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Redefining Snacking as a Piece of Daily Happiness: A Randomized Controlled Trial of Engagement in *Oyatsu* Activities for Improving Well-Being

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ABSTRACT

Background: Today, mental illness is one of the most serious social issues in Japan. To proactively prevent psychological disorders and improve and maintain well-being, each individual must take action and engage in small yet significant daily activities for their well-being on a daily basis. The purpose of this study was to investigate if our daily engagement in *oyatsu* activities, sharing and giving snacks, can enhance hedonic and eudaimonic well-being. **Methods:** We conducted a randomized controlled, open-label, parallel-group comparative design trial. Participants were recruited from a community website run by a snack company in Japan. Participants who were 20 years old or older without currently experiencing physical or mental illnesses were included. The participants in the intervention group ($n = 152$) were instructed to do *oyatsu* activities, defined as sharing or giving snacks to others, for one month intentionally, while the participants in the control group ($n = 154$) were not given any instructions. Hedonic or subjective well-being (SWB) was measured using the Scale of Positive and Negative Experience (SPANE) and Satisfaction with Life Scale (SWLS), and eudaimonic well-being was measured by the Flourishing Scale (FS). A one-way independent t -test was conducted to determine statistically significant differences in the degree of improvement of the scores between the intervention and the control groups. **Results:** The primary outcome was the difference in change in FS scores from baseline to one-month follow-up between the groups, and the secondary outcome was the difference in change in SWLS and SPANE scores. We found a significant between-group difference in the improvement in FS score from baseline to one-month follow-up ($t(280) = 2.235, p = 0.03$), as well as SPANE-P ($t(280) = 3.514, p < 0.001$), SPANE-N ($t(282) = -2.651, p = 0.01$) and SWLS ($t(281) = 2.842, p = 0.01$). **Conclusions:** Engaging in *oyatsu* activities might improve hedonic and eudaimonic well-being partly due to the prosocial nature of *oyatsu* activities.

KEYWORDS

Snacking; subjective well-being; eudaimonic well-being; prosocial behaviors



Introduction

Today, mental illness is one of the most serious social issues in Japan. According to the Ministry of Health, Labour and Welfare, approximately 4,193,000 people are suffering from psychological disorders in Japan [1]. Considering this large number, it is of paramount importance for each citizen to prioritize their mental health. This entails proactively cultivating awareness and tending to their well-being in their daily lives.

When it comes to well-being, there are two major concepts in the field of positive psychology: hedonic well-being or Subjective Well-Being (SWB) and eudaimonic well-being [2]. Hedonic well-being focuses on emotional aspects of well-being (i.e., increased positive emotions and reduced negative emotions), along with subjective evaluation of one's global life satisfaction. Whereas eudaimonic well-being centers on actualizing one's potential, fostering positive relationships with others, and having a purpose in life [2]. Previous literature shows that both hedonic and eudaimonic well-being can be improved through prosocial behaviors, since these behaviors not only increase positive emotions in the givers by providing a sense of satisfaction but also enhance their sense of meaning in life as well and build positive relationships [3–5]. To proactively prevent psychological disorders and improve and maintain well-being, each individual must take action and engage in small yet significant daily activities for their hedonic and eudaimonic well-being on a daily basis.

One example of common daily activities in Japanese society is “Kanshoku (間食).” Kanshoku means “eating between meals” for energy intake; most people often eat snacks for kanshoku [6]. Since people would often partake in kanshoku between 2 to 3 pm, it became customary to refer to the practice of kanshoku as “*oyatsu*,” named after this specific period (Yatsu-doki) which was prevalent during the Edo period [6]. Over time, the concept of *oyatsu* has expanded to not only include eating snacks between meals for energy intake but also as a pick-me-up when feeling down or tired [7,8], or for promoting social interaction and communication [9,10]. This is achieved through the sharing and giving of snacks, which fosters a warm atmosphere filled with smiles. Although there are times when people eat snacks alone, there are also times when people eat *oyatsu* with others, involving social interactions. We can say that engagement in *oyatsu* activities, which refer to small daily activities such as sharing snacks with others, giving snacks to others, and acquiring information about the snacks' background, can foster a sense of closeness to the snacks' manufacturers. Engaging in *oyatsu* activities is different from the mere act of eating snacks because it involves emotional interactions with others. In this sense, *oyatsu* activities are similar to the Swedish “fika” break [11]. Since engagement in *oyatsu* activities can involve interaction with others, we can infer that *oyatsu* activities can bring a positive ambiance to social interactions, which has the potential to enhance well-being in a small yet meaningful way on a day-to-day basis.

While Hurling et al. [12] demonstrated that eating and sharing ice cream can boost positive emotions (i.e., hedonic

aspect of well-being) and several previous literatures have demonstrated the relationship between eating snacks and emotional well-being [7,8,13,14], there are currently few studies investigating the effect of engaging in *oyatsu* activities on the eudaimonic aspect of well-being.

Therefore, the primary research purpose of this study is to examine whether partaking in *oyatsu* activities has any impact on the eudaimonic aspect of well-being. We also aim to explore the effect of engagement in *oyatsu* activities on hedonic well-being as a secondary purpose. As mentioned above, engagement in *oyatsu* activities refers to small daily activities such as sharing snacks with others, giving snacks to others, and acquiring information about the snacks' backgrounds which fosters a sense of closeness to the snacks' manufacturers. These three daily activities are commonly observed in our everyday lives and are easily achievable. If these simple and commonplace actions hold the potential to enhance both hedonic and eudaimonic well-being in our daily lives, they could offer a promising avenue for preventing mental health issues.

Our hypothesis is that engagement in *oyatsu* activities can enhance eudaimonic well-being among the participants in the intervention group. This improvement may stem from the development of warm and close relationships facilitated by sharing snacks. Regarding hedonic well-being, we hypothesized that engagement in *oyatsu* activities can also increase positive emotions or hedonic well-being because people identify eating as a pleasure-induced activity [15].

Materials and Methods

Design

A randomized controlled, open-blind, parallel-group comparative design was used for this study. This trial has been registered with UMIN-CTR number UMIN000049783.

Recruitment procedure

Participants were recruited through an online announcement of this study on “Angel PLUS,” a community website run by Morinaga & Co., Ltd., (Japan) between 21 December 2022, and 04 January 2023. 4309 people showed interest in participating. The study was approved by the Institutional Review Board of Non-Profit Organization MINS Research Ethics Committee (IRB number: MINS-REC-220235). All participants signed the online informed consent in this study. The sample selection criteria are shown in Table 1.

Since the aim of this study was to explore the effectiveness of *oyatsu* activities on hedonic and eudaimonic well-being among adults, individuals below the age of 20 were excluded from participation. Those who were experiencing physical illnesses and/or psychological disorders during the study period were also excluded because these conditions could have become confounding factors. In addition, since the study involved snacks and sweets, those with fasting blood glucose levels indicative of diabetes (exceeding 125 mg/dL) were also excluded from this study for their health. Furthermore, those who anticipated undergoing significant lifestyle changes during the study period (e.g., transitioning into night shift

TABLE 1

Participants' selection criteria

20 years old and over
Not currently experiencing physical illness and/or psychological disorders
Without fasting blood glucose levels indicative of diabetes (exceeding 125 mg/dL)
Not anticipating significant lifestyle changes during the study period (e.g., transitioning into night shift work, going on a long-term trip, childbirth, or marriage)

work, going on a long-term trip, childbirth, or marriage) were also excluded since these changes could potentially serve as confounding factors. Among 4309 people who showed interest in participating, 3330 met the entry criteria.

Concerning the sample size, we targeted 300 participants for this study. Employing a closed testing procedure, we utilized an independent *t*-test to assess the degrees of improvement in Flourishing Scale (FS) scores between groups. Given the absence of relevant previous literature on the effectiveness of *oyatsu* activities on the Flourishing Scale score, we set the significance level (α) at 0.05, the medium effect size at 0.4, the power at 0.8, the standard deviation at 1, the group allocation at 1:1 for a two-sided test, adhering to Cohen's conventions for sample size calculation. The calculation yielded a sample size of 198. To account for potential participant attrition during the study and within-group analyses, we initially determined 300 as our target sample size, but the final number of participants ended up being 306.

Trial procedure

First, eligible, consenting participants were registered. After obtaining online consent and personal information, we allocated them into 24 groups, using stratified random sampling based on their age groups and gender (e.g., male in their 20's, female in their 30's) on a first-come-first-served basis, ensuring a 1:1 group allocation in order to maintain an equivalent ratio of age and gender between the groups. Approximately 25 participants were randomly chosen from each group. Then, the selected participants who met the entry criteria provided online informed consent and were randomly assigned into either the intervention or control group. The allocation was concealed beforehand from researchers involved in the intervention and data analysis. The randomization results were not reported to the participants. Enrollment continued until accrual of the necessary number of participants was reached, following which baseline questionnaires were administered to all the participants (T1).

Once snacks were delivered to all participants between 06 and 08 February 2023, participants in the intervention group were instructed to take a 15-min session on engagement in *oyatsu* activities. They then completed a second questionnaire immediately after the session (T2) and completed a third and fourth questionnaire two weeks and one month after the session (T3 and T4, respectively). Participants were instructed to engage in one *oyatsu* activity

at least once per week during the T2 to T4 periods. In contrast, the participants in the control group were solely instructed to consume snacks. Subsequently, all participants, including those in the control group, completed identical questionnaires at T2, T3, and T4. The flowchart is shown in Fig. 1.

Intervention

As previously mentioned, we defined engagement in *oyatsu* activities as three actions: giving snacks to others, sharing snacks with others, and learning about the snacks' backgrounds. Learning about the snacks' backgrounds involved understanding the intentions and wishes of the product developers, which allowed the participants to form an emotional connection with them. First, the participants in the intervention group spent approximately 15 min acquiring knowledge about the backgrounds of four different kinds of snacks (chocolate, ice cream, peanut cookies, sweet potatoes) via online videos and/or columns on the "Angel PLUS" website. Subsequently, they received the mentioned snacks from Morinaga and were instructed to give or share them with others at their discretion over the next few days. For the following month, participants were instructed to do one of the activities (giving, sharing, or learning about the snacks' backgrounds), that felt more natural to incorporate into their daily lives and to continue doing it intentionally. They were also allowed to use snacks they bought on their own. The participants in the control group also received snacks from Morinaga but received no instruction to engage in *oyatsu* activities. The participants in the control group were also interested in snacks or *oyatsu*, as they were members of "Angel PLUS" as well.

Outcome measures

Flourishing Scale (FS). Eudaimonic well-being was assessed using the Flourishing Scale, which measures psychosocial flourishing based on contemporary theories of psychological and social well-being [16]. This concept of social-psychological prosperity encompasses elements such as purpose and meaning, supportive relationships, engagement, contribution to others, competence, optimism, being respected, and being a good person. This scale was developed by the researchers who primarily studied hedonic or subjective well-being in order to assess eudaimonic aspect of well-being [16]. The eight items are rated on a seven-point Likert scale (ranging from 1–7, with a total range of 7–56), where higher scores indicate greater psychological flourishing. The scale had high Cronbach's alpha coefficients

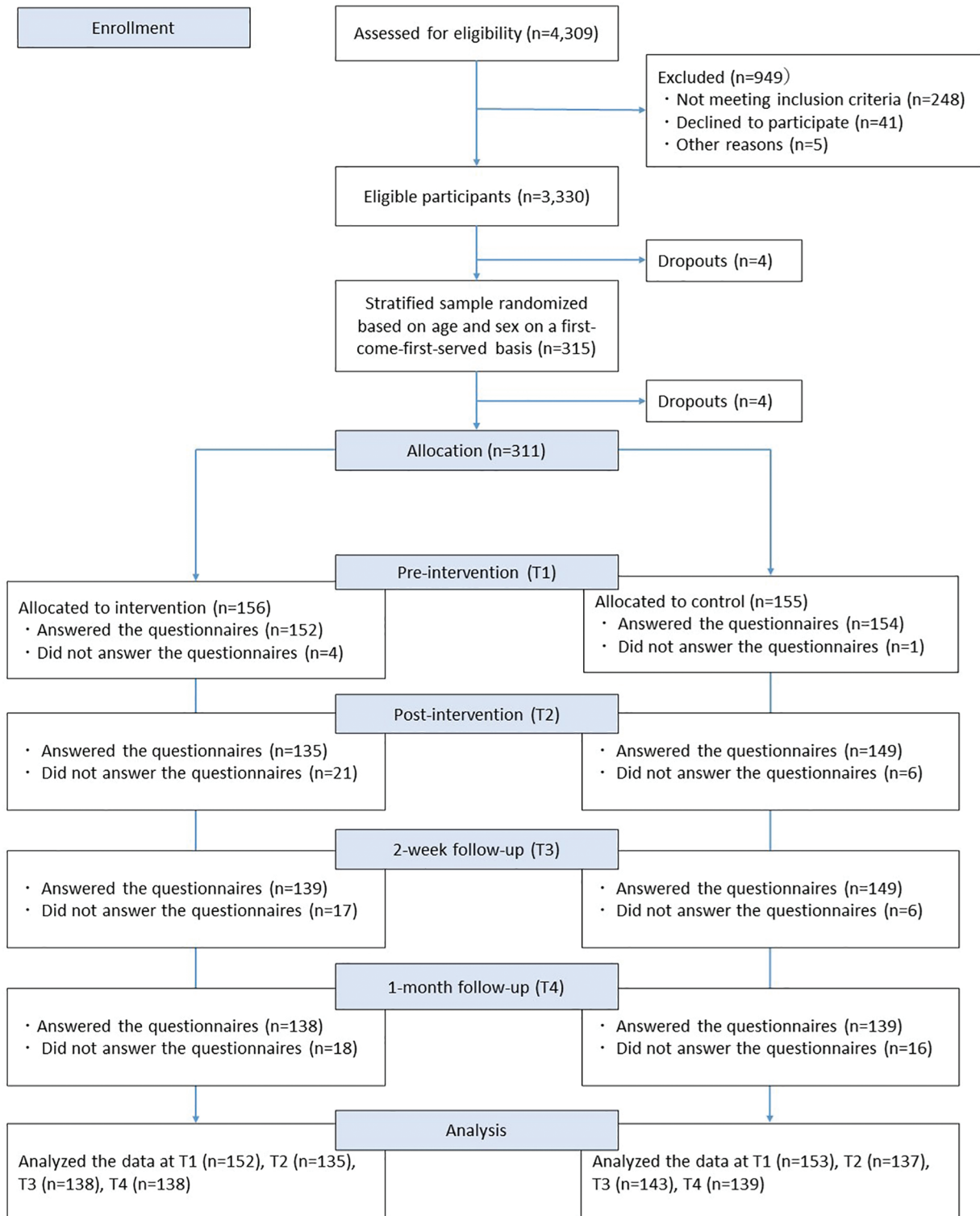


FIGURE 1. Flowchart.

(0.95) of internal consistency reliability in the Japanese version [17].

Scale of Positive and Negative Experience (SPANE). The SPANE was utilized to assess participants' subjective feeling of well-being and ill-being by asking people to report their broad range of pleasant and unpleasant feelings [16]. The SPANE comprises 12 items: six items evaluate positive feelings (SPANE-P) using a five-point Likert scale (ranging from 1–5, total range 6–30), and the remaining six items assess negative feelings (SPANE-N) (ranging from 1–5, total

range 6–30). The sub-scales in the Japanese version exhibited robust internal consistency ($\alpha = 0.88–0.91$) and demonstrated acceptable convergent validity through correlations with scores for life satisfaction, subjective happiness, optimism, pessimism, positive and negative affect, depression, anxiety, and psychological stress [17].

Satisfaction with Life Scale (SWLS). The Satisfaction with Life Scale is a widely used psychological assessment designed to assess an individual's overall cognitive judgment of their life satisfaction. It consists of five items that assess a person's

global satisfaction rather than focusing on specific life domains such as work, health, or relationships [18]. The questionnaire employs a seven-point Likert scale (ranging from 1–7, total range 5–35), where higher scores indicate greater life satisfaction [18]. In this study, we utilized the Japanese version translated by Sumino [19]. The Japanese scale demonstrated satisfactory test–retest reliability ($r = 0.80$) over four weeks [19].

Personal information. Personal information and demographics of participants were examined. These included gender, age, marital status, number of children, employment status, and annual incomes since gender [20], age [20], marital status [21], employment status [22], annual income [23–25] and child-rearing [26] are associated with well-being.

Statistical Analysis

Initially, a descriptive analysis was used to illustrate the sociodemographic characteristics of the participants. Then, the difference-in-differences method was applied. Subsequently, a one-way independent *t*-test was conducted to determine statistically significant differences in the degree of improvement of FS, SPANE, and SWLS scores from T1 to T2, T1 to T3, and T1 to T4, respectively, between the

intervention and the control groups. Within the intervention group, analyses of variation (ANOVA) were used to determine any significant differences in the improvement of FS, SPANE, and SWLS scores from T1 to T4, based on factors such as the activity which the participants considered most effective for their well-being, the frequency of that activity, and the number of activities they experienced. In order to identify the impact of annual incomes on the improvement of FS, SPANE and SWLS from T1 to T4, we conducted a multiple regression within the intervention group. $p < 0.05$ was set as the threshold of significance for all analyses, which were performed using SPSS version 29 for Windows (SPSS Inc., Chicago, IL, USA). A threshold *p*-value of 0.05 was used to determine statistical significance.

Results

Group characteristics are summarized in Table 2 along with the sociographic characteristics between the intervention group and the control group.

Participants' mean FS, SPANE, and SWLS scores at each time point are shown in Table 3. There was no statistical difference in the baseline (T1) of each score of FS ($p = 0.63$), SPANE-P ($p = 0.86$), SPANE-N ($p = 0.84$), and

TABLE 2

Participants' sociodemographic characteristics. FS, SPANE, and SWLS scores at baseline

Variables	Intervention (n = 152)		Control (n = 154)		<i>p</i>
	n	%	n	%	
Gender	–	–	–	–	0.74
Female	87	55.8	91	58.7	–
Male	65	41.7	63	40.6	–
Age	–	–	–	–	0.60
20's	23	14.7	24	15.5	–
30's	29	18.6	21	13.5	–
40's	27	17.3	32	20.6	–
50's	28	17.9	27	17.4	–
60's	23	14.7	27	17.4	–
70's	22	14.1	23	14.8	–
Marital status	–	–	–	–	0.45
Single	34	21.8	36	23.2	–
Married	108	69.2	113	72.9	–
Others	10	6.4	5	3.2	–
Employment status	–	–	–	–	0.96
Yes	90	57.7	106	68.4	–
No	62	39.7	48	31.0	–
Annual income (yen/year)	–	–	–	–	0.13
<2 million	13	8.6	12	7.8	–
≥2 million, <6 million	72	47.4	76	49.4	–
≥6 million, <10 million	50	32.9	48	31.2	–
≥10 million	17	11.2	18	11.7	–

Note: Missing data: Intervention Group; Gender (n = 4), Age (n = 4), Marital Status (n = 4), Employment (n = 4), Annual Income (n = 4). Control Group; Age (n = 1), Marital Status (n = 1), Employment (n = 1) Annual Income (n = 1). FS: Flourishing Scale; SPANE-P: Scale of Positive and Negative Experience-P, SPANE-N: Scale of Positive and Negative Experience-N, SWLS: Satisfaction with Life Scale. $p < 0.05$.

TABLE 3

Participants' mean FS, SPANE, and SWLS scores at each time point

	Time point	Intervention				Control			
		T1	T2	T3	T4	T1	T2	T3	T4
		n	152	135	138	138	153	137	143
FS	Mean	39.01	39.68	40.17	40.17	38.59	38.33	38.76	38.50
	(SD)	(7.35)	(7.22)	(7.07)	(7.07)	(7.83)	(8.67)	(8.43)	(8.85)
	Range	12–54	8–53	8–53	0–56	13–56	9–56	8–56	9–56
SPANE-P	Mean	20.20	21.00	21.33	21.63	20.29	20.29	20.34	20.43
	(SD)	(4.63)	(4.74)	(4.33)	(4.84)	(4.95)	(5.20)	(5.23)	(5.17)
	Range	6–30	6–30	6–30	6–30	6–30	6–30	6–30	6–30
SPANE-N	Mean	16.22	15.40	14.36	14.71	16.34	15.98	15.83	16.05
	(SD)	(4.84)	(4.89)	(4.78)	(5.53)	(5.31)	(5.42)	(5.55)	(5.46)
	Range	6–29	6–29	6–27	0–30	6–30	6–30	6–30	6–30
SWLS	Mean	19.81	21.07	21.22	21.10	20.21	20.54	20.46	20.44
	(SD)	(6.87)	(6.79)	(6.39)	(7.19)	(6.77)	(6.90)	(7.23)	(7.14)
	Range	5–35	5–34	5–34	0–34	5–35	5–35	5–35	5–35

Note: FS: Flourishing Scale; SPANE-P: Scale of Positive and Negative Experience-P, SPANE-N: Scale of Positive and Negative Experience-N, SWLS: Satisfaction with Life Scale, SD: Standard Deviation. T1: Pre-Intervention (baseline), T2: Post-Intervention, T3: 2-Week Follow-up, T4: 1-Month Follow-Up.

SWLS ($p = 0.61$). Regarding attrition, it occurred at random. The FS scores at each time point for both groups are shown in Fig. 2.

The results of the independent t -test of the degrees of the improvement of the mean FS, SPANE, and SWLS scores from T1 to T2, T1 to T3, T1 to T4 between the intervention and control groups are shown in Table 4.

There was a statistically significant difference in the degrees of improvement of FS score from T1 to T4 between the groups, but not from T1 to T2 and T1 to T3. Regarding the degrees of improvement of SPANE-P and SWLS scores, there were significant differences between the groups from T1 to T2, T1 to T3, and T1 to T4. There was no difference in the degree of improvement of SPANE-N scores between the groups from T1 to T2, but there were the differences from T1 to T3 and T1 to T4.

Within the intervention group, there was no statistically-significant difference in the degrees of improvement of FS score from T1 to T4 according to the activity type [$F(3, 132) = 1.753, p = 0.159$], the frequency of the activity

[$F(2, 126) = 0.751, p = 0.474$], and the number of the activities engaged in by participants [$F(3, 132) = 0.908, F = 0.439$].

Furthermore, since a number of studies indicate that annual incomes and socioeconomic status are associated with well-being and life satisfaction [23–25], we conducted a multiple regression analysis to examine how annual income affects the improvement of FS, SPANE-P, SPANE-N, and SWLS from T1 to T4 among the participants in the intervention group with gender, age, marital status, children, employment, and annual incomes as independent variables. The multiple regression analyses showed that there was no significance difference in the degree of improvement of FS ($\beta = -0.07, p = 0.41$), SPANE-P ($\beta = -0.10, p = 0.26$), SPANE-N ($\beta = 0.11, p = 0.207$), and SWLS ($\beta = -0.02, p = 0.79$) according to annual incomes.

Discussion

This present study investigated the effectiveness of engagement in *oyatsu* activities on both hedonic and eudaimonic well-being and revealed that engaging in *oyatsu* activities improved both hedonic ($p < 0.001$) and eudaimonic well-being ($p < 0.03$) for at least one month irrespective of the kind of *oyatsu* activity engaged in by participants. This result is striking given that most of the previous literature focused on the relationship between the effect of eating snacks and the hedonic aspect of well-being. To understand this finding, we suggest several possible explanations underlying this result.

First, in contrast to the basic act of snacking, engagement in *oyatsu* activities involves prosocial behaviors such as sharing snacks with others, which can improve eudaimonic well-being. Prosocial behavior is defined as any behavior that is intended to benefit another person or persons [27].

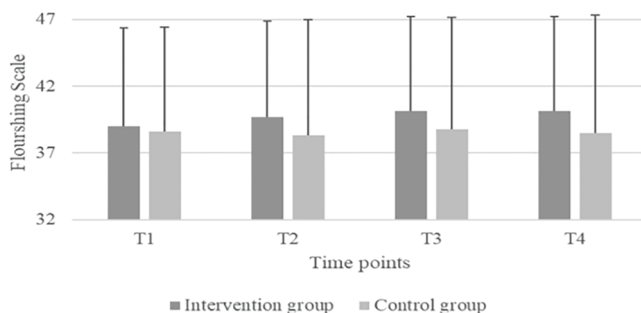


FIGURE 2. The mean FS scores of each time point in the intervention and control groups.

Note: FS: Flourishing Scale. T1: Pre-Intervention (baseline), T2: Post-Intervention, T3: 2-Week Follow-Up, T4: 1-Month Follow-Up.

TABLE 4

Results of the independent *t*-tests on the degree of the improvement of mean FS, SPANE, SWLS scores from T1 to T2, T1 to T3, and T1 to T4 between the intervention and control groups

Variables	Time points	<i>t</i>	<i>df</i>	<i>p</i>
FS	T1 to T2	1.556	278	0.12
	T1 to T3	1.598	281	0.11
	T1 to T4	2.235	280	0.03*
SPANE-P	T1 to T2	2.108	2278	0.04*
	T1 to T3	2.537	281	0.01*
	T1 to T4	3.514	280	<0.001*
SPANE-N	T1 to T2	-1.104	277	0.27
	T1 to T3	-2.892	281	0.01*
	T1 to T4	-2.651	282	0.01*
SWLS	T1 to T2	2.520	278	0.01*
	T1 to T3	2.694	281	0.01*
	T1 to T4	2.842	281	0.01*

Note: FS: Flourishing Scale; SPANE-P: Scale of Positive and Negative Experience-P, SPANE-N: Scale of Positive and Negative Experience-N, SWLS: Satisfaction with Life Scale. **p* < 0.05.

There is a positive correlation between prosocial behaviors and eudaimonic well-being. For example, Nelson et al. [28] indicated that performing acts of kindness for others can improve the psychological flourishing of the actor more than acts of kindness for oneself. The systematic review and meta-analysis of the effect of performing acts of kindness on well-being also demonstrate that acts of kindness for others can improve well-being [29]. Furthermore, prosocial behaviors can promote social connection. When you give, you are more likely to receive in return and this reciprocity can promote a sense of trust and reinforce positive relationships, which are critical components of eudaimonic well-being. Since the nature of engagement in *oyatsu* activities contains prosocial behaviors and the participants in the control group were also interested in the act of snacking, the participants in the intervention group may have improved eudaimonic well-being by the act of giving.

In addition to the effect of engagement in *oyatsu* activities on improved eudaimonic well-being, this study demonstrated that engagement in *oyatsu* also improved hedonic or subjective well-being among the participants in the intervention group. The act of eating sweets or snacks can, by itself, generate positive emotions [7,8,12,13], but it is possible that prosocial behaviors may have also contributed to improve hedonic or subjective well-being since the act of giving can make givers happy [30]. Raposa et al. [31] indicated that people who engage in prosocial behaviors are more likely to experience better moods. Dunn et al. [32] also reported that giving money to someone else lifted participants' happiness more than spending it on themselves. When it comes to the context of snacks, Hurling, et al. noted that both eating ice cream and giving ice cream to others can improve subjective well-being [12]. The act of giving can increase SWB of the givers regardless of whatever is given.

It is worth noting that eudaimonic well-being improved over time among the participants in the intervention group.

There was no statistically significant difference in the degree of improvement of psychological flourishing between the intervention and control groups for the first two weeks from T1 to T2 and T1 to T3, but a significant difference was identified during one-month follow-up point from T1 to T4. A similar phenomenon (i.e., psychological flourishing improving over time through performing prosocial behaviors) was also observed in other study [28]. Nelson et al. asserted that a plausible explanation for this phenomenon could be that engaging in prosocial behaviors induces positive emotions in the givers [28]. These positive emotions may then initiate an upward spiral leading to greater overall well-being, facilitating the enhancement of social relationships with others, as proposed by the broad-and-build theory of positive emotions [33]. The result of the present study might be explained by this upward spiral of positive emotions, particularly since improvement of positive emotions was clearly observed at an early stage in this study.

Furthermore, the present study revealed that both hedonic and eudaimonic well-being improved regardless of participants' annual incomes in the intervention group. Many studies indicated the correlation between annual incomes and well-being [24,25] as well as socioeconomic status and life satisfaction [23]. However, we could not identify any differences in the improvement of participants' well-being in the intervention group based on their annual incomes. Since snacks are not considered a luxury, engaging in *oyatsu* activities may have the potential to enhance both hedonic and eudaimonic well-being in daily life across various socio-economic backgrounds.

As a limitation of this study, we were able to follow up on participants' level of hedonic and eudaimonic well-being for only up to one month. The result might be changeable over time, so further research should include longer follow-ups to explore the sustainability of the effectiveness of engagement in *oyatsu* activities. Moreover,

all the participants were healthy, and those who had physical or psychological illnesses were excluded. Therefore, we cannot overgeneralize this finding or apply it to all people. Future research needs to include those who have physical ailments and/or psychological distress. Furthermore, since this study was conducted only in Japan, we could not identify the cultural significance of *oyatsu* activities based on this result. Since *Oyatsuas* are a concept that exists in different cultures with snacking traditions such as *fika* in Sweden, it would be interesting to conduct a comparative study to identify the cultural significance of *oyatsu* activities in future research. Lastly, the present study was conducted only with the participants who were interested in *oyatsu* itself, so another comparative study with those who are not interested in *oyatsu* might be needed to clarify this effectiveness.

In summary, we reveal that engagement in *oyatsu* activities has the potential to improve both hedonic and eudaimonic well-being in daily life. This study contributes to the understanding of how eating snacks affects well-being by focusing not only on the emotional or hedonic aspect of well-being but also by examining its effect on eudaimonic well-being. The practical implication is that daily *oyatsu* activities can provide opportunities to practice prosocial behaviors in a natural way, contributing not only to the individual's emotional well-being, but also promoting social interaction and strengthening positive relationships with others, which may gradually improve eudaimonic well-being.

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Availability of Data and Materials: The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics Approval: The study was approved by the Institutional Review Board of Non-Profit Organization MINS Research Ethics Committee (IRB number: MINS-REC-220235). All participants signed the online informed consent in this study.

Conflicts of Interest: The authors declare no conflicts of interest to report regarding the present study.

References

1. Ministry of Health, Labour and Welfare. Report of the committee for the realization of mental health and medical welfare system that enables people to live with peace in mind in the community. 2022 (In Japanese). Available from: <https://www.mhlw.go.jp/content/12200000/000940708.pdf>. [Accessed 2022].
2. Deci EL, Ryan RM. Hedonia, eudaimonia, and well-being: an introduction. *J Happiness Stud.* 2008;9(1):1–11. doi:10.1007/s10902-006-9018-1.
3. Huta V, Waterman AS. Eudaimonia and its distinction from hedonia: developing a classification and terminology for understanding conceptual and operational definitions. *J Happiness Stud.* 2014;15(6):1425–56.
4. Hui BPH, Ng JCK, Berzaghi E, Cunningham-Amos LA, Kogan A. Rewards of kindness? A meta-analysis of the link between prosociality and well-being. *Psychol Bull.* 2020;146(12):1084–116.
5. Martela F, Ryan RM. Clarifying eudaimonia and psychological functioning to complement evaluative and experiential well-being: why basic psychological needs should be measured in national accounts of well-being. *Perspect Psychol Sci.* 2023;18(5):1121–35.
6. Mainichi Newspaper. Etymological pilgrimage: Oyatsu (Shimo-Gyo Ward, Kyoto City): The temple bell that announces yatsudoki. 2021 (In Japanese). Available from: <https://mainichi.jp/articles/20210828/ddf/012/040/006000c>. [Accessed 2024].
7. Yamanaka K, Daimoto H, Hirakakiuchi I, Koriyama N, Sato R. Relation between the psychological effect of eating chocolate and the size of useful field of view. *Jpn J Ergon.* 2024;60(1):43–50 (In Japanese).
8. Sakurai H, Yamamoto C. Study into the psychological effects of sweet food: collection of basic data. *J Nagoya Bunri Univ.* 2023;23:109–14 (In Japanese).
9. Nakamura S, Miura A. Effects of snacking on communication behavior and subjective evaluation during discussion: does snacking produce more active discussion? *Humanit Rev.* 2014;64(2):59–77 (In Japanese).
10. Hida M. The effects of confectionery snack upon small group creative performance. *Bull Fac Hum Dev Cul Fukushima Univ.* 2017;25:39–48 (In Japanese).
11. Yngve A, Scander H, Almroth S. Taking a closer look at the Swedish coffee break, “fika”. *Int J Gastron Food Sci.* 2023;1(33):100775.
12. Hurling R, Linley A, Dovey H, Maltby J, Wilkinson J. Everyday happiness: gifting and eating as everyday activities that influence general positive affect and discrete positive emotions. *Int J Wellbeing.* 2015;5(2):28–44. doi:10.5502/ijw.v5i2.3.
13. Kasamaki J, Miyanishi K, Kasahara Y, Matsumoto H, Nishida J, Shibukura T. The correlation between snacking behavior and interpersonal stress in female university students: a longitudinal survey from first year to third year. *Health Behav Sci.* 2021;19(2):45–56 (In Japanese). doi:10.32269/hbs.19.2_45.
14. Tuck N, Farrow C, Thomas J. Frequency of fruit consumption and savoury snacking predict psychological health; selective mediation via cognitive failures. *Br J Nutr.* 2023;129(4):660–9. doi:10.1017/S0007114522001660.
15. Berenbaum H. Varieties of joy-related pleasurable activities and feelings. *Cogn Emot.* 2002;16(4):473–94. doi:10.1080/0269993014000383.
16. Diener E, Wirtz D, Tov W. New measures of well-being: flourishing and positive and negative feelings. *Soc Indic Res.* 2009;39:247–66. doi:10.1007/s11205-009-9493-y.
17. Sumi K. Reliability and validity of Japanese versions of the flourishing scale and the scale of positive and negative experience. *Soc Indic Res.* 2014;118(2):601–15. doi:10.1007/s11205-013-0432-6.

18. Diener E, Emmons RA, Larsen RJ, Griffin S. The satisfaction with life scale. *J Pers Assess.* 1985;49:71–5. doi:10.1207/s15327752jpa4901_13.
19. Sumino Z. Development of Japanese version of the Satisfaction with Life Scale (SWLS). *Annu Conv Japanese Assoc Educ Psychol.* 1994;36:192 (In Japanese). doi:10.20587/pamjaep.36.0_192.
20. Tiefenbach T, Kohlbacher F. Subjective well-being across gender and age in Japan: an econometric analysis. In: Eckermann E, editor. *Gender, lifespan and quality of life.* Dordrecht: Springer; 2014. p. 183–201.
21. Dochi M, Suwazono Y, Oishi M, Sakata K, Kobayashi E, Nogawa K. The relation between cumulative fatigue and marital status in Japanese workers. *Behav Med.* 2007;33(2):55–65. doi:10.3200/BMED.33.2.55-66.
22. Ohtake F. Unemployment and happiness. *Jpn Labor Rev.* 2012;9(2):59–74 (In Japanese).
23. Anderson C, Kraus MW, Galinsky AD, Keltner D. The local-ladder effect: social status and subjective well-being. *Psychol Sci.* 2012;23(7):764–71. doi:10.1177/095679761143453.
24. Kahneman D, Deaton A. High income improves evaluation of life but not emotional well-being. *Proc Natl Acad Sci U S A.* 2010;107(38):16489–93. doi:10.1073/pnas.1011492107.
25. Killingsworth MA. Experienced well-being rises with income, even above \$75,000 per year. *Proc Natl Acad Sci U S A.* 2021;118(4):e2016976118. doi:10.1073/pnas.2016976118.
26. Takehara K, Suto M, Kato T. Parental psychological distress in the postnatal period in Japan: a population-based analysis of a national cross-sectional survey. *Sci Rep.* 2020;10(1):13770. doi:10.1038/s41598-020-70727-2.
27. Dunfield KA. A construct divided: prosocial behavior as helping, sharing, and comforting subtypes. *Front Psychol.* 2014;5:958. doi:10.3389/fpsyg.2014.00958.
28. Nelson SK, Layous K, Cole SW, Lyubomirsky S. Do unto others or treat yourself? The effects of prosocial and self-focused behavior on psychological flourishing. *Emotion.* 2016;16(6):850. doi:10.1037/emo0000178.
29. Curry OS, Rowland LA, Van Lissa CJ, Zlotowitz S, McAlaney J, Whitehouse H. Happy to help? A systematic review and meta-analysis of the effects of performing acts of kindness on the well-being of the actor. *J Exp Soc Psychol.* 2018;76:320–9. doi:10.1016/j.jesp.2018.02.014.
30. Chancellor J, Margolis S, Jacobs Bao K, Lyubomirsky S. Everyday prosociality in the workplace: the reinforcing benefits of giving, getting, and glimpsing. *Emotion.* 2018;18(4):507–17. doi:10.1037/emo0000321.
31. Raposa EB, Laws HB, Ansell EB. Prosocial behavior mitigates the negative effects of stress in everyday life. *Clin Psychol Sci.* 2016;4(4):691–8. doi:10.1177/2167702615611073.
32. Dunn EW, Aknin LB, Norton MI. Spending money on others promotes happiness. *Science.* 2008;319(5870):1687–8. doi:10.1126/science.1150952.
33. Fredrickson BL, Joiner T. Positive emotions trigger upward spirals toward emotional well-being. *Psychol Sci.* 2002;13(2):172–5. doi:10.1111/1467-9280.00431.