



# Relation Between Daydreaming and Well-Being: Moderating Effects of Otaku Contents and Mindfulness

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## Abstract

The relationship between daydreaming and well-being were examined with mindfulness and consumption of Otaku contents (animations and games) as potential moderators. Recent theory suggests that both the context and contents of daydreaming matter in determining the beneficial effects of daydreaming. Mindfulness is a candidate for the former, whereas Otaku contents represent one for the latter. Metacognitive awareness and intentionality of daydreaming, and accepting relationship with the same, may facilitate such beneficial effects. As Otaku consumers obsessively engage in the imaginative contents, they will be adept at enjoying daydreaming of favorite contents. In Study 1, a survey of a large adult sample ( $n = 800$ ), hierarchical regression analysis was employed to predict well-being from the three-way interaction of daydreaming  $\times$  mindfulness  $\times$  Otaku consumption. Significant three-way interactions emerged, predicting both life satisfaction and psychological well-being. Those high on either the non-judging facet of mindfulness or Otaku consumption showed a positive relationship between daydreaming and life satisfaction. Those low on both non-judging mindfulness and Otaku consumption showed a negative relationship between daydreaming and psychological well-being. In Study 2 ( $n = 104$ ), priming of Otaku contents was employed in lieu of individual differences in Otaku consumption. Without Otaku priming, higher mindfulness revealed a positive relationship between daydreaming and life satisfaction. In addition, Otaku priming with short stimulus viewing time showed a positive relationship between daydreaming and subjective well-being (life satisfaction/positive mood). The results suggested that both contents and context of daydreaming affect well-being.

**Keywords** Daydreaming · Mind-wandering · Otaku contents · Mindfulness · Well-being

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## 1 Introduction

The present study aimed to examine the relationship between daydreaming and well-being, with mindfulness and consumption of Otaku contents (animations and games) as potential moderators. These two candidate moderators, namely, context and contents, are thought to represent different aspects of daydreaming that will determine its beneficial effects (Smallwood and Andrews-Hanna 2013). Specifically, mindfulness is expected to enhance meta-awareness and intentional control of daydreaming, and accepting attitudes to, thus it will reveal the positive relation between daydreaming and well-being. Otaku consumers frequently engage in daydreaming of their favorite contents. Therefore, they are expected to have rich experiences of engagement in their favorite daydreaming. Consequently, they may be adept at enjoying daydreaming and thus will be able to derive well-being from it. This research is a two-part study. Study 1 was a correlational study of daydreaming, dispositional mindfulness, Otaku consumption, and well-being. Study 2 introduced experimental manipulation: priming of Otaku contents before rating daydreaming, coupled with dispositional mindfulness as the other moderator.

### 1.1 Daydreaming and Well-Being

Interest in daydreaming has seen a revival in recent years, primarily because of its relation to mind-wandering (e.g., Mrazek et al. 2012; Stawarczyk et al. 2012). In the absence of specific demands, the mind tends to wander away from tasks at hand and any present perceptual inputs. Mind-wandering is a prevalent phenomenon (50% of waking time in experience sampling studies; Killingsworth and Gilbert 2010). Mind-wandering and daydreaming are often treated synonymously, or, at least, the latter is treated as an index of the former (Mrazek et al. 2012; Stawarczyk et al. 2012). Mind-wandering does not mean that one is thinking about nothing. Rather, one tends to daydream while the mind wanders. In other words, the default content of mind-wandering is daydreaming. This close relation between the two constructs enables us to reference the growing number of recent studies on mind-wandering to derive predictions on daydreaming.

Detrimental effects have been found for increased mind-wandering, including impaired cognitive performance (e.g., sustained attention and working memory) and negative mood (Mooneyham and Schooler 2013; Schooler et al. 2014). For example, it reduces moment-to-moment happiness; that is, when one's mind wanders, one is less happy (Killingsworth and Gilbert 2010). These features are seemingly contradictory to the finding that mind-wandering is a common phenomenon. It is hard to imagine that internal mental activity unrestrained by immediate sensory inputs has no function (c.f., Smallwood et al. 2012). Mooneyham and Schooler (2013) listed some benefits of mind-wandering, such as future thinking and the ability to incubate solutions following initial attempts at solving a problem. While mind-wandering is operationalized as off-task thoughts, daydreaming is not defined in relation to any particular external task. Mar et al. (2012) also suggested that daydreaming can be intentional. Therefore, focusing on daydreaming may make it easier to determine potential adaptive properties of mind-wandering, as daydreaming may include situations beyond those where attention unintentionally drifts away from a current task.

Smallwood and Andrews-Hanna (2013) hypothesized that whether mind-wandering is beneficial or detrimental is dependent on the context of its occurrence and contents. It is possible that situations exist in which daydreaming is adaptive. Mar et al. (2012) found an

overall negative correlation between daydreaming and life satisfaction was weak in magnitude ( $r = -.13$ ,  $p < .01$ ;  $n = 421$ ). These findings suggest that examination of moderators may be of importance.

## 1.2 Mindfulness

A potent contextual moderator of the effects of daydreaming is how one monitors and controls it: meta-awareness, intention, and appraisal. These approaches are all represented by a construct of mindfulness. Notably, slightly different mechanisms are supposed for each. (1) Mooneyham and Schooler (2013) and Mrazek et al. (2012) argued for the possibility of “productive” mind-wandering supported by metacognitive skills (i.e., mindfulness). Meta-awareness (i.e., noticing that one’s mind is wandering) has been found to prevent the detrimental effects of mind-wandering on task performance (Schooler et al. 2011). Thus, the present study anticipated that higher mindfulness would enhance the beneficial effects of daydreaming by preventing people from losing track of their own cognitive processes through meta-awareness. (2) Smallwood et al. (2012) suggested that top–down control is necessary for maintaining and continuing internally generated thoughts. Recent evidence has also indicated that working memory makes mind-wandering more available (Levinson et al. 2012). Mar et al. (2012) also suggested that daydreaming can be intentional. Moreover, Seli et al. (2017a, b) demonstrated the dissociation of intention and meta-awareness of mind-wandering. Both intentional mind-wandering without meta-awareness and unintentional mind-wandering with meta-awareness were found during sustained attention tasks. Unintentional mind-wandering has been associated with obsessive–compulsive symptoms (Seli et al. 2017a, b). Mindfulness would also enable more elaborate daydreaming by top–down control. (3) Carciofo et al. (2017) found that the correlation between daydreaming and negative affect is mediated by negative appraisals of one’s unwanted thoughts, such as beliefs that worrying will make one sick. (4) Finally, mindful individuals are more likely to enjoy quotidian experiences (e.g., washing dishes; Hanley et al. 2015), and daydreaming may not be an exception. In other words, mindful individuals may enjoy daydreaming. Because this mechanism emphasizes pleasure from daydreaming, a relationship between daydreaming and subjective well-being is expected.

Mindfulness is defined as “paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally” (Kabat-Zinn 1994, p. 4). A systematic review by Chiesa et al. (2011) and a meta-analysis by Eberth and Sedlmeier (2012) both found that mindfulness meditation enhanced multiple facets of cognition, including higher-order attentional control and executive functions. Therefore, mindfulness is expected to enhance meta-awareness and intentional control of daydreaming. In addition, as mindfulness also includes nonjudgmental awareness of experiences, it will counter negative appraisals of daydreaming.

The neural substrates of mind-wandering underscores the expectation that mindfulness might enhance meta-awareness and intention of mind-wandering. The activation of interconnected higher-level brain areas (e.g., the ventral and dorsal medial prefrontal cortex and posterior cingulate cortex) has been observed when no cognitive demands are posed. These areas are collectively called the default mode network (Raichle et al. 2001). The situations in which the default mode network is activated coincide with when the mind wanders (Christoff et al. 2009). A neural architecture has been proposed that relates mind-wandering to three subsystems of cognitive control (Smallwood et al. 2012). First, the default mode network is implicated in information processing on the self (e.g., self-concepts,

autobiographical memory, and simulation of future) and is distinct from the dorsal attention network (i.e., the posterior parietal cortex and visual cortex), which is related to the processing of external information. The default mode network and dorsal attention network are mutually inhibiting, and therefore, mind-wandering interferes with task performance and tends to be observed under low task demand. Although the default mode network and dorsal attention network both involve active control, the frontal parietal network (i.e., the dorsolateral prefrontal cortex and dorsal anterior cingulate cortex) represents an even higher level of control. The frontal parietal network monitors and regulates both the default mode network and dorsal attention network. Mind-wandering has been found to be reduced by mindfulness meditation (Mrazek et al. 2013). Meanwhile, the three-subsystems architecture suggests that mindfulness and daydreaming can go together such that mindfulness may lead to meta-awareness and intentional control of daydreaming. Mindfulness entails awareness of every experience, both internal and external. Internal experiences, like daydreaming, can be observed with a stance of mindful awareness. Brewer et al. (2011) reported that experienced meditators show a coupling of the default mode network seed region (posterior cingulate) and region for higher-level cognitive control (dorsolateral prefrontal cortex). In addition, mindfulness may lead to more elaborate daydreaming. Golchert et al. (2017) compared intentional and unintentional mind-wandering with respect to brain structure and functional connectivity. Intentional mind-wandering is associated with strong integration between the brain network for cognitive control and that for internal processing. Effective communication between these networks may enable more controlled daydreaming. Therefore, it is expected that enhanced cognitive control, as a result of mindfulness, may enhance meta-awareness and deliberate control of one's daydreaming.

Mindfulness may also affect how one perceives one's own daydreaming. Mindfulness includes nonjudgmental awareness of experiences, in addition to attentional control. Such different aspects are represented in individual differences in mindfulness, which are divided into five facets (Baer et al. 2006): observing experiences (e.g., sensations, perceptions, thoughts, and feelings), acting with awareness (noticing what is happening in the present moment), describing or labeling experiences (finding proper words fitting experiences), not judging experiences (not criticizing one's experiences), and being non-reactive to inner experiences (not being overwhelmed by one's experience and keeping notice of it). These five facets are combined into the two higher-order factors of attention and attitudes (Bishop et al. 2004; Tran et al. 2013). The acting with awareness facet is representative of the attentional component, whereas non-judging is that of attitudes. Increased attention will lead to meta-awareness and intentionality of mind-wandering, whereas non-judging is expected to reduce negative appraisals of daydreaming.

Finally, mindful individuals are more likely to enjoy quotidian experiences (Hanley et al. 2015). This may extend to inner experiences, including daydreaming. This mechanism emphasizes pleasure from daydreaming; therefore, a relationship between daydreaming and subjective well-being is expected. The mechanisms of increased enjoyment have not yet been associated with any particular facet of mindfulness; therefore, we cannot make facet-level predictions for this mechanism.

The above discussion suggests that mindfulness may reveal a positive relation between daydreaming and well-being. This relation may be brought about by enhanced meta-awareness, intentionality, reduced negative evaluation/increased enjoyment of daydreaming .

### 1.3 Otaku Contents

The other candidate moderator that may reveal the beneficial effect of daydreaming is the contents of daydreaming. Killingsworth and Gilbert (2010) found that even positively-valenced mind-wandering does not enhance happiness, relative to times free of mind-wandering. However, Mar et al. (2012) found that increased daydreaming about close friends and family is related to higher life satisfaction. Other mind-wandering found to enhance benefit of are that rated as interesting (Franklin et al. 2013) and that about the self or future (Ruby et al. 2013).

We will examine a not-yet-explored dimension potentially related to the contents of daydreaming, namely Otaku contents (i.e., animation and video games), as a potential moderator of the relationship between daydreaming and well-being. Otaku consumers are individuals who are obsessively engaged in such media contents as comics, animation, and games (Azuma 2009; Niu et al. 2012). The rationale for focusing on Otaku contents is to examine contents that participants voluntarily chose according to their taste and with which participants can be expected to have expertise in imagining, compared with objectively classified contents (e.g., valence). Otaku contents may be only one of the possible daydreaming contents, but it reaches beyond objectively classifiable contents, such as valence (Welz et al. 2018). Such nature of otaku contents suggests expertise in enjoying daydreaming.

The term “Otaku” is a Japanese word, and the Otaku sub-culture is considered a Japanese phenomenon. Nonetheless, preoccupation with fictions seems a universal phenomenon, with empirical studies outside Japan, such as that from the United States (Dauphin and Heller 2010) and Taiwan (Niu et al. 2012). As devoted consumers of fictional contents from subcultures, Otaku consumers are enthusiastic and eager about consuming animation, video games, and comics (Niu et al. 2012). Otaku consumers are thought to be adept at enjoyable daydreaming, as they have rich materials for imaginative activities with their favorite contents. For example, Niu et al. (2012) conducted focus-group interviews with Otaku youths in Taiwan and found that they engage in imaginative activities related to their interest (e.g., “May self-imagine as the comics’ characters and imitate moves, habits, and styles of the characters”; “May imagine the comic character as a romantic partner but do not expect this to happen in real life”). Dauphin and Heller (2010) found that engagement in video games is correlated with positive constructive daydreaming (e.g., insight and planning). Otaku consumers are expected to be skilled or expertized at imaging their favorite contents.

Based on the above discussion, Otaku consumption may enhance the benefits of daydreaming. Although Otaku behavior is not confined to media consumption, consuming animation and games is correlated with a deep interest in and knowledge of these contents (Niu et al., 2012); therefore, Study 1 focused on Otaku consuming. In contrast, Study 2 employed a priming manipulation with stimulus reminiscent of Otaku contents, to further examine the causal influence of Otaku contents on the link between daydreaming and well-being.

### 1.4 Well-Being

The dependent variable, well-being, is further dividable into the concepts of subjective well-being (*hedonia*) and psychological well-being (*eudaimonia*) (Keyes et al. 2002). Although closely related, these two classes of well-being have different points of emphasis.

Subjective well-being refers to positive cognitive and affective evaluation of life, including life satisfaction (cognitive aspects) and positive affective experiences. As subjective well-being reflects hedonic well-being, it may be related to enjoyment of daydreaming. Meanwhile, psychological well-being is characterized by a sense that one's development is oriented toward important personal values and making the most of one's potential. Psychological well-being includes personal growth, autonomy, purpose in life, and self-acceptance, thereby reflecting thinking about future growth; therefore, psychological well-being is expected to be related to self-related cognitions based on the default mode network (e.g., future planning). For example, Waytz et al. (2015) reported that mental simulation enhances subjects' sense of meaning in life, a part of psychological well-being.

## 1.5 Aim and Hypotheses

This study examined the relationship between daydreaming and well-being with two candidate moderators, namely mindfulness and Otaku contents. We predicted that there would be a more positive relationship between daydreaming and well-being among participants with high mindfulness or high consumption of Otaku contents, compared with individuals with low mindfulness or low consumption of Otaku contents. Specific predictions that involve mindfulness facets are also possible. The acting with awareness and non-judging facets may reveal a positive relationship between daydreaming and well-being. Acting with awareness leads to increased monitoring and control of daydreaming, whereas non-judging may reflect reduced negative appraisal of daydreaming. The role of mindfulness in enhancing enjoyment cannot be mapped to specific mindfulness facets at present. Therefore, we cannot make facet-level predictions about this last mechanism.

This paper consists of two studies. Study 1 utilizes a correlational design with a large web sample. Study 2 used a priming manipulation related to Otaku contents that presented illustrations reminiscent of typical animation/comic/game characters before participants completed questionnaires, in lieu of examining individual differences in Otaku consumption. This manipulation is expected to influence recall of daydreaming toward that with more Otaku contents. By using an experimental manipulation, Study 2 aimed to advance a causal understanding of Otaku contents.

## 2 Study 1

### 2.1 Methods

#### 2.1.1 Participants

A total of 800 Japanese participants (400 women) recruited from a registered participant pool of a web-based survey company completed an internet questionnaire survey. We included participants from a wide age range, grouped into four levels (20–29, 30–39, 40–49 and 50–59). Eight subgroups based on combinations of age group and sex were constructed. Within each stratified pool, participants were randomly selected and sent an email inviting their participation. This procedure was continued until each subgroup had 100 participants.

This study was approved by the institutional ethical review board at Hiroshima University Graduate School of Integrated Arts and Sciences (25–20). Before beginning the study,

the nature and purpose of the research were explained to participants, and they were told that they were free to refuse to participate and that their data would be treated and analyzed anonymously. Confidentiality was strictly preserved with the web-based survey system. Participants were asked to complete the questionnaires only if they agreed to take part in the study by selecting a radio button. Therefore, this button served as an electronic indicator of informed consent. Data are available from the authors upon request. This data is a part of large project, with some portion published in Sugiura and Sugiura (2018).

### 2.1.2 Measures

*Daydreaming* Six items from the Creative Experiences Questionnaire (CEQ; Merckelbach et al. 2001) were used to capture daydreaming per recommendations by Mar et al. (2012). These six items were selected because they directly reflect daydreaming among the other items, all of which capture the broader construct of fantasy proneness. Two items reflect frequency and four items reflect vividness of daydreaming, and all are rated on a 5-point scale. Item wordings were slightly modified in line with Mar et al. (2012). The Japanese version of the full CEQ was developed by Okada et al. (2004), and demonstrates good reliability and validity. In the present study, Cronbach's alpha for the six items was .83, even higher than that reported by Mar et al. ( $\alpha = .74$ ).

*Mindfulness* The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al. 2006) includes 39 items, each of which is rated on 5-point scale from 1 (*never or very rarely true*) to 5 (*very often or always true*) to measure individual differences in mindfulness. The FFMQ was derived using a joint factor analysis of existing mindfulness measures, and has five factors: observing experiences (e.g., sensations, perceptions, thoughts, and feelings), acting with awareness, describing or labeling experiences, non-judging of experiences, and non-reactivity to inner experiences. Sugiura et al. (2012) constructed the Japanese version and confirmed comparable psychometric properties to the original version. Specifically, the factor structure was replicated, total score and subscales had acceptable to good internal consistency, and the mindfulness facets were positively correlated with adaptive psychological traits, indicating construct validity.

*Otaku consumption* Otaku consumption was measured by two original items rated on a 7-point scale reflecting how much they spent money on animation and games, respectively, ranging from 1 (*none*) to 7 (*very much*). Items were scored so that higher scores indicated higher consumption of animation and video games.

*Well-being* The Satisfaction with Life Scale (SWLS; Diener et al. 1985) is a widely used measure of SWB, with five items rated on a 7-point scale of 1 (*strongly disagree*) to 7 (*strongly agree*) aimed at capturing overall positive evaluations of one's life. It has strong psychometric properties (Pavot and Diener 1993). The Japanese version was developed by Suh et al. (1998) using a back-translation technique. The SWLS showed excellent reliability in the present sample (Cronbach's  $\alpha = .88$ ). The Psychological Well-Being Scale (PWB; Nishida 2000) has six subscales to measure PWB: Self-Acceptance, Environmental Mastery, Positive Relations with Others, Personal Growth, Purpose in Life, and Autonomy. Forty-three items were rated on a 6-point scale, from 1 (*strongly disagree*) to 6 (*strongly agree*). Nishida (2000) developed a Japanese adaptation (i.e., not a direct translation) of the PWB, based on Ryff's (1989) widely used original scale. The convergence of the original scale with other measures is not overly strong, suggesting its unique value (Ryff and Keyes 1995). Nishida (2000) found a similar set of six factors to the original version among 241 Japanese women (ages 25–63). It has excellent psychometric properties, including



convergence with existing well-being measures and sufficient internal consistency and test-retest reliability. The Japanese version's 6-factor structure was replicated in 232 students (Y. Sugiura, personal communication, 20 December, 2013). The total score demonstrated excellent internal consistency in this study (Cronbach's  $\alpha = .94$ ). SWLS and PWB were positively correlated in the present sample ( $r = .60$ ;  $p < .001$ ), consistent with previous findings (Keyes et al. 2002). This is supportive of the convergent validity of the current scales.

### 2.1.3 Statistical Analyses

Hierarchical regression analyses were used to test the study hypothesis. Variables in regression analyses were mean centered to avoid multicollinearity. In Step 1, the main effects of the three predictors (CEQ, each mindfulness facet, and Otaku consumption) were entered. In Step 2, two-way interaction terms between each pair of predictors were entered. In Step 3, the three-way interaction was entered. As hierarchical regressions comprised the chief analysis to test the study hypotheses, to make the test stringent, Bonferroni's correction was applied for statistical significance to avoid inflated type 1 error. As hierarchical regression analyses were conducted for five mindfulness subscales and two well-being scales,  $p < .005$  (two-tailed) was considered significant. In addition, standardized estimates were included to examine the effect sizes for simple slopes. Where appropriate, 99% confidence intervals (CIs) are reported.<sup>1</sup> When reporting basic statistics, the conventional  $p < .05$  (two-tailed) is used. Basic statistics were analyzed with SPSS version 21. Hierarchical regressions and simple slope analyses were conducted using a moderated regression package (Fletcher 2012; Mirisola and Seta 2013) for R (R Core Team 2014) and the PROCESS v2.13 macro for SPSS (Hayes 2013).

## 2.2 Results

All scales indicated good-to-excellent Cronbach's alpha reliability coefficients ( $\alpha = .79-.94$ ), except for Otaku consumption ( $\alpha = .67$ ; Table 1), which is understandable given that it was constructed from only two items.

As shown in Table 1, the CEQ showed a significant positive correlation with SWLS ( $r = .09$ ;  $p < .05$ ) and a significant negative correlation with PWB ( $r = -.08$ ;  $p < .05$ ). However, the magnitudes of the correlations were small, suggesting that the amount of day-dreaming itself is not a strong predictor of well-being. Mindfulness total- and sub-scores were positively related to both SWB and PWB, and the magnitudes ranged from small to large ( $r = .11-.64$ ;  $ps < .01$ ).

The relationships between CEQ and mindfulness were inconsistent. CEQ was positively correlated with the subscales for observing ( $r = .27$ ;  $p < .001$ ) and non-reactivity ( $r = .08$ ;  $p < .05$ ), but was negatively related with acting with awareness ( $r = -.30$ ;  $p < .001$ ), non-judging ( $r = -.28$ ;  $p < .001$ ), and the FFMQ total ( $r = -.08$ ;  $p < .05$ ). In addition, CEQ and Otaku consumption were positively correlated ( $r = .17$ ;  $p < .001$ ).

<sup>1</sup> To be strictly consistent with the adjusted  $p$ -value, 99.5% CIs shall be employed. However, 99% was chosen as provided by the Process Macro.



**Table 1** Descriptive Statistics and Zero-Order Correlations among Study 1 Variables (N=800)

	2	3	4	5	6	7	8	9	10	M	SD	$\alpha$
1. CEQ	.27***	.06	-.30***	-.28***	.08*	-.08*	.17***	.09*	-.08*	14.58	4.68	.83
2. Observing	1.00	.28***	-.26***	-.54***	.53***	.37***	.02	.15***	.26***	22.62	5.22	.82
3. Describing	1.00	1.00	.29***	-.06	.42***	.75***	-.07	.36***	.52***	23.08	5.06	.81
4. Acting with Awareness	1.00	1.00	1.00	.51***	-.07	.61***	-.13***	.11**	.35***	27.42	5.27	.85
5. Non-judging	1.00	1.00	1.00	1.00	-.30***	.27***	-.02	.10**	.11**	25.73	5.22	.84
6. Non-reactivity	1.00	1.00	1.00	1.00	1.00	.57***	.00	.31***	.41***	19.91	4.36	.79
7. FFMQ total	1.00	1.00	1.00	1.00	1.00	1.00	-.08*	.39***	.64***	118.76	12.84	.81
8. Otaku Consumption	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-.01	-.12***	4.57	2.81	.67
9. SWLS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.60***	18.68	6.19	.88
10. PWB	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	162.34	26.75	.94

CEQ creative experiences questionnaire, FFMQ five facet mindfulness questionnaire, SWLS Satisfaction with life scale, PWB psychological well-being scale

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

## 2.2.1 Moderation Analyses

Moderation of the relationship between CEQ and well-being indices by mindfulness and Otaku consumption was examined. Three-way interactions involving CEQ, the mindfulness facet of non-judging, and Otaku consumption were significant for both the SWLS and the PWB, explaining a further 1% of the variance in both cases in Step 3 ( $p < .005$ ). Two-way interactions involving two of these factors were not significant (Table 2).<sup>2</sup>

Simple slopes for these three-way interactions are shown in Figs. 1 and 2, which indicate the relationship of CEQ with SWLS and PWB, respectively, when non-judging and/or Otaku consumption are high or low ( $M \pm 1$  SD). When predicting SWLS scores, three of the four simple slopes of CEQ showed a positive relationship between CEQ and SWB, two of which were statistically significant (Fig. 1). For those who are non-judging of experiences and are low consumers of Otaku contents, daydreaming was positively related to SWLS ( $B = .29$ ,  $SE = .09$ ,  $p = .0019$ ; 99% CI: .06–.52;  $\beta = .22$ ). Among those who are judgmental of experiences (low non-judging) and high in Otaku consumption, there was a significant positive relation between daydreaming and SWLS ( $B = .38$ ,  $SE = .10$ ,  $p = .0001$ ; 99% CI: .12–.63;  $\beta = .29$ ).

For PWB, one of the negative simple slopes indicated trend for significance (Fig. 2). Specifically, when both the non-judging mindfulness facet and Otaku consumption were low, higher CEQ tended to be related to reduced PWB ( $B = -.89$ ,  $SE = .35$ ,  $p = .0115$ ; 99% CI:  $-1.71$ – $-.03$ ;  $\beta = -.15$ ).

## 2.3 Discussion

Study 1 examined the relationship between daydreaming and well-being, with mindfulness and Otaku consumption investigated as moderators. The simple correlation between daydreaming and subjective well-being was positive ( $r = .09$ ), whereas its relationship with psychological well-being was negative ( $r = -.08$ ). However, their magnitudes were small. This finding is in line with our proposed need to explore moderators. Interactions involving non-judging attitudes toward experiences and consumption of Otaku contents were revealed, and the nuances of these interactions resulted in both beneficial and detrimental relationships between daydreaming and subjective and psychological well-being.

### 2.3.1 Relationship to Subjective Well-Being

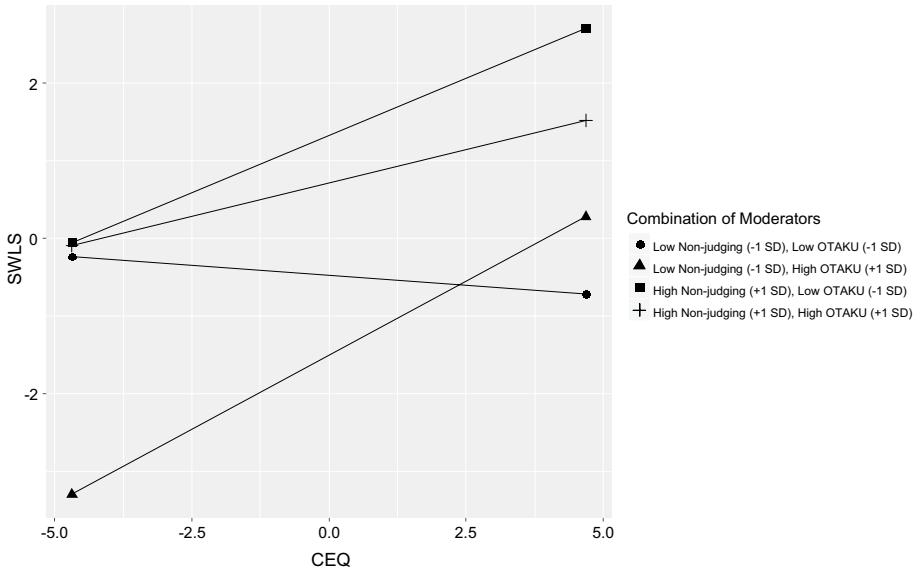
When predicting life satisfaction (subjective well-being), the presence of either non-judging attitudes toward experiences or consumption of Otaku contents resulted in a positive relation between daydreaming and life satisfaction (Fig. 1). Those who do not judge their experiences may be more likely to enjoy any internal mental activity that arises. For such people, daydreaming not focused on specific topics (e.g., fictional characters from animations or games) may be even better compared with daydreaming focused on one's own choice, as shown by low Otaku consumption. However, as those high on both non-judging and Otaku consumption also demonstrated a trend toward a positive relationship between

<sup>2</sup> Controlling for age and sex in the first step of regressions did not change the overall pattern of results reported, as identical three-way interactions were preserved. Further, neither age nor sex moderated the three-way interactions of daydreaming  $\times$  mindfulness  $\times$  Otaku consumption ( $p > .06$ ).

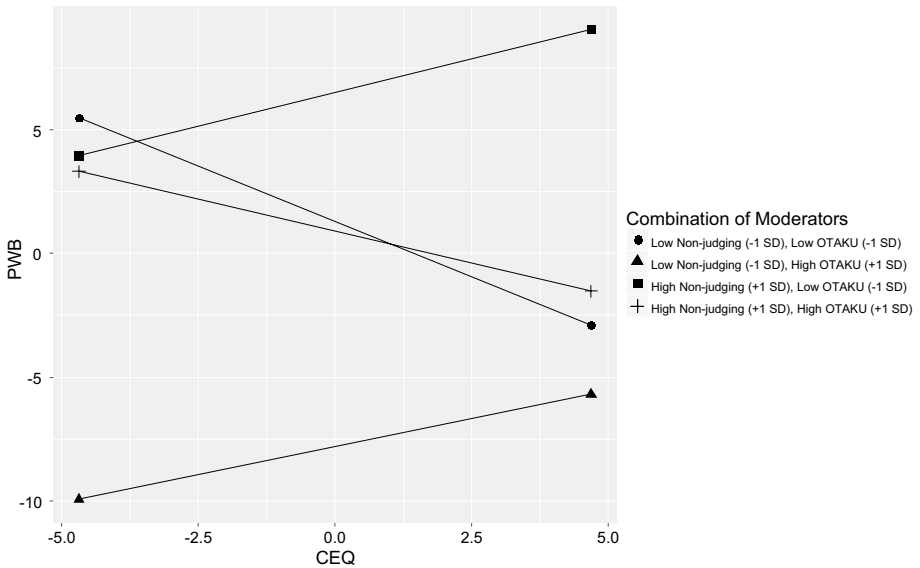
**Table 2** Three-Way Interaction of Daydreaming, Mindfulness (Non-judging Facet), and Otaku Consumption in Hierarchical Regression Analyses Predicting Subjective and Psychological Well-Being (N = 800)

	Satisfaction with life scale				Psychological well-being scale					
	<i>B</i>	<i>R</i> <sup>2</sup>	$\Delta R^2$	99% CI		<i>B</i>	<i>R</i> <sup>2</sup>	$\Delta R^2$	99% CI	
				LL	UL				LL	UL
Step 1		.03**	.03**				.03**	.03**		
CEQ	.20**			.07	.33	-.10			-.65	.45
Non-judging	.19**			.08	.31	.67**			.17	1.16
Otaku	-.15			-.35	.06	-1.31**			-2.21	-.41
Step 2		.03**	.01				.03**	.00		
CEQ × Non-judging	.01			-.01	.03	.02			-.07	.11
CEQ × Otaku	.03			-.02	.07	.03			-.17	.22
Non-judging × Otaku	.01			-.03	.05	.06			-.11	.23
Step 3		.04***	.01*				.04**	.01*		
CEQ × Non-judging × Otaku	-.01*			-.02	.00	-.04*			-.08	-.01

CEQ creative experiences questionnaire, CI bias-corrected confidence interval, LL lower limit, UL upper limit  
 \**p* < .005, \*\**p* < .001 (Bonferroni adjusted)



**Fig. 1** Relationship between daydreaming and satisfaction with life as moderated by the non-judging facet of mindfulness and Otaku consumption. CEQ=Creative Experiences Questionnaire; SWLS=Satisfaction with Life Scale



**Fig. 2** Relationship between daydreaming and psychological well-being as moderated by the non-judging facet of the mindfulness scale and Otaku consumption. CEQ=Creative Experiences Questionnaire; PWB=Psychological Well-Being

daydreaming and life satisfaction,<sup>3</sup> we might speculate that non-judging individuals enjoy any type of imaginative contents. At least, we can say that those high on non-judging may not have a negative impact from daydreaming, including that with Otaku contents.

Meanwhile, those with a judgmental stance may enjoy daydreams only when they are avid consumers of animation or video games. Daydreaming about one's favorite contents may engender enjoyment, despite taking a judgmental stance toward one's internal states. Daydreaming can be stressful for a person who negatively evaluates his or her own experiences, as reflected in reverse-coded non-judging items (e.g., "I believe some of my thoughts are abnormal or bad and I shouldn't think that way" and "I tell myself I shouldn't be thinking the way I'm thinking"). However, even with a judgmental stance toward internal states, if one is adept at forming favorite fantasy contents modeled after animations or games, daydreaming may lead to greater subjective well-being.

Although magnitudes of positive relation were seemingly weak ( $\beta = .22$  for those high on the non-judging facet;  $\beta = .29$  for otaku consumers), they should be considered in the context that mind-wandering is generally detrimental for well-being (e.g., Killingsworth and Gilbert 2010). They are larger than the exceptional positive correlation between life satisfaction and daydreaming of close friends/family ( $r = .15$ ; Mar et al. 2012).

### 2.3.2 Relationship to Psychological Well-Being

Among those who were judgmental of experiences and were low Otaku consumers, daydreaming was related to lower psychological well-being. Judgmental individuals may see daydreaming as an indicator of a lack of concentration, low ability, or even immaturity. In addition, lower interest in Otaku contents suggests a lower personal valuation of fantasy, or perhaps difficulties in learning important takeaways from it. Given the synergistic effects between low non-judging and low Otaku consumption, daydreaming could not lead to a sense of growth and self-realization. Conversely, non-judging and Otaku consumption may be considered protective factors from the aversive effect of daydreaming on psychological well-being. This assumption is supported by the configuration shown in Fig. 2: those high in either the non-judging facet of mindfulness did not indicate negative relationships at least.

A moderated positive relationship with daydreaming was observed for subjective well-being, but not for psychological well-being. We expected a positive relationship between psychological well-being and daydreaming, given the predominantly future-directed and self-related nature of daydreaming, but this was not the case. A more active enjoyment derived from daydreaming may explain its relationship with subjective well-being (c.f., Hanley et al. 2015). Otaku consumption enhanced the positive relationship between daydreaming and subjective well-being, possibly by providing rich material for their favorite daydreaming content. Those with non-judging attitudes may enjoy diverse contents of daydreaming, not bothered by negative appraisals.

<sup>3</sup> Non-judging and high Otaku-consuming participants showed a trend wherein daydreaming was positively related to life satisfaction ( $B = .17$ ,  $SE = .10$ ,  $p = .099$ ; 95% CI:  $-.03$ – $.38$ ; 99% CI:  $-.10$ – $.44$ ;  $\beta = .13$ ).

### 3 Study 2

Study 1 revealed that both non-judging facet of mindfulness and Otaku consumption showed a positive relationship between daydreaming and life satisfaction. One limitation of Study 1 is its cross-sectional nature, which precludes causal interpretations. To overcome this limitation, Study 2 employed priming manipulation to examine the effects of Otaku contents on the link between daydreaming and life satisfaction. Specifically, Study 2 presented illustrations reminiscent of Otaku contents to participants before they completed the daydreaming questionnaire (CEQ). Experimental manipulation focused only on Otaku contents for two reasons. First, of two moderators, the effect of Otaku consumption was demonstrated in Study 1 for the first time, thereby meriting more priority. Although moderation by mindfulness is also the first demonstration, the relation between mindfulness and mind-wandering has been examined in previous studies (e.g. Mrazek et al. 2012; Rahl et al. 2017), albeit not as a moderator. Second, to demonstrate the effect of mindful awareness of daydreaming, continuous training of mindfulness meditation will be desirable, which will not fit the priming design. As these two objectives in one experiment would make it less valid, we presumed to plan a different future study for mindfulness as a reasonable recourse. Nevertheless, to be consistent with Study 1, dispositional mindfulness was included.

In addition, because of the known relationship between fantasy gaming/daydreaming and introversion, analyses in Study 2 statistically controlled for the Big Five personality traits. Fantasy game playing, a prototypical type of Otaku consumption, is correlated with introversion (Douse and McManus 1993). In addition, Singer and Schonbar (1961) found a positive correlation between daydreaming and social introversion. Therefore, one alternative possibility to explain our obtained results from Study 1 is that introversion, which presumably correlates with our Otaku consumption items, is a confounding variable when examining Otaku consumption. We also controlled for age and sex. The inclusion of covariates was also a way to make statistical tests more stringent.

For Study 2, only subjective well-being was included as a dependent variable, primarily because only subjective well-being showed a positive relation with daydreaming in Otaku consumers or non-judging people in Study 1. In addition, in the experimental context of Study 2, we were concerned that priming effects might dissipate over the course of completing the long psychological well-being measure, or generally if too many measures were used post-priming. In lieu of psychological well-being, visual analogue scales for positive and negative mood ratings were used to tap state affects, which are part of subjective well-being.

In summary, Study 2 used a manipulation intended to prime Otaku concepts, in lieu of examining individual differences in Otaku consumption. Using a web-based survey system, priming was conducted by presenting two illustrated girls reminiscent of characters from animations and/or video games on the start screen before the rating of daydreaming. We hypothesized that Otaku priming would reveal a positive relationship between daydreaming and subjective well-being. This was expected because after Otaku priming, daydreaming ratings may be influenced toward that with Otaku contents. Thus, the priming manipulation was expected to help us examine the hypotheses that daydreaming with Otaku contents leads to higher well-being. As priming is an experimental manipulation, the resulting findings will provide stronger inferences on causality, compared with results from cross-sectional correlation. In addition, being a direct replication of Study 1, those high on dispositional mindfulness will indicate the positive relation between daydreaming

and well-being. It is also expected that the above relationship will hold after controlling for the Big Five traits, especially introversion, and age and sex.

### 3.1 Methods

#### 3.1.1 Participants

A total of 104 Japanese residents (55 women) from a registered participant pool from a web-based survey company completed an internet questionnaire survey (mean age  $M=41.95$ ,  $SD=10.25$ , Range=22–50). Participants were randomly recruited from within a set age range (20–50) and with equal numbers of each gender. Ethical consideration and methods of obtaining (electronical) informed consent were the same as those in Study 1. Again, approval was obtained from the same committee (26–43). Data are available from the authors upon request.

#### 3.1.2 Procedure

Participants who were interested in the study were randomly allocated to Otaku priming or Control conditions ( $n=52$  for each). In the Otaku priming condition, two illustrated girls reminiscent of characters from animations and/or video games appeared on the start screen after participants read the introduction to the study and gave their consent, while in the control condition no such illustration appeared. Participants pressed a button below the illustration or blank screen, respectively, to proceed to the questionnaires. Thereafter, participants completed the questionnaires in the following order: (1) The CEQ (same six items as in Study 1) (2) how much of their fantasy (daydreaming) is preoccupied by Otaku contents (0 to 100 on a Visual Analog Scale [VAS]) (3) positive and negative mood at the time (0 to 100 VAS) (4) and the SWLS.

In addition, the web-based survey system enabled us to record the amount of time taken by participants watching the illustrations (for control participants, the pause before pressing the button to proceed). It is relevant for priming effect, which is known to emerge with short presentation of stimuli.<sup>4</sup>

Finally, they completed trait measures in randomized order (i.e., FFMQ, the Ten Item Personality Inventory for the Big Five personality traits, and Otaku consumption.). The Ten Item Personality Inventory (Gosling et al. 2003) is a brief measure of the Big Five (including 2 items per trait). The Japanese version by Oshio et al. (2012) was used. This version has sound psychometric properties comparable to the original version, including expected relations to longer Big Five inventories. While individual differences in Otaku consumption is not the focus of Study 2, it was measured for exploratory purposes.

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<sup>4</sup> Time needed to complete the CEQ and Otaku contents measures, time to answer the mood visual analogue scales, and time to complete the SWLS were also recorded, but not reported here (see Supplementary material).



**Table 3** Three-Way Interaction of Daydreaming, Mindfulness, and Otaku Priming in Hierarchical Regression Analyses Predicting Life Satisfaction (N = 104)

	<i>B</i>	<i>R</i> <sup>2</sup>	$\Delta R^2$	95% CI	
				LL	UL
Step 1		.22**	.22**		
Age	-.15			-0.33	0.03
Sex	1.36			-1.21	3.94
Neuroticism	-.18			-0.89	0.53
Extraversion	.48			-0.09	1.06
Openness	-.15			-1.00	0.70
Agreeableness	-.23			-0.93	0.46
Conscientiousness	-.01			-0.68	0.67
CEQ	.30			-0.06	0.65
FFMQ total	-1.33			-0.27	0.24
Otaku Priming	-.01			-3.94	1.29
Step 2		.24*	.02		
CEQ × FFMQ total	.05*			0.00	0.10
CEQ × Otaku Priming	-.33			-0.82	0.16
FFMQ total × Otaku Priming	.20			-0.07	0.48
Step 3		.28**	.04*		
CEQ × FFMQ total × Otaku Priming	-.06*			-0.12	-0.01

CEQ creative experiences questionnaire, FFMQ five facet mindfulness questionnaire, CI bias-corrected confidence interval, LL lower limit, UL upper limit

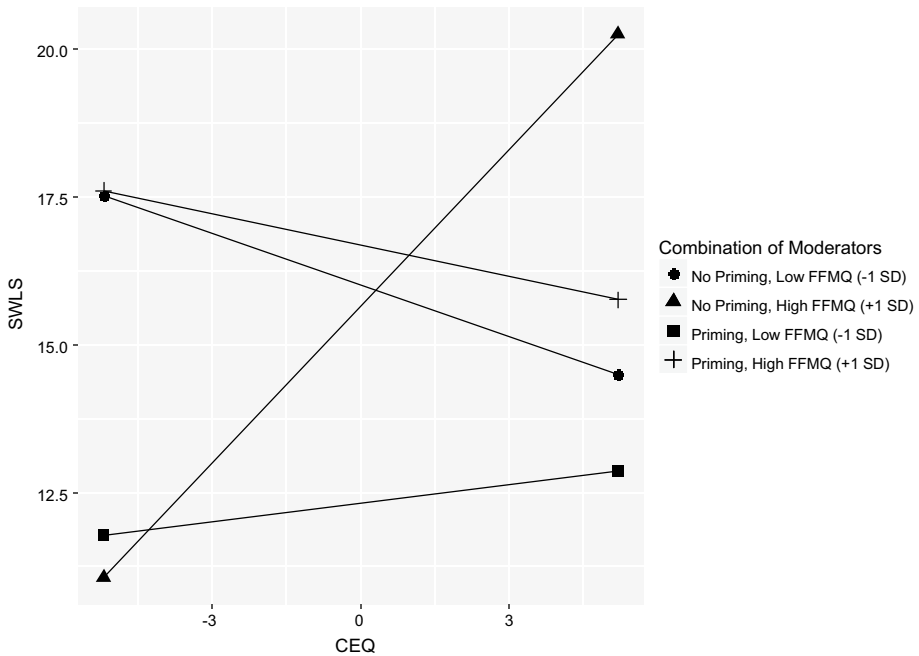
\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

## 3.2 Results

### 3.2.1 Moderation Analysis

We examined three-way interactions between Otaku priming × daydreaming × mindfulness facets, in a manner that was conceptually analogous to our analyses of the cross-sectional correlations in Study 1. Hierarchical regressions similar to those in Study 1 were conducted. Covariates and main effects were included in Step 1, two-way interactions, in Step 2, and the three-way interaction of interest, in Step 3. Study 2 differed from Study 1 in that Otaku priming was one of the moderators. Statistical significance was set at the conventional  $p < .05$ , as the sample was smaller than that in Study 1. However, we controlled for the participants' age, sex, and Big Five traits as covariates to ensure test rigor.

Three-way interactions predicting life satisfaction involving total FFMQ were significant ( $p < .05$ ) (Table 3). Simple slopes for 1 *SD* above/below the mean for mindfulness scores and for priming conditions (presence/not) were probed. Under high mindfulness and without Otaku priming, higher daydreaming was related to higher life satisfaction ( $B = .89$ ,  $SE = .36$ ,  $p < .05$ , 95% CI: .17–1.59;  $\beta = .68$ ) (Fig. 3).

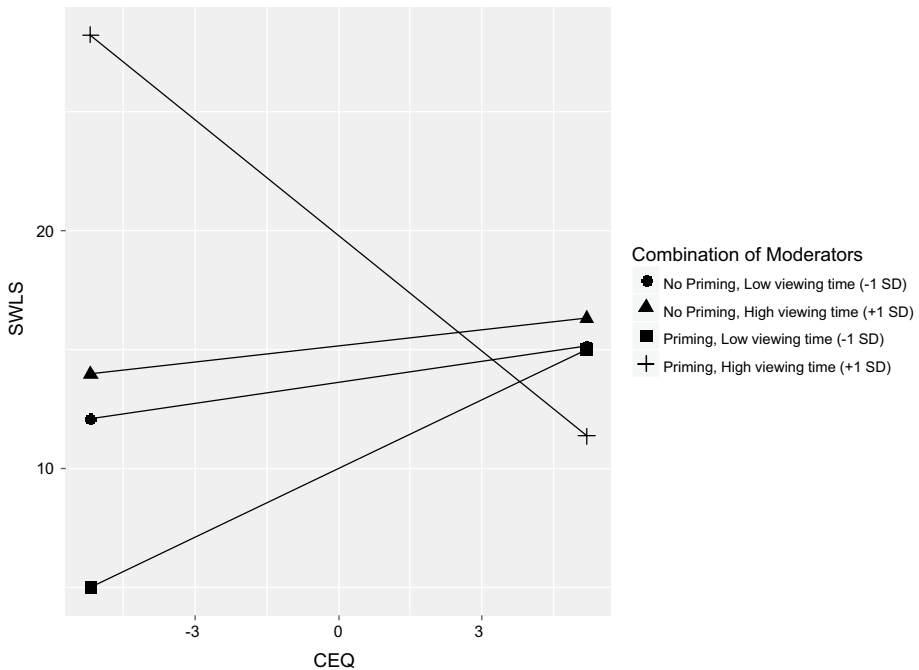


**Fig. 3** Relationship between daydreaming and satisfaction with life as moderated by the total mindfulness score and Otaku priming. Priming=presentation of illustration; CEQ=Creative Experiences Questionnaire; SWLS=Satisfaction with Life Scale; FFMQ=Five Facet Mindfulness Questionnaire total score

### 3.2.2 Otaku Priming with Short Viewing Time

The main analyses above conceptually replicated half of the findings from Study 1: mindfulness reveals a beneficial effect of daydreaming. However, the emergence of such beneficial effects of daydreaming by Otaku contents was not replicated. Considering that priming is an implicit phenomenon, it is expected that it works best with a brief presentation of a stimulus (e.g., Quoidbach et al. 2010). Therefore, adding the time an individual took viewing the Otaku illustration (Table S3) as an additional moderator may reveal the moderating effect by Otaku priming.

Well-being was regressed on  $CEQ \times \text{priming condition} \times \text{time viewing the Otaku illustration}$ . For consistency between the priming and control conditions, the time taken before pressing the button to go to the next screen in the control condition was used for control participants. Covariates (age, sex, and the Big Five traits) were controlled, as was done for main analyses. Significant three-way interactions of  $CEQ \times \text{priming} \times \text{illustration viewing time}$  were found when predicting life satisfaction ( $\Delta R^2 = .06$ ,  $p < .01$ ;  $B = -.22$ ,  $SE = .08$ ; 95% CI:  $-0.39$ – $0.06$ ) and positive mood ( $\Delta R^2 = .04$ ,  $p < .05$ ;  $B = -.68$ ,  $SE = .31$ ; 95% CI:  $-1.29$ – $0.06$ ). Simple slopes for 1 SD above/below the mean for viewing time and for priming conditions were probed. When predicting life satisfaction (Fig. 4), Otaku priming paired with a shorter viewing time was associated with a positive slope, such that more daydreaming predicted higher life satisfaction ( $B = 0.97$ ,  $SE = .42$ ,  $p < .05$ ;  $\beta = .74$ ). Meanwhile, Otaku priming with a longer viewing time was associated with a negative slope between daydreaming and life satisfaction ( $B = -1.62$ ,  $SE = .54$ ,  $p < .01$ ;  $\beta = -1.24$ ). A



**Fig. 4** Relationship between daydreaming and psychological well-being as moderated by Otaku priming and its viewing time. CEQ=Creative Experiences Questionnaire; SWLS=Satisfaction with Life Scale

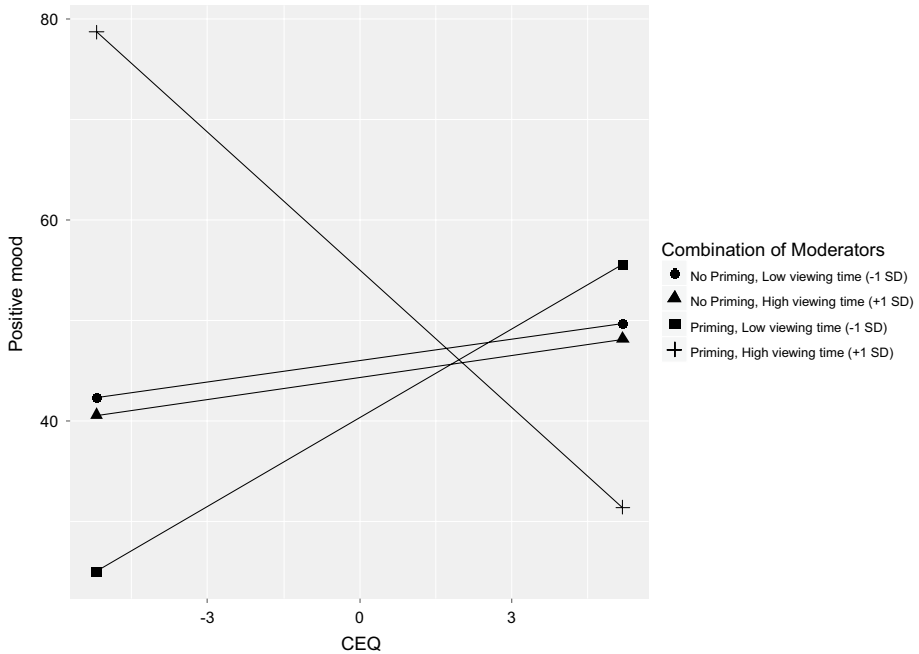
similar pattern of interaction effects was found when predicting positive mood. Priming with a shorter viewing time was associated with a trend for a positive relationship between daydreaming and positive mood ( $B=2.94$ ,  $SE=1.57$ ,  $p<.10$ ;  $\beta=.58$ ). Meanwhile, priming with a longer viewing time revealed a negative relationship between daydreaming and positive mood ( $B=-4.57$ ,  $SE=2.03$ ,  $p<.05$ ;  $\beta=-.91$ ) (Fig. 5).<sup>5</sup>

As the above results suggested that priming affects implicitly, to examine further the implicit nature of the effect of Otaku priming on daydream contents, a *t*-test was conducted between groups to compare the ratio of Otaku contents in participants' daydreaming. No significant differences were found between the priming and control conditions (Table S1). The lack of consciously reported change in contents may be another indication of the implicitness of priming.

### 3.3 Discussion

Study 2 results indicated that high mindfulness and Otaku priming with short viewing time could reveal a positive relationship between daydreaming and well-being.

<sup>5</sup> Another potential moderator is individual differences in Otaku consumption, as more "experienced" participants may benefit more from Otaku priming. However, Otaku consumption did not further moderate the priming  $\times$  daydreaming interaction ( $\Delta R^2 < .01$ ,  $p > .42$ ) in predicting subjective well-being indices.



**Fig. 5** Relationship between daydreaming and positive mood as moderated by Otaku priming and its viewing time. CEQ=Creative Experiences Questionnaire

The effects of mindfulness conceptually paralleled Study 1 results, such that higher mindfulness with no Otaku priming revealed a positive relationship between daydreaming and life satisfaction (Fig. 3). Having mindful attitudes will enable one to accept any experiences. Without Otaku priming, recalled daydreaming might have included diverse contents. Therefore, individuals high on mindfulness may enjoy increased diversity of daydreaming with curiosity more than daydreaming in line with one's taste.

The results of the priming manipulation showed that Otaku priming before rating daydreaming frequency revealed salutary effects of daydreaming on well-being, only when the time spent viewing the Otaku illustration was short, suggesting priming worked as intended under its optimal conditions (Figs. 4, 5). While the CEQ is a trait-like measure that does not assess specific content of daydreaming, the priming manipulation might have implicitly influenced participants toward increased recall of Otaku-like daydreaming contents from their everyday life. This interpretation is also consistent with the absence of reportable increase in Otaku contents in daydreaming by priming. As priming is thought to work implicitly, the Otaku-primed participants with a short viewing time may have been implicitly biased in their recall of daydreaming of Otaku-colored contents in their daily life. Conversely, when viewing time was longer, Otaku priming revealed a negative relationship between daydreaming and well-being. In view of the notion that priming is most potent with a short time presentation, longer viewing of the stimulus may have made participants suspicious about whether the aim of the study was to show effects of Otaku contents.

At minimum, Study 2 again indicated that daydreaming can increase well-being under high mindfulness. In addition, we obtained results consistent with the notion that

Otaku contents represent another potential moderator for the positive relation between daydreaming and well-being. However, we should be cautious with respect to the role of Otaku contents as moderation was found in the post hoc analysis. Nevertheless, the finding of moderation effects when the viewing time of the priming stimulus is short is in line with the nature of priming. It should also be noted that these findings were obtained after controlling for the Big Five traits. Therefore, these personality traits are not third variable confounds for the present pattern of findings.

## 4 General Discussion

This study introduced mindfulness and Otaku contents as potential moderators revealing salutary effects of daydreaming. Study 1 was a survey with a large adult sample, and revealed that those high on either the non-judging facet of mindfulness or Otaku consumption, but not both, showed a positive relationship between daydreaming and subjective well-being. Those low on both non-judging and Otaku consumption showed a negative relationship between daydreaming and psychological well-being. Study 2 used priming of Otaku contents together with dispositional mindfulness. Higher mindfulness revealed a positive relationship between daydreaming and life satisfaction, when the participant was not primed with Otaku content. Otaku priming paired with a short viewing time revealed a positive relationship between daydreaming and life satisfaction/positive mood.

### 4.1 Theoretical Significance

Although the interaction between mindfulness and daydreaming in this study may seem to contradict previous findings of an antithetical relation between the two constructs, we might say that we can be mindfully aware of both internal and external information (Brown and Ryan 2004). This assumption is, in part, based on the notion that the brain network for cognitive control (frontal parietal network) is connected to the central network for mind-wandering (default mode network) in addition to that for external information (dorsal attention network) (Smallwood et al. 2012). Therefore, we introduced the possibility of “mindful daydreaming.” Supporting this idea, Gerlach et al. (2014) found that the default mode network and frontal parietal network work in concert to simulate processes to reach personal goals. In addition, compared with novices, experienced meditators (> 10 years) have shown stronger functional connectivity between default mode network seed regions and the dorsolateral prefrontal cortex (Brewer et al. 2011). Further, Golchert et al. (2017) found intentional (deliberate) mind-wandering is associated with the strong integration between the brain network for cognitive control and that for internal processing. Effective communication between these networks may enable more intentionally controlled daydreaming. These pieces of evidence collectively suggest that mindfulness may enhance the beneficial effects of daydreaming. Future studies employing the measure of intentional/unintentional mind-wandering (Seli et al. 2015) will be revelatory in interpretations of the present findings.

Brain networks related to mind-wandering and mindfulness, have also been found to be involved in subjective well-being, further corroborating the present results. Kringelbach and Berridge (2017) demonstrated that the pleasure system is included in the default mode network. This suggests that brain areas related to self-processing are also related to subjective well-being, which is consistent with our finding of the moderated positive relations

between daydreaming and subjective well-being. Our finding, together with the finding of Kringelbach and Berridge (2017), suggest that one can enjoy daydreaming. Otaku consumers are considered especially good at this. Furthermore, Shi et al. (2018) found that individuals with higher subjective well-being spend less time in a brain state in which information transfer between networks is less efficient, that is, indexed by weak connectivity between networks (default mode, frontal parietal, and saliency network). The importance of information flow between networks is consistent with the present finding that mindfulness revealed a positive correlation between daydreaming and well-being, as mindfulness enhances communication between brain networks (Brewer et al. 2011).

How can we integrate the obtained interaction between mindfulness and daydreaming with previous findings indicating a negative relation between the two constructs (e.g., Mrazek et al. 2013)? Study 1 found that the direction and magnitude of correlations between mindfulness and daydreaming differed across FFMQ facets and total scores ( $r = -.30$  to  $+.27$ ), and did not have a straightforward, antithetical relationship. These apparent differences can be explained by the multi-dimensional nature of both constructs. First, Mrazek et al. (2013) only measured mind-wandering as off-task thoughts during tasks, whereas daydreaming is not confined to off-task thoughts. Second, previous studies (Mrazek et al. 2012; Stawarczyk et al. 2012) used a measure capturing only one facet of mindfulness—awareness of ongoing experiences. The FFMQ subscale capturing this dimension, acting with awareness, was indeed negatively related to daydreaming in Study 1 ( $r = -.30$ ).

While we expected that the facets of mindfulness reflecting monitoring and control (acting with awareness) would also reveal positive effects of daydreaming, our results indicated that non-judgmental attitudes moderated the relation between daydreaming and well-being. Although present-moment awareness and non-judgmental acceptance are considered to represent two different aspects of mindfulness (Bishop et al. 2004; Tran et al. 2013), a recent review proposed that these two facets work in tandem to enhance detection of subtle changes in one's state, to in turn enhance executive control (Teper et al. 2013). Therefore, the observed moderation by non-judgmental attitudes is not necessarily at odds with the postulated role of monitoring. However, the present results suggested the need for deeper investigation of the quality or attitudes of awareness. A non-judging attitude may confer kindness toward inner experience (Hollis-Walker and Colosimo 2011) and allow one to enjoy daydreaming, without being critical of oneself for being not focused on external events (Carciofo et al. 2017). We believe that we obtained a pioneering result consistent with the possibility of "mindful daydreaming," and such preliminary finding is of value considering the novelty of this idea.

In addition, Otaku contents (consumption or priming) enhanced the relationship between daydreaming and well-being. Having favorite contents to draw upon or a greater ease of maintaining daydreaming may enhance joy derived from daydreaming. The rich database of Otaku consumers may provide them with efficiency in enjoying daydreaming of favorite contents.

## 4.2 Limitations

One of the limitations of the present study is the reliance on self-report. However, evidence indicates convergence of self-report and performance-based mind-wandering (Mrazek et al. 2012; Stawarczyk et al. 2012). In addition, there is considerable evidence supporting the psychometric properties of the FFMQ (Christopher et al. 2012; de Bruin et al. 2012).

Furthermore, its relation to brain structure (gray matter volume) has been demonstrated (Murakami et al. 2012), suggesting that there are objective psychobiological correlates of self-reported mindfulness. Finally, subjective evaluation of happiness is an essential aspect of well-being (Diener et al. 2003).

Another limitation of both studies is that the time trajectory of daydreaming and the influence of the moderator on the same are not clear. We cannot be certain that those high on both daydreaming and mindfulness at the trait level experience states in which they are mindfully aware of their daydreaming, that is, mindfully daydreaming. However, we believe to have obtained results consistent with the possibility of mindful daydreaming. Future studies may examine how the current set of predictors interacts moment-to-moment via experience sampling and/or longer-term changes in happiness in a longitudinal design. In addition, experimental induction (training) of being mindfully aware of daydreaming may further elaborate the present findings.

Finally, although Otaku contents go beyond valence (Welz et al. 2018), future/past tense, or self-reference (Ruby et al. 2013), and have shed light on daydreaming with self-selected contents, it is only one of the candidates of daydreaming contents. Future studies may employ experience sampling or diary keeping to explore wider daydreaming contents and propose an overarching classification scheme.

### 4.3 Conclusions

The relationship between daydreaming and well-being were examined in a large adult sample, with mindfulness and Otaku consumption explored as potential moderators. Those who were high on either mindfulness (especially non-judging) or Otaku consumption showed a positive relationship between daydreaming and life satisfaction. Those low on both non-judging and Otaku consumption showed a negative relation between daydreaming and psychological well-being. In addition, Otaku priming under a short priming viewing time revealed a positive relationship between daydreaming and life satisfaction/positive mood. A non-evaluative stance toward experience may enhance enjoyment of wider mental contents, whereas Otaku consumption may help with generating favorite fantasies.

These findings have implications for finding ways to enhance well-being via internal mental activities. In addition, our findings may provide clues to understanding the architecture underpinning mental processes of daydreaming, which occupies a large part of our life.

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### Compliance with Ethical Standards

**Conflict of interest** There are no conflicts of interests to declare.

**Ethical approval** All procedures performed in the studies involving human participants were in accordance with the ethical standards of the institutional research committee and the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed consent** Informed consent was obtained electronically from all individual participants included in the study.



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