

## REGISTERED REPORT

# Objectification and facial emotion recognition: The moderating roles of loneliness and depression

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## Abstract

People are occasionally regarded or treated in ways similar to tools or objects (objectification). Previous research shows that experiencing objectification leads to detrimental interpersonal and psychological consequences. However, it remains unclear whether objectification influences a core interpersonal ability, facial emotion recognition. We conducted two preregistered studies to examine the relationship between objectification and emotion recognition accuracy. In Study 1, 265 participants completed a facial emotion recognition task and well-validated measures of daily objectification experiences, as well as depression and loneliness. Results revealed that daily objectification experiences were negatively associated with emotion recognition accuracy. Depression and loneliness moderated this relationship. Individuals with higher depressive symptoms exhibited a stronger negative association between objectification and emotion recognition accuracy. In contrast, individuals with higher loneliness showed increased emotion recognition accuracy as objectification increased, whereas those with lower loneliness showed decreased accuracy. In Study 2, 188 participants' situational feelings of objectification were experimentally manipulated. The manipulation successfully increased self-reported feelings of objectification, but the results did not provide evidence for the predicted causal effect of objectification on emotion recognition accuracy, nor for the predicted moderating effects of loneliness and depression. Taken together, these findings provide correlational but not causal support for the hypothesized relationship.

## KEYWORDS

depression, emotion recognition, loneliness, objectification

[Correction added on 24 September 2026, after first online publication: The copyright line was changed.]

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People are occasionally regarded or treated in ways similar to tools or objects (objectification; Nussbaum, 1995). For instance, in the context of online services, individuals can be easily evaluated and rated by customers. Similarly, on dating apps, people are often judged primarily by their appearance rather than their personality or other qualities (Smith et al., 2025). Additionally, in the workplace, workers are increasingly valued based on their utility in achieving a goal (Andrighetto et al., 2017). Opportunities for objectification are more prevalent in these contexts than in many other contexts (Belmi & Schroeder, 2021). Such external objectification can also lead individuals to perceive themselves in object-like ways. These observations raise an important question about the psychological consequences of being treated as objects, particularly regarding social interactions and relationships.

Objectification is defined as being seen and treated as an object (Nussbaum, 1995). People can be objectified in one or more of the following seven ways: instrumentality (being treated as a tool for another's purposes), denial of autonomy (being perceived as lacking independence and self-determination), inertness (being seen as lacking agency or activity), fungibility (being treated as interchangeable with other objects), violability (being regarded as lacking boundary integrity and therefore violable), ownership (being treated as something that is owned) and denial of subjectivity (being viewed as someone whose experiences and feelings need not be considered) (Nussbaum, 1995). Langton (2009) further expanded this framework by introducing three additional dimensions: reduction to body (being identified solely with one's body or body parts), reduction to appearance (being evaluated primarily based on physical appearance) and silencing (being perceived as lacking a voice). In summary, objectification involves valuing certain characteristics of the objectified person while ignoring other essential aspects, such as emotions, will and humanity. While the concept has primarily been explored in the context of the sexual objectification of women (Bernard et al., 2018), it also relates to a wide range of societal issues, including workplace dynamics (Belmi & Schroeder, 2021) and social and psychological well-being (Cheng et al., 2022; Sáez et al., 2019).

Objectification has various psychological consequences for the objectified person, including significant effects on social functioning. Notably, research consistently shows that experiencing objectification alters one's self-perception in terms of humanity (Baldissarri & Andrighetto, 2021; Holland et al., 2017; Loughnan et al., 2017). For example, individuals who recall being objectified tend to perceive themselves as less warm, competent and human. In other words, objectified individuals come to see themselves as more object-like, a phenomenon known as self-objectification (Loughnan et al., 2017). Additionally, those who experience sexual objectification are more likely to enter a state of self-objectification (Holland et al., 2017). Previous research has primarily focused on the intrapersonal psychological distress caused by self-objectification. According to objectification theory, self-objectification is linked to mental health issues such as shame, anxiety and depression (Fredrickson & Roberts, 1997). Indeed, empirical studies have consistently demonstrated an association between self-objectification and negative emotions, including anxiety, shame and depression (Gapinski, 2003; for a review, see Jones & Griffiths, 2015; Tiggemann & Boundy, 2008). However, despite extensive research on intrapersonal consequences, relatively little attention has been paid to its interpersonal effects. In particular, it has been shown that self-objectification also contributes to interpersonal distress, especially loneliness. Studies have found that individuals who engage in self-objectification by focusing on their physical appearance report higher levels of loneliness than those who do not (Teng et al., 2019). Furthermore, objectified individuals are more likely to distance themselves from others (Teng et al., 2015). These findings suggest that objectification not only affects individual psychological well-being but also plays a role in shaping social interactions. Specifically, self-objectification has been associated with avoidance of social relationships and difficulties in maintaining positive connections with others (Terán et al., 2021). Moreover, it is linked to decreased feelings of comfort and authenticity in their social interactions (Garcia et al., 2016). However, to our knowledge, no prior study has addressed the influence of objectifying experiences on more fundamental psychological processes involved in social interactions, specifically emotion recognition. Therefore, we addressed this issue in the current research.

Emotion recognition, namely, the ability to identify others' facial expressions, is a crucial aspect of social interaction and may be influenced by objectification. The ability to recognize emotions is strongly

related to interpersonal well-being (Carton et al., 1999; Nowicki & Duke, 1992) and is necessary to maintain social relationships. As discussed earlier, since self-objectification is associated with difficulties in social interactions (Garcia et al., 2016; Terán et al., 2021), it may also be linked to difficulties in emotion recognition. Furthermore, self-objectification has been linked to negative emotions such as anxiety, shame and depression, which may in turn affect emotion recognition. For instance, individuals with high social anxiety tend to exhibit interpretive bias towards facial expressions, being more likely to misclassify neutral or ambiguous faces as threatening (Bell et al., 2011; Heuer et al., 2010). Similarly, people with depression show impairments in recognizing facial expressions compared to those without depression (Csukly et al., 2009). More specifically, depressed individuals exhibit greater sensitivity to sad faces, a bias towards misattributing other expressions as sad, and reduced sensitivity to happy faces (Joormann & Gotlib, 2006). Taken together, these findings suggest that objectification may lead to difficulties in emotion recognition, and that these difficulties may vary across different types of emotions. Based on this reasoning, we propose the following hypothesis:

**Hypothesis 1.** *Objectified experiences are negatively correlated with emotion recognition accuracy.*

Furthermore, if there is a link between objectification and emotion recognition, moderating roles of individual differences, such as states of loneliness and depression, need to be considered. Although loneliness and depression share similar functions and conceptual features (Cacioppo et al., 2006), they may play distinct roles. From an evolutionary perspective, loneliness serves to motivate individuals to form or restore social connections and to strengthen social ties for survival (Cacioppo et al., 2014). In particular, previous studies have consistently highlighted the relationship between loneliness and hypervigilance to social threats. Lonely individuals tend to perceive the social world as a more threatening place, characterized by negative interactions, and this cognitive bias makes them hypervigilant to negative social information as a means of survival (Cacioppo et al., 2016; Hawkey & Cacioppo, 2010). For example, loneliness has been associated with heightened sensitivity in recognizing sad and fearful faces (Vanhalst et al., 2017). In line with this, the Social Monitoring System model suggests that people have a psychological function regulating their social connections to meet their needs to belong (Gardner et al., 2005). If this social monitoring system activates when lacking social connections, people are more attentive to social cues and better at decoding social cues. Experiencing objectification has been shown to induce feelings of ostracism (Dvir et al., 2021), and individuals who feel ostracized or have a heightened need to belong tend to exhibit greater accuracy in emotion recognition (Gardner et al., 2005; Pickett et al., 2004; Saito et al., 2020). From this perspective, the role of objectification may differ for lonely individuals. If objectification is linked to loneliness, it may activate the social monitoring system and increase attentiveness to other social signals, which may in turn enhance rather than impair emotion recognition accuracy. Based on these considerations, we propose the second hypothesis:

**Hypothesis 2.** *Loneliness will moderate the relationship between objectification and emotion recognition accuracy, with higher loneliness increasing accuracy.*

In contrast to loneliness, objectification may particularly impair emotion recognition accuracy, particularly among individuals with depression. Depression is typically associated with emotion regulation deficits and a tendency towards rumination in response to negative mood states and life events, which can exacerbate depression symptoms (Joormann & Gotlib, 2010). Such emotion regulation difficulties and cognitive biases may render individuals with depressive symptoms especially vulnerable to the psychological consequences of objectification. Empirical research has consistently demonstrated an association between depression and impairment in emotion recognition, with the severity of such impairments correlating with the intensity of depressive symptoms (Dalili et al., 2015; Porter-Vignola et al., 2021; for a review, see Krause et al., 2021). Objectification is also associated with interpersonal distancing (Terán et al., 2021), likely reducing motivation for processing social cues. For individuals with depression, who already tend to avoid social stimuli

(Hammen, 2005), these effects may compound, yielding larger decrements in identifying others' expressions. Taken together, depressive mood may act as a moderating factor in the relationship between objectification and emotion recognition. Specifically, individuals experiencing higher levels of depressive mood may exhibit greater impairments in emotion recognition following experiences of objectification.

**Hypothesis 3.** *Depressive mood will moderate the relationship between objectification and emotion recognition, such that higher levels of depressive mood strengthen the negative association between the two constructs.*

Furthermore, if loneliness and depression play moderating roles in the relationship between objectification and emotion recognition, the magnitude of these relationships may vary across different types of emotions. For example, previous studies have consistently reported that loneliness led people to be hypervigilant to negative emotions, especially sad and fearful faces (Vanhalst et al., 2017). As mentioned above, individuals with depression show increased sensitivity to sad faces but decreased sensitivity to happy faces (Joormann & Gotlib, 2006). Indeed, loneliness and depression show distinct patterns of associations with emotion recognition: Loneliness is associated with increased accuracy for sad faces, whereas depression is linked to decreased accuracy for happy faces (Cheeta et al., 2021). Therefore, the moderating effects of loneliness and depression on the relationship between objectification and emotion recognition may vary depending on the type of emotion. To explore this possibility, we conducted separate analyses for each emotion.

This research aimed to examine the relationship between objectified experiences and emotion recognition accuracy. Furthermore, we examined the moderating effects of loneliness and depression. In the first study (Study 1), we examined the relationship between daily objectification experiences and emotion recognition accuracy, and the moderating roles of depression and loneliness in this relationship. In a preregistered follow-up experiment (Study 2), we experimentally induced situational feelings of objectification and subsequently assessed participants' emotion recognition accuracy.

## STUDY 1

In Study 1, we examined whether daily experiences of being objectified were linked with emotion recognition accuracy.

## Method

### Participants

We sought to recruit as many participants as possible within our resource constraints, and ultimately settled on a sample size of 300. We recruited 300 participants (131 women, 166 men, three preferred not to disclose; mean age, 42.21; *SD* of age, 9.92) through CrowdWorks (<https://crowdworks.jp>), a crowdsourcing website in Japan. They were compensated with a small amount of money for their participation. We excluded 35 participants who failed to complete attention checks. Thus, we analysed data from 265 participants (117 women, 145 men, three preferred not to disclose; mean age, 42.24; *SD* of age, 9.80) in the current study. The study was approved by the ethics committee of Waseda University and conducted in accordance with the Declaration of Helsinki. Sensitivity power analysis conducted in G\*Power indicated that, for a sample size of 265, the minimum detectable effect size was  $f^2=0.032$  in the simple regression analysis and  $f^2=0.071$  in the multiple regression analysis, with  $\alpha=.05$  and power  $(1 - \beta)=.90$ .

## Facial emotion recognition task

The facial emotion recognition task was based on a previous study (Treeby et al., 2016). For the task, we used Asian face images from the Tsinghua Facial Expression Database (Yang et al., 2020). The facial images were from two male and two female models (IDs of the models: Y6F, Y14F, Y8M and Y16M). There were five types of facial images, happy, angry, fearful, sad and neutral faces. To create the emotional face space, we morphed emotional expressions and neutral faces from identical models with morphing software (Abrosoft FantaMorph; [www.fantamorph.com](http://www.fantamorph.com)). There were five levels of morphing from neutral to emotional faces, 20%, 40%, 60%, 80% and 100%. Therefore, we used 80 images of static emotional faces in total, 4 models  $\times$  4 expressions  $\times$  5 levels of morphing degree. In the task, after seeing a fixation point for 500 ms, participants saw one of the facial stimuli as long as they wanted and they indicated which emotion was expressed by the face by clicking an option from five potential options, 'happy', 'angry', 'fearful', 'sad' and 'don't know'. Participants saw all stimuli in a random order. In total, they made their choices 80 times with a short break in the middle of the task.

## Questionnaires

### *Daily objectification experiences*

We adopted the objectification scale developed in a previous study (Belmi & Schroeder, 2021). The scale consists of seven items capturing all seven components of objectification, instrumentality, denial of autonomy, fungibility, violability, ownership, denial of subjectivity, inertness (Nussbaum, 1995). These items were originally designed to assess respondents' perceptions of objectification towards a target such as "This organization seems like the type of organization that values employees primarily on what they can do" [instrumentality]. Therefore, we modified them to assess participants' daily experiences of objectification: (1) 'Others value me primarily on what I can do for them', (2) 'others restrict my independence' [denial of autonomy], (3) 'Others treat me as though I am replaceable' [fungibility], (4) 'Others push me to do something even if I am not physically well' [violability], (5) 'Others treat me as if they own me' [ownership], (6) 'Others do not genuinely care about my thoughts and feelings' [denial of subjectivity], (7) 'Others are not responsive to me' [inertness]. Participants answered how often they experienced those events in the last 2 weeks on a seven-point Likert scale from 1 = never to 7 = always. We averaged the answers from participants as the degree of experienced objectification. The score ranged from 1 to 7.

### *Loneliness*

To measure participants' degree of loneliness, we used the UCLA Loneliness Scale (Russell, 1996). The UCLA Loneliness Scale was designed for measuring the degree of loneliness and consisted of 20 questions such as 'How often do you feel left out?'. Respondents answered those questions with a four-point Likert Scale: 1 = never to 4 = always. The mean score of each participant was used as the degree of loneliness, with possible values ranging from 1 to 4.

### *Depression*

To measure participants' severity of depression, we used the second version of the Beck Depression Inventory (BDI-II) (Beck et al., 2011). The BDI-II was designed for measuring the severity of depression and consisted of 21 groups of items such as 'I do not feel sad', 'I feel sad', 'I am sad all the time and I can't snap out of it', 'I am so sad or unhappy that I can't stand it'. Respondents chose the item that best matched their current situation from each group. A value of 0 to 3 is assigned for each item and the total score was used as the severity of depression. The score ranged from 0 to 63.

## Procedure

After consenting to participate, the participants answered an attention check question based on a previous study (Oppenheimer et al., 2009). In particular, participants were asked to ignore the standard response format, which required them to select listed activities they usually do (e.g., skiing, swimming, tennis), with an ‘other’ option that included a blank box for specifying additional activities. Instead of responding in this way, they were instructed to confirm that they had read the instructions by selecting the ‘other’ option and typing ‘confirmed’ in the box. Participants completed the facial emotion recognition task for about 15 min. Then, participants answered three questionnaires, the experiences of daily objectification questionnaire, the BDI-II and the UCLA Loneliness Scale. The order of questionnaires was randomized among participants. Finally, participants answered their demographic information, age and sex. Aside from the randomized order of questionnaires, the overall procedure—attention check, emotion recognition task, questionnaires and demographic questions—was fixed.

## Statistical analysis

In the emotion recognition task, participants received a score of 1 for each correct response and 0 for each incorrect response. Then, we averaged the numbers from each participant and treated the number as the participant's emotion recognition accuracy.

Firstly, we conducted a regression analysis with the degree of objectification experience as an independent variable and emotion recognition accuracy as a dependent variable to examine the relationship between objectification experience and emotion recognition accuracy. Then, we conducted multiple regression analysis with degrees of objectification, loneliness and depression, and those interactions as independent variables and the accuracy of emotion recognition as a dependent variable. When we included interaction terms into the model, we centred all variables around their respective means. If we found a significant interaction among variables, we conducted simple slope analyses to interpret the interaction.

All analyses were performed in R software (R Core Team, 2021). For simple slope analyses, we used the package *interactions* (Long, 2019). All data and scripts for the analysis are publicly available via OSF and can be accessed at <https://doi.org/10.17605/OSF.IO/SVFEH>. We report how we determined our sample size, all data exclusions, all manipulations and all measures in the study.

## Results

### Emotion recognition accuracy

Overall emotion recognition accuracy across participants was 71.15% ( $SD=8.45$ ). The mean accuracies for each emotion were as follows: Anger, 73.00% ( $SD=13.60$ ); fear, 62.24% ( $SD=16.04$ ); sadness, 67.43% ( $SD=14.34$ ) and happiness, 81.92% ( $SD=10.71$ ). A within-participant ANOVA revealed that accuracy significantly differed across expressions ( $F(2.86, 754.64)=118.269, p<.001, \eta_p^2=.31$ ). Accuracy was highest for happiness, followed by anger, sadness and fear.

### Emotion recognition and objectification

The simple regression analysis indicated that emotion recognition accuracy decreased as objectification experiences increased (Figure 1,  $\beta=-.14, t(263)=-2.37, p=.018$ ). Although statistically significant, the effect was small, with objectification experiences accounting for approximately 2% of the variance in emotion recognition accuracy. Table 1 represents correlations among measured variables.

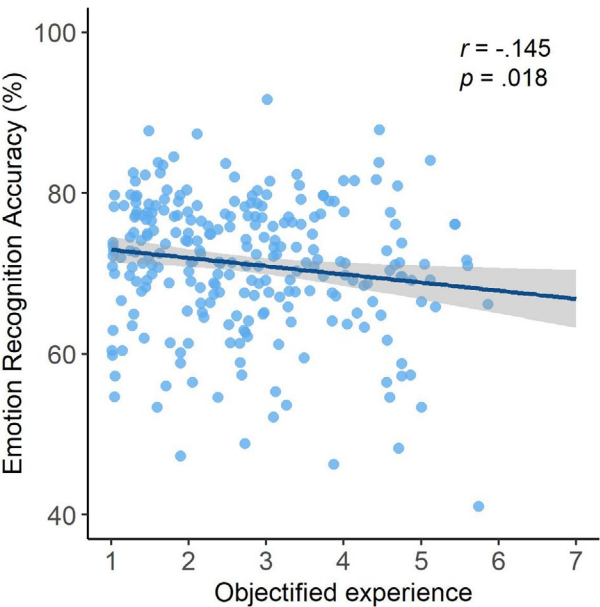


**FIGURE 1** Relationship between emotion recognition accuracy and the objectification experience. Each point represents each participant. The points were jittered. The solid line represents the regression line. The transparent grey area represents the 95% confidence intervals. The coefficient of determination ( $R^2$ ) was .021.

**TABLE 1** Correlations among variables.

|                      | Objectification | Loneliness | Depression | Recognition accuracy |
|----------------------|-----------------|------------|------------|----------------------|
| Objectification      | -               |            |            |                      |
| Loneliness           | 0.487**         | -          |            |                      |
| Depression           | 0.482**         | 0.662**    | -          |                      |
| Recognition Accuracy | -0.145*         | -0.077     | -0.152*    | -                    |

Note: Values are Pearson's correlation coefficients. \* $p < .05$ , \*\* $p < .01$ .

Subsequently, we conducted a multiple regression analysis to examine whether loneliness and depression moderated the relationship between objectification and emotion recognition accuracy. The model indicated that all Variance Inflation Factors (VIFs) were below 4.00 [2.07–3.52], which is below the customary cutoff (5) for high multicollinearity (James et al., 2017). The multiple regression analysis revealed the significant interactions between loneliness and objectified experience, and depression and objectified experience (Table 2). This means that loneliness and depression moderated the relationship between objectified experience and emotion recognition accuracy. The standardized interaction effects were  $\beta = -.37$  for depression and  $\beta = .37$  for loneliness, with corresponding partial  $R^2$  values of approximately .05 and .06, respectively. These results indicate modest moderation effects. Post-hoc analyses for interpreting each interaction indicated that the effect of objectified experience on emotion recognition depended on levels of loneliness and depression (Figure 2). In particular, among people with higher levels of loneliness, emotion recognition accuracy was positively correlated with experiences of objectification ( $b = 0.018$ , 95% CI = [.004, .033],  $t(257) = 2.45$ ,  $p = .015$ ). However, among those with lower levels of loneliness, emotion recognition accuracy was negatively correlated with objectification experiences ( $b = -0.035$ , 95% CI = [-.055, -.016],  $t(257) = -3.59$ ,  $p < .001$ ). Regarding depression, people with higher levels of depression, emotion recognition accuracy decreased as objectification experiences increased ( $b = -0.032$ , 95% CI = [-.051, -.014],  $t(257) = -3.51$ ,  $p < .001$ ). However, objectification experiences did not significantly predict emotion recognition accuracy in those with lower levels of depression

TABLE 2 Summary of the multiple regression analysis.

| Variables                                 | <i>b</i> | SE  | <i>t</i> | $\beta$ | <i>p</i> |
|-------------------------------------------|----------|-----|----------|---------|----------|
| Intercept                                 | 0.72     | .01 | 107.09   |         | <.001*** |
| Objectification                           | −0.01    | .01 | −1.49    | −.13    | .138     |
| Depression                                | 0.00     | .00 | 0.73     | .08     | .463     |
| Loneliness                                | 0.01     | .01 | 0.58     | .06     | .562     |
| Objectification × depression              | 0.00     | .00 | −3.72    | −.37    | <.001*** |
| Objectification × loneliness              | 0.04     | .01 | 4.07     | .37     | <.001*** |
| Depression × loneliness                   | 0.00     | .00 | −1.92    | −.17    | .056     |
| Objectification × depression × loneliness | 0.00     | .00 | −0.42    | −.04    | .677     |

Note: SE refers to the standard error. *b* refers to unstandardized coefficients and  $\beta$  refers to standardized coefficients. The adjusted coefficient of determination ( $R^2$ ) is .096.

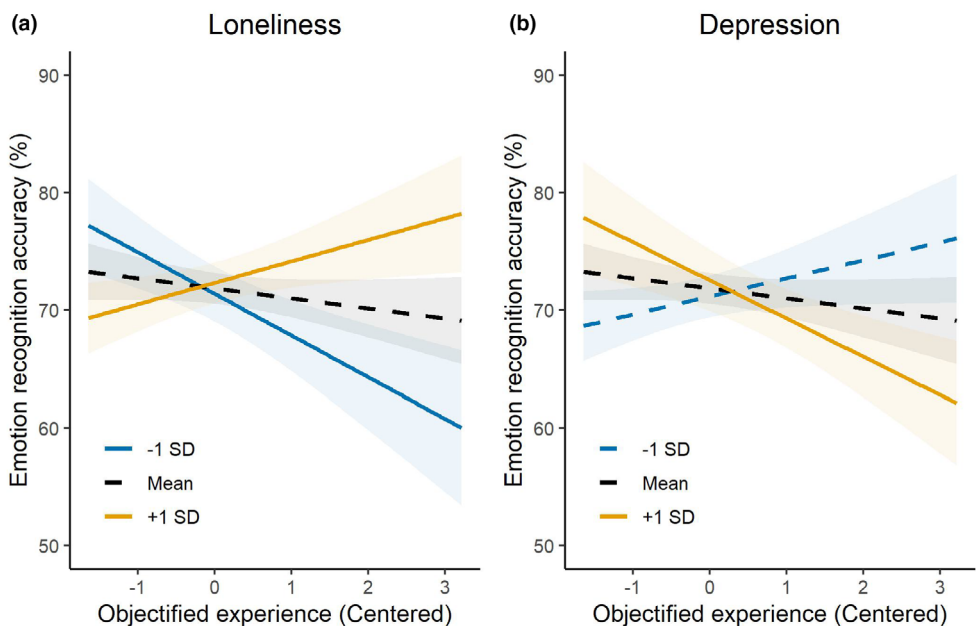


FIGURE 2 Interactions between emotion recognition accuracy and both loneliness and depression. Interactions of objectified experience (a) with loneliness and (b) with depression. The solid lines represent significant slopes, and the dashed line represents non-significant slopes. Transparent grey areas indicate 95% confidence intervals.

( $b=0.015$ , 95% CI=[−.001, .031],  $t(257)=1.93$ ,  $p=.054$ ). At mean levels of loneliness and depression, the relationship between emotion recognition accuracy and objectified experience was negative but not significant ( $b=−0.009$ , 95% CI=[−.020, .003],  $t(257)=−1.49$ ,  $p=.138$ ).

To examine the results in more detail, we conducted multiple regression analyses for each emotion. For most negative emotions, both loneliness and depression moderated the association between objectification and recognition accuracy, although loneliness was not related to anger recognition (Table 3). The overall patterns were consistent with our main findings: objectification was associated with decreased accuracy among individuals high in depression, whereas it was associated with increased accuracy among those high in loneliness but decreased accuracy among those low in loneliness (Table 4). For happiness recognition, the Objectification × Loneliness interaction showed a marginal trend. The corresponding simple-slope analysis indicated that objectification was positively associated with

**TABLE 3** Summary of the multiple regression analyses for each emotion recognition accuracy, showing standardized coefficients and significance levels.

| Variables                                 | Anger  | Fear    | Sadness | Happiness |
|-------------------------------------------|--------|---------|---------|-----------|
| Objectification                           | −0.14  | −0.10   | −0.13   | 0.09      |
| Depression                                | −0.02  | 0.11    | 0.07    | 0.02      |
| Loneliness                                | 0.08   | −0.01   | 0.00    | 0.09      |
| Objectification × depression              | −0.01* | −0.01*  | −0.02** | −0.00     |
| Objectification × loneliness              | 0.14   | 0.42**  | 0.47*** | 0.27+     |
| Depression × loneliness                   | 0.16   | −0.32** | −0.18   | −0.17     |
| Objectification × depression × loneliness | 0.01   | 0.00    | 0.00    | −0.02     |

Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , +: marginal  $p < .10$ .

**TABLE 4** Summary of the simple slope analyses for significant interactions between objectification and the moderators (loneliness, depression).

| Emotion   | Moderator (+/−1 SD) | <i>b</i> | <i>t</i> | <i>p</i> |
|-----------|---------------------|----------|----------|----------|
| Anger     | Depression (−)      | 0.01     | 0.76     | .450     |
|           | Depression (+)      | −0.04    | −2.65    | .008**   |
| Fear      | Loneliness (−)      | −0.05    | −2.70    | .007**   |
|           | Loneliness (+)      | 0.03     | 1.85     | .065+    |
|           | Depression (−)      | 0.02     | 1.24     | .216     |
|           | Depression (+)      | −0.04    | −2.44    | .015*    |
| Sadness   | Loneliness (−)      | −0.05    | −3.22    | .001**   |
|           | Loneliness (+)      | 0.03     | 1.98     | .049*    |
|           | Depression (−)      | 0.02     | 1.36     | .176     |
|           | Depression (+)      | −0.05    | −2.99    | .003**   |
| Happiness | Loneliness (−)      | −0.01    | −0.65    | .514     |
|           | Loneliness (+)      | 0.02     | 2.51     | .012*    |

Note: Unstandardized coefficients are reported. \* $p < .05$ , \*\* $p < .01$ , +: marginal  $p < .10$ .

happiness-recognition accuracy among individuals with higher loneliness ( $b = 0.02$ ,  $t = 2.51$ ,  $p = .012$ ). In sum, variations across emotion types in the magnitude of the associations between the moderating factors and emotion recognition were partly, but not fully, consistent with previously reported patterns. Specifically, loneliness-related hypervigilance to sad and fearful faces and depression-related hypervigilance to sad faces, as previously reported (Joormann & Gotlib, 2006; Vanhalst et al., 2017), were observed in the present study, whereas previously reported depression-related difficulty in recognizing happy faces (Cheeta et al., 2021) was not. Because these emotion-specific analyses were exploratory and involved multiple statistical tests, the results should be interpreted cautiously.

Discussion

In the current study, experiences of being objectified were negatively correlated with emotion recognition accuracy. Furthermore, the relationship between objectification and emotion recognition accuracy was moderated by levels of loneliness and depression. In particular, regarding loneliness, objectification was negatively correlated with emotion recognition accuracy in participants with low levels of loneliness, while objectification was positively correlated with emotion recognition accuracy

in those with higher levels of loneliness. Regarding depression, however, objectification was negatively correlated with emotion recognition accuracy only in participants with higher depression. These findings build upon prior evidence suggesting that objectification leads individuals to withdraw from social interactions and experience difficulties in social engagement (Garcia et al., 2016; Terán et al., 2021). Moreover, objectification appears to be associated with disruptions in a fundamental psychological process essential for social functioning—emotion recognition—which may partly account for the observed impairments in social interaction. Furthermore, the moderating roles of loneliness and depression observed in Study 1 are consistent with previous evidence demonstrating their differential influences on emotion recognition. Specifically, loneliness has been shown to heighten sensitivity to social information, whereas depression tends to diminish it (Csukly et al., 2009; Gardner et al., 2005). The moderation by depression indicates that individuals with higher depressive symptoms may be particularly susceptible to objectification-related decrements in emotion recognition, which could, in turn, contribute to difficulties in social interactions and relationships (Steger & Kashdan, 2009).

However, the causal relationship between them remained unclear. Additionally, objectification can also be interpreted as a moderator of the associations between loneliness or depression and emotion recognition accuracy, particularly since depression has been consistently linked with emotion recognition (Krause et al., 2021). Therefore, in the subsequent follow-up study, we experimentally manipulated situational objectification and assessed its impact on emotion recognition accuracy, including moderation by loneliness and depression.

## STUDY 2

Previous studies experimentally manipulated situational feelings of objectification, particularly sexual objectification. For example, participants either received objectifying comments about their physical appearance or recalled a past experience of objectification (Chen et al., 2013). Those who were objectified reported stronger feelings of shame and guilt. Similarly, participants exposed to the objectification manipulation, such as receiving objectifying comments or imagining workplace sexual objectification, were more likely to behave aggressively (Poon & Jiang, 2020). Importantly, these manipulations (receiving comments, recalling experiences or imagining scenarios) successfully induced situational feelings of objectification.

Therefore, in Study 2, we adopted these established methods to examine whether incidental manipulation of objectification influences emotion recognition accuracy, as well as whether loneliness and depression moderated this relationship. Furthermore, beyond the examination of the association between objectification and overall emotion recognition ability, we explored this relationship for each specific emotion. Consistent with the findings of Study 1, the moderating influences of loneliness and depression may differ across emotional categories. Specifically, loneliness, which has been associated with heightened sensitivity to sad and fearful facial expressions (Vanhalst et al., 2017), is expected to amplify the effect of objectification on the recognition of these emotions. Likewise, depression, which tends to increase sensitivity to sad faces while reducing sensitivity to happy faces (Joormann & Gotlib, 2006), is expected to strengthen the impact of objectification on the recognition of these emotions. Although these predictions were not fully supported in Study 1, further investigation into the emotion-specific effects of objectification and the moderating roles of loneliness and depression remains warranted in Study 2. Before collecting the data, we preregistered our study at [AsPredicted.org](https://aspredicted.org/753xs8.pdf), <https://aspredicted.org/753xs8.pdf>.

## Method

### Participants

We determined the sample size *a priori* using a power analysis conducted with the *pwr* package in R (Champely, 2006). The expected effect size was based on Study 1, with the adjusted  $R^2$  of .096 resulting

in an  $f^2$  of 0.106. A multiple regression model was planned with seven predictors, including three independent variables, objectification, loneliness, depression and those interactions. The analysis indicated that a sample size of approximately 172 participants would be required to achieve 90% power to detect the expected effect at a significance level of .05. Considering the procedural difference from Study 1 and the expected number of participants who may fail the attention check items, we planned to set the sample size as 200. We recruited 200 participants, 98 in the objectification condition and 102 in the control condition, through CrowdWorks (<https://crowdworks.jp/>), a crowdsourcing website in Japan. They were compensated with a small amount of money for their participation. We excluded 12 participants who failed the attention check. Thus, we analysed data from 188 participants, 91 in the objectification condition (30 women, 61 men; mean age, 41.45; *SD* of age, 8.33) and 97 in the control condition (46 women, 51 men; mean age, 43.07; *SD* of age, 9.36). The study was approved by the ethics committee of Waseda University and conducted in accordance with the Declaration of Helsinki. Sensitivity power analysis conducted in G\*Power indicated that, for the final analytic sample of 188 participants, the minimum detectable effect size was  $d=0.476$  in the  $t$ -test, with  $\alpha=.05$  and power  $(1 - \beta)=.90$ .

## Procedure

The procedure of Study 2 was similar to that of Study 1, except for the incidental manipulation of objectification. After consenting to participate, participants answered the attention check question. Then, they were randomly assigned to an objectification condition or a control condition which were adapted from prior research (Calogero, 2013; Chen et al., 2013; Poon & Jiang, 2020). In the objectification condition, participants received the following instructions: Please take a moment to recall a time when you felt that somebody treated you not as a person, but as a tool or an object, solely based on your performance. For example, someone might have valued you only for your achievement without recognizing your effort or personality at work, dismissed you as worthless due to poor performance, or judged you purely by your grades in school. Think about what took place, where you were, who you were with, how you felt, what you were thinking, and write about your experience in the space below. In the control condition, participants were asked to write about their last visit to a supermarket or grocery store and their experience and feelings there. Afterward, participants responded to the four manipulation-check statements. Three statements about objectified experience: I feel objectified, I feel like I am being treated as an object, and people treat me as a tool, and a statement about vividness of recalling: I can clearly recall the experience. Participants responded to those statements in a seven-point Likert scale (1: strongly disagree; 7: strongly agree).

After engaging in either of two conditions, participants engaged in the facial emotion recognition task for about 15 min. Then, participants answered three questionnaires, the experiences of daily objectification questionnaire, the BDI-II, and the UCLA Loneliness Scale, with the order of questionnaires randomized across participants. Finally, participants answered their demographic information, age and sex. We reported how we determined our sample size, all data exclusions, all manipulations and all measures in the study.

## Statistical analysis

For checking the successful experimental manipulation, we compared averages of ratings for three statements of objectified experience and one rating for the recalling vividness between objectification and control conditions. We conducted  $t$ -tests for both comparisons. Furthermore, to check the absence of floor or ceiling effects in data distributions, we calculated skewness and kurtosis and visualized data distributions. If the average ratings of objectified experience significantly differ between the objectification and control conditions, and there was no significant difference in recall vividness between the two conditions, we interpreted these results as indicating that our manipulation was successful.

For the main analysis to confirm our hypotheses, we conducted a *t*-test to see the difference in emotion recognition accuracy between objectification and control conditions. Then, we conducted a multiple regression analysis with a dummy variable of objectification (1: objectification, -1: control), loneliness, and depression, and those interactions as independent variables and the accuracy of emotion recognition as a dependent variable. In addition, we performed separate multiple regression analyses using the same independent variables, with the recognition accuracy for each emotion as the dependent variable. When we included interaction terms into the model, we centred all variables on their means. If we found a significant interaction among variables, we conducted simple slope analyses to interpret the interaction.

We performed all analyses in R software (R Core Team, 2021). For simple slope analyses, we used the package *interactions* (Long, 2019).

Results

Manipulation check

First, we calculated the skewness and kurtosis of the key variables: emotion recognition accuracy, loneliness, depression and objectified experience. Skewness ranged from -1.12 to 1.04, and kurtosis ranged from 2.11 to 4.93. These values indicate that the data did not substantially deviate from normality (West et al., 1995).

Regarding manipulation check items, self-reported objectification was significantly higher in the objectification condition than in the control condition ( $t(186)=28.03, p<.001, d=4.09, 95\% \text{ CI}=[3.58, 4.59]$ ), whereas recall vividness did not differ significantly between conditions ( $t(186)=1.15, p=.251, d=0.17, 95\% \text{ CI}=[-.12, .45]$ ). These results indicated that the manipulation successfully increased situational feelings of objectification without affecting recall vividness.

Emotion recognition accuracy

Overall emotion recognition accuracy in the objectification and control conditions is shown in Table 5. A within-participant ANOVA revealed that accuracy differed significantly among expressions ( $F(3, 561)=74.953, p<.001, \eta^2_p=.29$ ). Accuracy was highest for happiness, followed by anger, sadness and fear.

The effect of objectification manipulation on emotion recognition accuracy

Although emotion recognition accuracy tended to be lower in the objectification condition than in the control condition, none of these differences reached statistical significance (Table 5). Contrary to our preregistered hypothesis, the results did not provide evidence for a statistically reliable effect of

TABLE 5 Averages of emotion recognition accuracy and the results from *t*-tests.

|           | Conditions     |                 | <i>t</i> | <i>p</i> | Cohen's <i>d</i> | 95% CI |      |
|-----------|----------------|-----------------|----------|----------|------------------|--------|------|
|           | Control        | Objectification |          |          |                  |        |      |
| Overall   | 73.20% (7.79)  | 71.60% (9.63)   | 1.300    | .195     | 0.190            | -.097  | .476 |
| Anger     | 77.70% (12.65) | 74.80% (15.43)  | 1.387    | .167     | 0.202            | -.085  | .489 |
| Fear      | 63.00% (16.36) | 62.10% (19.66)  | 0.343    | .732     | 0.050            | -.236  | .336 |
| Sadness   | 69.60% (15.30) | 67.40% (16.01)  | 0.997    | .320     | 0.146            | -.141  | .432 |
| Happiness | 82.60% (10.23) | 82.00% (10.05)  | 0.405    | .686     | 0.059            | -.227  | .345 |

Note: Values in parentheses indicate standard deviations. The degrees of freedom associated with the *t*-tests were 186.

**TABLE 6** Summary of the multiple regression analyses for each emotion recognition accuracy in Study 2, showing standardized coefficients and significance levels.

| Variables                                        | Overall | Anger | Fear  | Sadness | Happiness |
|--------------------------------------------------|---------|-------|-------|---------|-----------|
| Manipulation condition                           | −0.01   | −0.04 | −0.02 | 0.00    | 0.01      |
| Depression                                       | 0.00    | 0.00  | 0.00  | 0.00    | 0.00      |
| Loneliness                                       | −0.01   | −0.01 | −0.05 | 0.01    | −0.01     |
| Manipulation condition × depression              | 0.00    | 0.00  | 0.00  | 0.00    | 0.00      |
| Manipulation condition × loneliness              | −0.02   | −0.04 | −0.01 | −0.04   | 0.01      |
| Depression × loneliness                          | 0.00    | 0.00  | 0.00  | 0.00    | 0.00      |
| Manipulation condition × depression × loneliness | 0.00    | 0.00  | 0.01  | 0.00    | 0.00      |

Note: \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ , +, marginal  $p < .10$ .

the objectification manipulation on emotion recognition accuracy. The observed effects were small ( $d_s \leq .20$ ), and all confidence intervals included zero, suggesting considerable uncertainty regarding the presence of the hypothesized effect. At the same time, the data constrain the plausible magnitude of the effect, indicating that large immediate effects are unlikely in the present paradigm.

The moderating roles of loneliness and depression

Although the primary analyses did not reveal significant effects of the objectification manipulation, we conducted the preregistered moderation analyses to examine whether loneliness and depression moderated emotion recognition accuracy. However, we did not find any significant moderating effects of loneliness or depression (Table 6). This pattern remained unchanged when daily objectification experiences were included as a covariate (see Table S1).

Discussion

In Study 2, we aimed to test the predicted causal role of situational objectification on emotion recognition accuracy, as well as the preregistered moderating roles of loneliness and depression. Although the manipulation successfully increased self-reported feelings of objectification, the results did not provide evidence for the predicted causal effect on emotion recognition accuracy, nor for the predicted moderating effects of loneliness and depression. Thus, Study 2 did not support the causal pattern that had been anticipated from the correlational findings of Study 1.

GENERAL DISCUSSION

Through two preregistered studies, we examined the relationship between objectified experiences and emotion recognition accuracy. In Study 1, daily objectified experiences were negatively associated with emotion recognition accuracy, and this association was moderated by both loneliness and depression. Specifically, depression strengthened the negative association between objectification and emotion recognition accuracy, whereas loneliness reversed the relationship, such that objectification was positively associated with emotion recognition accuracy at higher levels of loneliness. These findings supported our hypotheses at the correlational level. However, the overall association was small. The moderation effects of loneliness and depression were somewhat larger but remained modest in magnitude, suggesting that the association may vary across individuals but should not be interpreted as large.

To examine causality, participants in Study 2 were experimentally induced to recall objectified experiences and subsequently completed an emotion recognition task. Although the manipulation successfully increased situational feelings of objectification, the results did not provide evidence for the predicted causal effect of objectification on emotion recognition, nor for the predicted moderating effects of loneliness or depression. Taken together, the two studies provide correlational but not causal support for the hypothesized relationship.

A substantial body of previous research has documented the negative consequences of objectified experiences, including mental health problems and interpersonal difficulties (e.g., Garcia et al., 2016; Jones & Griffiths, 2015). Our findings extend this literature by suggesting that objectified experiences are associated with a core interpersonal cognitive ability, emotion recognition. This association raises the possibility that interpersonal difficulties linked to objectification (Garcia et al., 2016; Terán et al., 2021) may partly reflect disruptions in emotion recognition. However, the correlational nature of Study 1 precludes conclusions about the direction or mechanism of this relationship.

The divergence between the two studies suggests several possible interpretations. One possibility is that the association between objectification and emotion recognition is more likely to emerge through repeated or chronic experiences than through a brief, recalled episode. In a field study, workers' perceptions of objectifying job features and objectification by supervisors were associated with greater self-objectification (Baldissarri et al., 2019). Although this study did not directly assess the cumulative effects of objectification, repeated exposure to objectifying conditions may produce changes in self-perception that are sufficiently persistent or pronounced to relate to emotion recognition. Such an association may develop through gradual changes in social motivation or affect. Objectification has been linked to social avoidance motivation (Teng et al., 2015; Terán et al., 2021), which is associated with systematic biases in facial emotion recognition (Nikitin & Freund, 2015). Similarly, self-objectification has been associated with depressive symptoms (Jones & Griffiths, 2015), which are, in turn, associated with poorer emotion recognition performance (Krause et al., 2021). Thus, these motivational and emotional pathways may require repeated exposure to objectification rather than a single recalled experience. However, this explanation remains speculative because we did not directly measure these pathways or examine how they developed over time.

Another possibility is that the recall-based manipulation used in Study 2 did not capture the aspects of objectification that are most relevant to emotion recognition performance. Across three experiments, Baldissarri et al. (2017) manipulated working objectification by having participants perform repetitive, fragmented and other-directed activities. Compared with corresponding non-objectifying activities, these tasks reduced participants' belief in personal free will and their self-attribution of human mental states and increased their perceptions of themselves as instrument-like. Although recalling a past experience of sexual objectification is an established method of inducing state self-objectification or perceived objectification (Calogero, 2013; Chen et al., 2013), such recall-based manipulations may reactivate primarily the interpersonal and affective aspects of objectifying experiences. In contrast, task-based manipulations may more directly induce diminished agency, reduced self-attribution of mental states and a sense of instrumentality. These aspects of objectification may be more relevant to emotion recognition performance.

Finally, several limitations should be acknowledged. First, although we proposed motivational and emotional pathways to explain the observed associations, we did not directly measure or test these mechanisms. Future research should examine which factors mediate the relationship between objectification and emotion recognition and how these processes unfold over time. Second, although the effect estimates in Study 2 were in the predicted direction, they were small and statistically nonsignificant. Thus, Study 2 did not provide evidence for the predicted causal effect, although a small immediate effect cannot be conclusively ruled out. Third, we did not directly test the mechanisms proposed to explain the divergence between the two studies, including the distinction between brief and cumulative exposure and the potentially different psychological states induced by recall- and task-based manipulations. Finally, the recall-based manipulation used in Study 2 may not have fully captured the interpersonal, repeated and context-dependent nature of objectification as it unfolds in everyday life. Future studies

would benefit from longitudinal, daily or repeated-exposure designs that better reflect chronic objectification experiences.

## AUTHOR CONTRIBUTIONS

**Toshiki Saito:** Conceptualization; investigation; funding acquisition; writing – original draft; methodology; validation; visualization; writing – review and editing; formal analysis; project administration; data curation; resources. **Katsumi Watanabe:** Investigation; writing – review and editing; resources; supervision.

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## CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study and analysis scripts are openly available in Open Science Framework at <https://doi.org/10.17605/OSF.IO/SVFEH>. Study 2 reported in the manuscript was preregistered at [AsPredicted.org](https://doi.org/10.17605/OSF.IO/SVFEH) prior to data collection.

## ETHICS STATEMENT

The study was approved by the ethics committee of Waseda University and conducted in accordance with the Declaration of Helsinki. Before taking part in the current studies, participants gave their informed consent online.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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