**Gratitude and academic motivation among Japanese high school students: A nine-week gratitude journal intervention study**

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**Abstract**

Background

Gratitude interventions can positively impact student motivation and engagement. We assessed the effects of keeping a nine-week gratitude journal on the academic motivation of senior high school students.

Methods

The participants were thirty-four Japanese senior high school students who had already been admitted to a university at the time of the study. The students were divided into two groups; those assigned to the gratitude group were asked to keep a daily record of events that had made them feel grateful (gratitude journal), and those assigned to an active control group were asked to keep a record of events that evoked positive emotions in general (positive journal). The intervention lasted nine weeks and was part of an assignment aimed at advancing the students’ proficiency in English prior to the start of their first university year. The intervention’s effects on academic motivation were examined using a self-determination index derived from the scores obtained using the Academic Motivation Scale.

Results

While the academic motivation of students in the control group significantly worsened during the period of the intervention, the same decline was not observed among the students in the gratitude group.

Conclusions

The current results point to a specific effect yielded by continuous engagement with the emotion of gratitude. Although the journaling in both groups likely tapped into personal experiences of a largely positive valence, results showed that only continuous engagement with the emotion of gratitude had a protective effect against declines in academic motivation. This indicates that gratitude may have a distinct effect from other positive emotions on goal-oriented behavior in general and motivation in particular, and that students who cultivate the habit of engaging with the emotion of gratitude may see a positive impact on their motivation.

**Keywords**:

Gratitude, gratitude intervention, gratitude journal, academic motivation.

**Background**

Academic motivation is a multi-faceted construct, understood to be a primary factor in determining overall student satisfaction with curricular and extra-curricular activities, as well as a predictor of scholastic achievement and other educational outcomes (Howard, Bureau, Guay, Chong, & Ryan, 2021; Steinmayr & Spinath, 2009). However, adolescence is a period characterized by a decline in academic motivation (Gnambs & Hanfstingl, 2016; Gottfried, Fleming, & Gottfried, 2001; Legault, Green-Demers, & Pelletier, 2006), a phenomenon that can have profound implications for high school students about to begin their higher education. Amotivation, one of the three pillars of the motivation construct, together with intrinsic motivation and extrinsic motivation (Vallerand et al., 1992), is associated with lower levels of adjustment to university life and higher levels of perceived stress among second-year university students (Baker, 2004). Finding ways to ameliorate this condition is a major goal of research in educational psychology (Wigfield & Wentzel, 2007).

In this study, we examined changes in academic motivation among senior high school students associated with participation in a gratitude journal intervention. Interventions intended to enhance motivation among students can be an effective means of improving educational outcomes (Lazowski & Hulleman, 2016). Gratitude research in the field of psychology was pioneered by McCullough, Emmons, and Tsang (2002). Since then, gratitude intervention studies have yielded a host of positive outcomes, including, among other things, improvements in subjective well-being (Watkins, Uhder, & Pichinevskiy, 2015), enhancements in self-improving motivation among high school students (Armenta, Fritz, Walsh, & Lyubomirsky, 2020) and enhanced academic motivation among university students (Nawa & Yamagishi, 2021). The experimental research of Emmons and McCullough (2003) was significant, and the various studies on gratitude that followed it have produced several interesting results (Dickens, 2017). Nevertheless, more often than not, results have been mixed, indicating the need for a healthy dose of caution (Dickens, 2017; Wood, Froh, & Geraghty, 2010). In this study we developed a new perspective on both gratitude research and academic motivation research by (1) examining the effect of a gratitude intervention of a much longer duration (nine weeks) and intensity (daily activity) than the typical practice in previous gratitude intervention studies in the literature, and (2) clarifying the effect of a gratitude intervention on the academic motivation of a specific cohort of senior high school students, i.e., students who had already been accepted by a university but had yet to formally complete their high school studies.

**Literature review**

Self-determination theory (SDT; Deci & Ryan, 1985, 2000) is a major motivational theory, providing a theoretical framework that comprehensively captures motivation in various domains (see Okada, 2010, for a review). SDT assumes three motivational states: non-motivation (amotivation), extrinsic motivation, and intrinsic motivation. These motivational concepts, attached to a dimension of self-determinacy, have been used as a common framework across various domains, including, but not limited to, learning, sports, and interpersonal relationships (Vallerand & Ratelle, 2002). Many correlational studies have been conducted that adopt motivational measures, with the most significant of these studies exemplifying the importance of self-determined motivation and its association with adaptive outcomes in a variety of domains. For example, self-determined motivation has been found to enhance conceptual learning and inhibit intentions to drop out of school (Grolnick & Ryan, 1987; Vallerand, Fortier, & Guay, 1997). On the other hand, it remains to be established how self-determined motivation relates to gratitude, a point that the authors seek to rectify in the present study.

Although gratitude is a familiar concept from interactions in everyday life, it has recently gained traction as a scientific field in connection to the surge of research in the area of positive psychology (Peterson & Seligman, 2004), a field where human behavior is studied in terms of its relationship to thriving, in contrast to traditional psychology, which has been largely concerned with mental illness (Snyder & Lopez, 2002). In the positive psychology research literature, over time, gratitude has come to be specifically defined as a sense of thankfulness and joy in response to receiving a gift, whether the gift be a tangible benefit from a specific other, or a moment of peaceful bliss evoked by natural beauty (Emmons, 2004). The findings in the literature indicate that gratitude increases self-esteem (Kong & You, 2013), and has been positively associated with typical well-being indicators, such as life satisfaction (*r* = .53) and optimism (*r* = .51) (McCullough et al., 2002). However, one area of concern here is that much of the gratitude research hitherto has largely investigated adults, and that knowledge of how gratitude relates to youth, and adolescence in particular, is still in its infancy (Bono & Froh, 2009).

Previous studies of the relationship between learning theory and gratitude in young people have highlighted the positive effects of gratitude, including: greater peer, familial, and social support; greater optimism, which in turn leads to greater emotional support; and higher life satisfaction, specifically with regard to school, family, community, friends, and self (Froh, Yurkewicz, & Kashdan, 2009; Froh et al., 2011). More recently, it has been shown that gratitude interventions can directly affect self-report measures of academic motivation in university students (Nawa & Yamagishi, 2021).

**Objectives**

The main objectives of this study are:

1. To empirically demonstrate that increased awareness of the emotion of gratitude to others has a positive impact on academic motivation in a cohort of senior high school students.

2. To provide new suggestions from the perspective of gratitude research for future learning theory.

**Hypotheses**

Based on the above objectives, the study investigates the following hypotheses:

1. Maintaining a daily gratitude journal positively affects gratitude traits (as measured by the Gratitude Questionnaire (GQ-6). (Details about the scales employed in this study can be found in the Materials section below.)

2. Maintaining a daily gratitude journal impacts life satisfaction, as measured by the Satisfaction With Life Scale (SWLS), positive mood, as measured by the dimensions of the Profile of Mood States (POMS), and motivation toward academic activities, i.e., academic motivation, as measured by the Academic Motivation Scale (AMS).

**Methods**

***Participants***

The data were obtained from 34 Japanese high school seniors who had been accepted to attend a private university in the west of Japan by December 2018. The admission system for Japanese universities provides different routes for domestic students to be admitted to university; one of them is admission by recommendation, which secures a place for select students a few months before the general entrance examination takes place. Participants in the current study had all been admitted by recommendation at the time of the study. Usually, such students receive assignments from the university prior to the beginning of the university school year to ensure that they are academically well prepared. The data for the current study were procured as part of the English language assignment.

The study was performed in accordance with the ethical standards laid down in the Declaration of Helsinki and the research project was approved by the Department of Biotechnology, Ritsumeikan University. All participants provided informed consent prior to their inclusion in the study.

***Procedure***

A few days before the start of the interventions, a briefing session (Week 0) was held on campus with all participants. During the briefing, participants completed five assessments: NEO-FFI (personal trait), GQ6 (feeling of gratitude), SWLS (feeling of happiness), POMS 2 (positive mood), and AMS (academic motivation).

The participants were then randomly divided into two groups. They were not informed about the existence of different groups (sets of activities). Participants in the first group (the gratitude group) were requested to write each day in a gratitude journal, i.e., a record of things that they made them feel grateful for on that day. Participants in the second group (the control group) were asked to make daily entries in a positive journal, by writing about things that helped them feel more positive during the given day, with no specific mention of the emotion of gratitude.

From them on, all interaction with the students and their assigned activities were performed using the online system provided by the university or using social networking services. All the participants were Japanese native speakers but they were required to do the journaling in English, as part of their pre-college preparatory activities. The participants submitted the journals electronically on a weekly basis. No further constraints were imposed regarding the contents or length of their entries. The submissions were checked every week, and students who did not submit their entries were individually prompted online to increase the submission rate as much as possible. Participants were also requested to complete the items of the following assessments once a week, after the submission of their journal assignments (Weeks 1 to 9): GQ6, SWLS, POMS 2, and AMS.

The participants were asked to continue working on their diaries for nine weeks (from the end of December 2018 to March 2019). They were assured that all data would be kept confidential and only used in anonymized form for the purposes of scientific research. No financial compensation was included in the study.

***Materials***

*NEO Five-Factor Inventory (NEO-FFI)*

To ensure that no differences existed in terms of personality traits between the two groups, participants were asked to rate the items in the NEO Five-Factor Inventory (NEO-FFI, Costa & McCrae, 1992), and their scores were subsequently compared. The NEO-FFI is a shortened version of the NEO Personality Inventory-Revised, an empirically validated five-factor model of human personality (Chadyuk, 2015), and one of the most extensively applied models of personality currently in use (Spence, Owens, & Goodyer, 2012). The NEO-FFI describes individual differences in terms of five personality traits: Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness. This personality model has been used in both cross-sectional and longitudinal studies of populations of different ages and cultural backgrounds (De Fruyt et al., 2009; McCrae, Costa, & Martin, 2005; McCrae et al., 2000).

*Gratitude Questionnaire (GQ-6)*

The Gratitude Questionnaire (GQ-6) is a six-item scale used to assess individual disposition in experiencing the emotion of gratitude, conceptualized as an affective trait reflecting one’s tendency to notice and respond to the role of other people in giving rise to positive outcomes that benefit the self (McCullough et al., 2002; Japanese version: Kobayashi, 2013). GQ-6 scores have been found to be positively correlated to SWLS scores (Wood et al., 2008), subjective scores of happiness (Witvliet et al., 2019), and job satisfaction (Waters, 2012).

*Satisfaction With Life Scale (SWLS)*

The SWLS (Diener et al., 1985) consists of five items developed to measure satisfaction with life from a holistic perspective and beyond the influence of specific domains, such as health or finances. Satisfaction with life is thought to be a fundamental component of the construct of subjective well-being (Diener, 1984). The SWLS has been widely used in clinical and non-clinical populations in different cultural contexts (Pavot & Diener, 1993; Whisman & Judd, 2016).

*Profile of Mood States (POMS)*

The mood states of participants were assessed using a Japanese translation of the Profile of Mood States (POMS 2®, Second Edition, Adult Short Form, Kanekoshobo Inc., Tokyo, Japan), which was originally designed to assess individuals aged 13 years and older (Heuchert & McNair, 2012). The POMS uses self-rating scales to quickly assess transient and fluctuating feelings, as well as enduring affective states. The assessment is composed of six scales: Anger-Hostility (AH), Confusion-Bewilderment (CB), Depression-Dejection (DD), Fatigue-Inertia (FI), Tension-Anxiety (TA), and Vigor-Activity (VA), with higher values indicating greater intensity of the corresponding composite construct. Note that only the VA scale has positive valence; all the other scales have a negative connotation regarding the respondent’s mood. An aggregate score of total mood disturbance (TMD) can be computed based on the six values, with greater values indicating higher levels of disturbance. The individual POMS scales and the TMD score have been used in the past to monitor natural changes in mood states, as well as changes following an intervention in clinical, athletic, and psychological research settings (Bostock et al., 2011; Yoshioka et al., 2005; Yokoyama et al., 1990).

*Academic Motivation Scale (AMS)*

The AMS (Vallerand et al., 1992) draws heavily on the SDT proposed by Deci and Ryan (1985), which identifies “several distinct types of motivation” (Ryan & Deci, 2000) on a continuum ranging from amotivation and unwillingness to act to passive compliance, and then to active personal commitment. The AMS consists of 28 items subdivided into seven subscales assessing three types of intrinsic motivation (to gain knowledge, to accomplish things, and to experience stimulation), three types of extrinsic motivation (external, introjected, and identified regulation), and amotivation. The questions asked as part of academic motivation research (e.g., “Why do you go to college?”) are in accordance with this range of motivations. Thus, academic motivation can be understood as the motivation to decide to continue one’s university studies (Wilkesmann et al., 2012).

**Results**

Participants were divided randomly into two groups: 17 people were placed in the gratitude journal group, and 17 people in the positive journal group. Both groups were made up of predominantly male participants (for the gratitude group, male = 12; for the positive group, male = 11); however, potential differences in the responses given by male and female participants were not analyzed in the present study.

*NEO-FFI*

The NEO-FFI was used to characterize this particular cohort with regard to personality traits and to verify whether there were latent differences between groups in that respect prior to the intervention (even though, as mentioned before, participants were randomly assigned to each group). Because we did not expect personality traits to change in any substantial way over the duration of the intervention, the items of the NEO-FFI were only collected once (Week 0).

A two-way repeated measures ANOVA revealed a significant main effect for NEO-FFI factors (F(4, 128) = 28.674), p = 0.000), but no main effect was found for journal type (F(1, 32) = 0.315, p = 0.578). Moreover, no interaction was found between NEO-FFI factors and journal type (F(4, 128) = 0.234), p = 0.919). Findings from post-hoc tests (Bonferroni correction) showed that the mean score for the NEO-FFI factors differed between N(Neuroticism) < E (Extraversion), N < C (Conscientiousness), E > O (Openness), E > A (Agreeableness), O < C, A < C (p < 0.001), with N (Mean = 23.50, SD=4.67), E (Mean = 29.177, SD = 5.51), O (Mean = 23.59, SD = 4.19), A (Mean = 22.71, SD = 4.05), and C (Mean = 29.35, SD = 3.45). Importantly, these results indicate that there were no significant differences between the two groups with regard to personality traits before the start of the intervention.

*GQ-6*

The GQ-6 was used to measure potential effects in the orientation toward gratitude associated with the journaling activities performed during the intervention. As with the other measures, participants were asked to complete the items of the GQ-6 once a week, at the time of submission of their journal assignments. All assessments were conducted online. A two-way repeated measures ANOVA showed that there was no main effect for week (F(5.005, 160.153) = 2.190, p = 0.058) or journal type (F(1, 32) = 0.502, p = 0.484). Results also failed to detect any significant interaction between week and journal type (F(5.005, 160.153) = 0.644, p = 0.667).

The analysis showed that the GQ-6 scores did not change in any significant way in the course of the intervention for either group.

*SWLS*

The SWLS was used to measure any trends and changes in the participants’ life satisfaction. A two-way repeated measures ANOVA found a main effect for the week (F(3.640, 116.485) = 4.869, p = 0.002), but no significant interactions were seen between week and group (F(3.640, 116.485) = 0.481, p = 0.732). No main effect was found for journal type either (F(1, 32) = 0.022, p = 0.884). To verify whether there were significant differences between data collected at different timepoints (weeks), a post-hoc analysis (Bonferroni correction) was performed. However, no significant differences were found for any of the pairs of weeks. The results are summarized in Figure 1.

**<FIGURE 1 HERE>**

A significant main effect was found for week, but there were no differences between the two journal types or any interactions between week and journal type. In summary, participants’ life satisfaction increased as the intervention went on, regardless of diary type.

*POMS*  
The POMS was used to measure trends and/or changes in the participants’ mood. As with the other measures, students were asked to complete the items of the POMS once a week, at the time of submission of their journal assignments. The TMD score used in the analysis was computed using the equation TMD = (AH + CB + DD + FI + TA) – VA (Konuma, Hirose, & Yokoyama, 2015). Note that, by definition, greater values of TMD indicate greater levels of negative mood. A two-way repeated measures ANOVA showed a main effect for week (F(5.402, 172.862) = 2.962, p = 0.011), but no significant interaction was seen between week and journal type (F(5.402, 172.862) = 1.014, p = 0.414). No main effect for journal type was found either (F(1, 32) = 0.758, p = 0.391). Post-hoc analysis for week (Bonferroni correction) found a significant difference between week 4 and week 9; the TMD at week 4 was found to be significantly higher compared to week 9. The results are summarized in Figure 2.

**<FIGURE 2 HERE>**

For all POMS components (AH, CB, DD, FI, TA, and VA), there was no difference between the two diary types (p > 0.05), and no interaction between week and diary type (p > 0.05). For the components CB, FI, and TA, a significant main effect for week was detected (p < 0.05). These results indicate that, regardless of journal type, the negative mood of participants as measured by the TMD decreased as the intervention went on; moreover, decreases in the scores of CB, FI, and TA drove the observed effect.

*Academic Motivation Scale (AMS*)

The AMS was used to measure the participants’ motivation to participate in learning activities in the school context. As with the other measures, the participants were asked to complete all of the items of the AMS once a week, at the time of submission of their journal assignments. The self-determination index (SDI) was used to assess individual academic motivation, and it was calculated as the weighted sum of each of the AMS components, using the following weights (Vallerand & Losier, 1999; Vallerand, 1999; Taylor et al., 2008): 2 (intrinsic motivation), 1 (identified regulation), −1 (average of introjected and external regulation), and −2 (amotivation). Figure 3 represents the SDI scores by journal type.

**<FIGURE 3 HERE>**

First, we verified that there were no latent differences in mean SDI values between groups at the start of the study (Figure 3, Week 0); as expected, any differences were nonsignificant (t(32) = 1.326, p = 0.194 > 0.05). A two-way repeated measures ANOVA analysis showed a significant main effect for week (F(4.795, 153.470) = 3.864), p = 0.003) and an interaction between week and journal type (F(9, 288) = 2.885, p = 0.003). No main effect was detected for journal type (F(1, 32) = 0.020, p = 0.888).

Because a significant interaction was detected between week and journal type, a simple main effects analysis was conducted. We first compared SDI scores between groups at each time point, but no significant differences were detected (Week 0, p = 0.194, Week 1, p = 0.269, Week 2, p = 0.429, Week 3, p = 0.938, Week 4, p = 0.971, Week 5, p = 0.739, Week 6, p = 0.716, Week 7, p = 0.838, Week 8, p = 0.733, Week 9, p = 0.341). Next, we looked for simple main effects of week using data from each group individually. Although we failed to detect a simple main effect for week in the gratitude journal group (F(9, 288) = 0.90, p = 0.522), a significant effect was found in the positive journal group (F(9, 288) = 5.85, p = 0.000). A post-hoc analysis (Bonferroni correction) found that the following pairs were significantly different: Week 0 vs. Week 3 (p = 0.001), Week 0 vs. Week 4 (p = 0.004), Week 0 vs. Week 6 (p = 0.001), Week 0 vs. Week 7 (p = 0.002), Week 0 vs. Week 8 (p = 0.003), Week 0 vs. Week 9 (p = 0.000), Week 1 vs. Week 3 (p = 0.002), Week 1 vs. Week 6 (p = 0.002), Week 1 vs. Week 7 (p = 0.002), and Week 1 vs. Week 9 (p = 0.001). The overall pattern that emerges from these pairwise comparisons indicates that the SDI scores collected from the positive journal group decreased as the intervention went on.

To examine the mechanisms underlying the decrease in the SDI scores of the participants in the positive journal group more closely, we performed an exploratory analysis by breaking the SDI scores down into a positive subscore, i.e., the sum of the positively weighted AMS components (intrinsic motivation (x 2) + identified regulation) and a negative subscore, i.e., the sum of the negatively weighted AMS components (average of introjected and external regulation + amotivation (x 2)). This analysis should indicate whether the overall decrease in the SDI scores was primarily caused by a weakening of the positive motivation components, which are strongly associated with self-determined behaviors, or alternatively, by a strengthening of negative motivation components, which tend to hinder self-determined behaviors, or a combination of both. The positive and negative subscores of the positive journal group were subjected to a two-way repeated measures ANOVA analysis. The results showed a significant main effect for the positive/negative subscores (F(1, 16) = 95.537, p = 0.000), accompanied by an interaction between week and the positive/negative subscores (F(3.755, 60.077) = 5.239**,** p = 0.001). We failed to detect a main effect for week (F(3.119, 49.910) = 0.955, p = 0.424).

Because a significant interaction was observed, a simple main effects analysis was conducted. That analysis revealed a significant simple main effect for the positive subscores (F(3.711, 59.369) = 4.815**,** p = 0.002) but not for the negative ones (F(2.210, 35.363) = 2.677, p = 0.078). We then performed a post-hoc analysis using the positive subscores (Bonferroni correction) and found a significant difference between the sample collected on Week 2 (mean = 15.044, s.e. = 0.566) and the one collected on Week 9 (mean = 13.824, s.e., 0.662) (p < 0.05), signaling that the positive subscores significantly decreased from Week 2 to Week 9. To ensure that the weights assigned to the AMS components when computing the SDI did not affect these results in any substantial way, we repeated the analysis above, assigning equal weights to all elements in the equation, i.e., the positive subscore was calculated as the sum of the intrinsic motivation and identified regulation, whereas the negative subscore was the sum of the averages of introjected and external regulation and amotivation. The results of this analysis were qualitatively identical to the original analysis, confirming that the weights had little influence on the results.

The results thus indicate that the SDI of the participants in the positive journal group significantly decreased during the intervention, yet that of the gratitude journal group did not. Furthermore, exploratory analysis showed that the effect in the positive journal group was primarily caused by a reduction in intrinsic motivation and identified regulation, i.e., the positive motivation components of the SDI score.

**Discussion**

The most pertinent finding of this study was that when high schoolers were asked to complete gratitude journals and positive journals for nine weeks, the only significant difference that emerged between the two groups related to the measure of academic motivation. The academic motivation of the participants in the gratitude group remained unchanged, but the AMS (SDI) scores significantly decreased over time for the participants in the control group, who were asked to write about positive events experienced during the period of the intervention. As noted above, because the journaling activity was given to students as an assignment, and some were specifically prompted if they did not submit their journaling, a certain number of participants in the study likely only worked on their journal because they were required to do so. In this context, the gradual decline in academic motivation can be considered quite natural; however, it is quite remarkable that individuals in the gratitude group were shielded from that effect. Taking them at face value, the current results indicate that engaging with gratitude journaling may help prevent the natural decline in motivation that has been observed in young cohorts as they mature (Gottfried et al., 2001; Gnambs & Hanfstingl, 2016).

In the NEO-FFI, no difference was found regarding personality traits between groups. It was expected from the outset of the study that the gratitude journal activity and the positive journal activity would produce similar effects, given that at the most basic level, all participants would be writing about events with a positive connotation. In a previous gratitude study involving three groups of college students (Watkins et al. 2003), the correlations between gratitude and positive affect were reported to be r = .36 for one group and r = .52 for a second group, suggesting at least a partial overlap between these constructs. Given that the only significant effect identified was associated with the AMS, and in the absence of statistically significant differences in the GQ-6, POMS 2, or SWLS, it follows that these constructs did not play prominent roles in preventing the decrease in AMS observed among participants in the control group.

The present study featured some limitations that must be highlighted. First and foremost, because these results were obtained in a single study, a replication study must be conducted before any generalizations can be made. It is of fundamental importance that interventions similar in duration and intensity be attempted in the future, ideally among high school students from diverse social and cultural backgrounds, and that adequate empirical data are collected to allow a more in-depth and broader verification of potential effects.

Another limitation of this study is that we did not have access to the actual entries written by the participants. Quantitative and qualitative analysis of that data could provide further insights into the mechanisms underlying the effects observed in the current study, paving the way to the construction of a mechanistic model of the emotion of gratitude as experienced in daily life.

Although this study was not able to compare gender differences due to its lack of statistical power, previous research findings regarding gender and gratitude in high school student populations have found that female students tend to have higher levels of gratitude compared to those of male students (Froh, Emmons, Card, Bono, & Wilson, 2010), although no further empirical research has been done (Hasemeyer, 2013). Considering gender as an explicit variable in future academic motivation and performance studies involving gratitude interventions may provide a much needed novel perspective on gender differences.

The results found in this article originally indicated that the AMS scale reported satisfactory levels of internal consistency (mean alpha value = .81) and temporal stability over a one-month period (mean test-retest correlation = .79; Vallerand et al., 1992). However, the aggregate index of self-determination based on the AMS scores decreased over the course of the intervention among participants in the control group. This discrepancy can be attributed to the fact that the intervention lasted much longer (nine weeks) than the period used to test temporal stability (four weeks); in addition, although the participants in the control group were not targets of the manipulation of interest, they also actively complied with a daily task, in contrast to the situation faced by the participants in the original study. More broadly, the current results indicate that future research should examine the temporal stability of scales like the AMS over much longer periods of time to determine whether there are circumstantial or seasonal oscillations that could affect the motivation of students over the course of a schoolyear.

Finally, although the current results indicate that keeping a gratitude journal helps prevent a decline in academic motivation relative to a positive journal, it remains to be seen whether that effect is accompanied by actual improvements in subsequent academic performance. While it is likely that improvements in academic motivation will eventually lead to enhancements in actual performance (Steinmayr & Spinath, 2009), future work should directly address the question of whether gratitude interventions do in fact result in improved school performance. Such studies will likely need to adopt broader definitions of academic performance to establish the true extent of the impact of gratitude interventions.

**Conclusions**

In this study, 34 Japanese high school seniors who had been pre-admitted into a university science department were asked to write either a gratitude journal (intervention group) or a positive journal (control group), in English, for nine weeks. No significant differences were detected between the two groups with regard to the disposition toward experiencing the emotion of gratitude (GQ-6), satisfaction with life (SWLS), or general mood (POMS) after the intervention. The only difference that was found related to the measure of academic motivation (SDI); the SDI scores remained unchanged in the gratitude group, whereas the scores for the individuals in the control group (positive journal) declined significantly. Since engaging with both a gratitude and a positive journaling activity generally involves the recall of daily life events that often have a positive valence, it was no surprise to find that the results of the analysis showed no significant differences in the majority of the assessed constructs. However, an important finding was that academic motivation developed differently between the two groups. Given the scarcity of empirical studies in the literature that have assessed the effects of gratitude interventions of a similar duration (nine weeks) and intensity (daily activity), we hope that future studies will continue to inspect the potential and impact of sustainable, long-term gratitude interventions on student motivation.

**Declarations**

**Abbreviations**

AMS Academic Motivation Scale

SDI Self-Determination Index

SWLS Satisfaction With Life Scale

POMS Profile of Mood States

TMD Total Mood Disturbance

AH Anger-Hostility

CB Confusion-Bewilderment

DD Depression-Dejection

FI Fatigue-Inertia

TA Tension-Anxiety

VA Vigor-Activity

NEO-FFI Neuroticism-Extraversion-Openness Five-Factor Inventory

**Ethics approval and consent to participate**

This study was approved by the ethics and safety committees of the Ritsumeikan University.All participants verbally agreed to take part in the experiments. [If possible it would be good to provide more procedural details about the circumstances of how consent was obtained from the students. This is a required section from the BMC Psy – Eiji 2021/05/21]

**Consent for publication**

All authors authorize the publication of this manuscript.

# Competing interest

None.

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**Authors’ contribution**

TY and NY conceived and designed the experiments with inputs from NEN. TY performed the experiments. NY performed the statistical analyses with inputs from NEN. TY, NY, and NEN wrote and approved the manuscript.

**Availability of data and materials**

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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**Tables**

There are no tables in this manuscript.

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**Figure legends**

Figure 1. SWLS scores at baseline (Week 0) and during the period of the intervention (Weeks 1 to 9), for both groups. Error bars represent standard error of the mean (SEM).

Figure 2. POMS (TMD) scores at baseline (Week 0) and during the period of the intervention (Weeks 1 to 9), for both groups. Error bars represent standard error of the mean (SEM).

Figure 3 Self-Determination Index (SDI) scores at baseline (Week 0) and during the period of the intervention (Weeks 1 to 9), for both groups. Error bars represent standard error of the mean (SEM).

Figure 1

Figure 2

Figure 3

