Facebook. This result is consistent with Tandoc et al.'s results (2015). It is suggested that people tend to hide their envy because envious people are likely to be disliked (Smith & Kim, 2007). Because more people use Facebook rather than Twitter to communicate with their friends, people might hide their envy more carefully not to be disliked by their friends. Further investigation about this is required.

Limitation

Several limitations exist in our study. The first is that we used a crowdsourcing service to conduct a questionnaire survey. This was to prevent biases in user demographics. However, we are not sure whether the demographic distributions of the participants in this study coincide with those of general Twitter (or Facebook) users. In particular, we could not obtain users under 18, because they cannot participate in crowdsourcing services. Examination of younger people is work for the future. The participants in this study were all Japanese. Although envy is an emotion anyone feels despite culture (Foster, 1972; Schoeck, 1969), a difference might exist in how users feel envy on social media among cultures; it has been reported that there is a difference between nations or regions in how social media is used (Garcia-Gavilanes, Quercia, & Jaimes 2013). Thus, we need to conduct the same examination with people who live outside of Japan.

The second limitation is that we adopted a multiple-choice test in which participants answer each question item by selecting from several choices. This is to mitigate the participants' efforts in answering. However, it is difficult to obtain an unexpected answer in a multiple-choice

test. We might have obtained surprising tendencies if we had conducted a questionnaire survey in a free description format. In our survey, we did not ask participants for their account information because we cared about their privacy. Instead, we directly asked them about their action tendencies on social media. If we obtained the users' account information, we could obtain their real action logs. This would allow us to conduct a fine-grained analysis of the relationship between their envy sensitivity and actions.

The last limitation is that we targeted only Facebook and Twitter for the examination. Examination of other social media might give us further discoveries on envy. For example, Instagram and Flickr are social media on which users' posts are images with a few words. LinkedIn is designed for business communication. Users' behaviors and envy sensitivity in these services might differ from those on Facebook and Twitter. Examining the envy on social media other than Twitter and Facebook is work for the future.

Conclusion

In this study, we examined the difference in people's envy sensitivity felt on Facebook, on Twitter, and offline from social media (Study 1) and the types of people who are sensible to envy (Study 2). The results of Study 1 showed that people's envy sensitivity differed between on social media and offline from social media and between Twitter and Facebook. The results of Study 2 showed that people's envy sensitivity on social media differed by their demographic categories. We also found that some types of usage objectives on social media were correlated with envy sensitivity. Finally, we found that people who frequently performed some types of actions (e.g., tweeting, replying, and retweeting) on Twitter tended to feel envy sensitively on Twitter or offline from social media.

We hope that our findings will promote a greater understanding of people's envy felt on social media and will help people avoid or cope with their envy. Our current study did not develop a method for predicting users sensible to envy and a tool that gives a warning to users about the risk of envy. We need to verify the prediction ability of the features found in this study and the influence of the risk indication of envy to users in our future work.

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Endnotes

Table 1

Question items to ask for envy sensitivity. When we perform a questionnaire, one of the phrases in parentheses is selected according to the situation (offline from social media, online with Twitter, and online with Facebook).

#	Question Item	Answer choices
Q1	My friends (in my daily life / on Twitter / on Facebook) look happier than me and enjoy successful lives.	1 - strongly disagree 2 - disagree 3 - weakly disagree 4 - neither agree nor disagree 5 - weakly agree 6 - agree 7 - strongly agree
Q2	What I watch (in my daily life / on Twitter / on Facebook) reminds me that I'm not as happy as others.	
Q3	I feel envy every time (in my daily life / on Twitter / on Facebook).	
Q4	Feelings of envy (in my daily life / on Twitter / on Facebook) constantly torment me.	

Table 2

The mean, standard deviation, variance, and coefficient alphas of the OE, TE, and FE.

	Mean	**S.D.**	**Coefficient α**
OE	17.75	4.76	.86
TE	15.65	6.35	.94
FE	16.58	6.62	.94

Table 3

The number of answers on target people (N) about whom users feel envy and an adjusted residuals (r) obtained in residual analysis.

	Offline from social media		**Twitter**		**Facebook**	
Target people	*N*	*R*	*N*	*r*	*N*	*R*
Family	6	1.5	1	-1.7	4	0.2
Friend	40	-0.6	40	-0.6	48	1.1
Acquaintance	35	1.3	**16**	-3.3**	**38**	2.0*
Boss	**10**	2.5*	2	-1.8	4	-1.1
Colleague	**31**	2.5*	**14**	-2.2*	21	-0.3
Subordinate	8	1.7	4	-0.6	3	-1.1
Celebrity	20	-0.4	**30**	2.4*	**14**	-2.1*
Stranger	**4**	-2.5*	**21**	4.2**	6	-1.7
Whoever	27	-1.4	41	1.9	31	-0.5
The others	**11**	-2.4*	23	1.2	23	1.2

(**bold fonts**: *p > .05 or **p > .01)

Table 4

The number of people (N) and the mean value of each envy sensitivity scale (OE, TE, and FE) for each demographic feature, such as gender, age, and academic background.

	N	***OE***	***TE***	***FE***
Gender				
male	109	17.99	16.54	16.60
female	83	17.43	14.47	16.55
Age				
- 20	3	19.33	20.00	19.67
20 - 29	24	18.29	16.46	17.50
30 - 39	86	18.71	17.17	18.37
40 - 49	59	16.70	13.63	14.36
50 - 59	18	15.94	13.33	13.89
60 -	2	15.00	14.00	14.00
Academic background				
junior high school	7	16.00	23.00	23.29
high school	34	18.27	15.15	16.06
junior college	34	19.27	15.77	17.62
university	105	17.48	15.73	16.41
Graduate school	12	15.42	11.67	12.75

Table 5

Envy sensitivity for the group of people with a specific usage objective on social media (Yes-group) and the group of people without the usage objective on social media (No-group).

		OE		**TE**	
Usage objective on Twitter	*N of Yes-group*	Yes-group	No-group	Yes-group	No-group
commPeople	57	**19.19**	**17.19**	**18.07**	**14.70**
releaseStress	47	**19.25**	**17.26**	**18.38**	**14.76**
showInterest	67	**18.84**	**17.17**	**17.66**	**14.57**
		OE		**FE**	
Usage objective on Facebook	*N of Yes-group*	Yes-group	No-group	Yes-group	No-group
commPeople	116	**18.44**	**16.70**	**17.82**	**14.70**
releaseStress	31	**20.06**	**17.30**	**19.58**	**16.01**
seekHelp	15	18.81	17.66	**20.33**	**16.27**

(**Bold font:** Yes-group and No-group **differ** significantly, $p < .05$)

Table 6

Partial correlation coefficients across action types and envy sensitivity. Due to space limitations, the phrase ``information about'' is omitted for some action types.

Action on Twitter	OE	TE
tweet	**.161***	.095
reply	**.195****	**.220****
retweet	**.201****	**.185****
negative ... themselves	**.203****	**.161***
neutral ... themselves	**.152***	.130
negative ... the world	.087	**.142***
images	-.004	**.170***
mark and emoticon	.071	**.162***
Action on Facebook	**OE**	**FE**
post	.137	.057
share	**.142***	.074
negative ... themselves	**.202****	**.200****
negative ... the world	.111	.141
images	**-.147***	-.130
photos	**-.177***	-.113
hashtag	.090	.067

(*p < .05, **p < .01)

Bios of the authors

Shogoro Yoshida was born in Kumamoto, Japan. He received the B.E. and M.E. degrees from Osaka University in 2015 and 2017, respectively. In 2017, he joined Yahoo Japan Corporation. While in school, he studied user mind and user behavior on the Web, especially on social media.

Yoshinori Hijikata was born in Kobe, Japan. He received the B.E. and M.E. degrees from Osaka University in 1996 and 1998, respectively. In 1998, he joined IBM Research, Tokyo Research Laboratory. After working on Web technologies there, he received Ph.D. degree from Osaka University in 2002. He was assistant professor in Osaka University from 2002 to 2007 and associate professor there from 2007 to 2017. He visited University of Minnesota, GroupLens Research as a visiting researcher in 2014. Currently, he is associate professor in Kwansei Gakuin University. His research interests are on social computing, data mining, and social psychology. He received the best paper awards from ACM IUI'06, IPSJ Interaction'05, Interaction'13, WebDB'11, WebDB'12, and WebDB'13. He also received IPSJ Yamashita SIG Research Award in 2013. He is a member of the IPSJ, IEICE, JSAI, HIS and DBSJ.