**Gratitude and academic motivation among Japanese high-school students: A 9-week gratitude journal intervention study**

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**Gratitude and academic motivation among Japanese high-school students: A 9-week gratitude journal intervention study**

**Abstract**

Background

Past studies have shown that gratitude interventions can positively impact different facets of student motivation and engagement. Here, we assessed the effects of a nine-week gratitude journal intervention on the academic motivation of senior high-school students.

Methods

Participants were thirty-four Japanese senior high-school students who had already been admitted to a university at the time of the study. 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), while individuals 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 9 weeks and was performed as part of an assignment aimed at advancing the students’ proficiency in English prior to the start of their first university year. Intervention effects on academic motivation were examined using a self-determination index (SDI) derived from the scores obtained using the Academic Motivation Scale (AMS).

Results

Results showed that while the academic motivation (SDI) 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 out to a specific effect yielded by the continuous engagement with the emotion of gratitude. Though the journaling activity performed by both groups likely tapped on personal experiences that were largely of positive valence, results showed that only the 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 than other positive emotions on goal-oriented behavior in general and motivation in particular, and highlights the potential that cultivating the habit of engaging with the emotion of gratitude may have a positive impact on the motivation of students about to start their higher education studies.

**Keywords**:

Gratitude, gratitude intervention, gratitude journal, academic motivation.

**Background**

Academic motivation is a multi-faceted construct thought to be a primary factor in determining overall student satisfaction with curricular and extra-curricular activities, as well as a predictor of school achievement and other educational outcomes (Howard, Bureau, Guay, Chong, & Ryan, 2021; Steinmayr & Spinath, 2009). Regrettably, past studies have also shown that adolescence is a period markedly 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 start their higher education studies. Amotivation, which together with intrinsic motivation and extrinsic motivation comprise the three pillars of the motivation construct (Vallerand et al., 1992], has been associated with worse adjustment to university life and higher levels of perceived stress among second year university students (Baker, 2004). Finding ways to ameliorate such condition has been a major target of research in educational psychology (Wigfield & Wentzel, 2007).

Here, we sought to examine changes in academic motivation among senior high-school students associated with participation in a gratitude journal intervention. Interventions aiming at enhancing motivation among students can be an effective device to improve educational outcomes (Lazowski & Hulleman, 2016). Gratitude research in the field of psychological sciences was pioneered by McCullough, Emmons, and Tsang (2002), and since then, gratitude intervention studies have been shown to be associated with a host of positive outcomes, among other things, improvements in subjective well-being (Watkins, Uhder, & Pichinevskiy, 2014), enhancements in self-improving motivation among high-school students (Armenta, Fritz, Walsh, & Lyubomirsky, 2020) and enhanced academic motivation among university students (Nawa & Yamagishi, 2021). To date, experimental studies such as those conducted by Emmons and McCullough (2003) have been highly regarded for their significance, and the variety of gratitude studies that followed have produced several interesting results (Dickens, 2017); nevertheless, more often than not the results across studies have shown to be mixed, which call for a healthy dose of caution (Dickens, 2017; Wood, Froh, & Geraghty, 2010). Here, we sought to provide a new perspective on both gratitude research and academic motivation research by attempting to (1) examine the effect of a gratitude intervention of a much longer duration (9 weeks) and intensity (daily activity) than what is the typical practice on previous gratitude intervention studies found in the literature, and (2) clarify 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 an university but were yet to formally complete their high school studies at the time of the study.

**Literature review**

Self-determination theory (SDT; Deci & Ryan, 1985, 2000) is a major motivational theory with 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. Attached to a dimension of self-determinacy, these motivational concepts have been applied 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 to date using 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, in the learning domain, 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, how self-determined motivation relates to gratitude has yet to be vigorously examined in the literature to date, a point which the authors attempt to rectify in the present study.

Although gratitude is a familiar concept in everyday life interactions, it has recently gained traction as a scientific field with the surge of research in the area of positive psychology (Peterson & Seligman, 2004), a field where human behavior is studied as it relates to thriving as opposed to traditional psychology concerned with mental illness (Snyder & Lopez, 2002). Over time in the positive psychology research literature, 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). Findings in the literature include that gratitude increases self-esteem (Kong & You, 2013), and that gratitude was positively associated with typical well-being indicators such as life satisfaction (*r*=.53) and optimism (*r*=.51) (McCullough et al., 2002). However, an area of concern is that much of the gratitude research that exists today has findings largely pertinent to adults, and that the study of how gratitude relates to youth, and adolescence in particular, is still in its infancy (Bono & Froh, 2009).

　　　　　Previous studies regarding the relationship between learning theory and gratitude in young people have highlighted the positive effects of gratitude, including: more peer, familial, and social support; more optimism, which in turn leads to greater emotional support; and more likely to have 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 a self-report measure of academic motivation in university students (Nawa & Yamagishi, 2021).

**Objectives**

The main objectives of the present research are:

1. To empirically demonstrate that the increased awareness to the emotion of gratitude for 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 to future learning theory.

**Hypotheses**

Following are the hypotheses of this research based on the above objectives:

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 section Materials 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 towards academic activities, i.e., academic motivation, as measured by the Academic Motivation Scale (AMS).

**Methods**

***Participants***

The data sample in the present study consisted of 34 Japanese high school seniors who had been accepted to a private university in the west of Japan by December 2018. The admission system to Japanese universities provides different routes for domestic students to be admitted to a university and one of them is the admission by recommendation, which secures a place to 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 start of the university school year to ensure that they are academically well prepared. The current study took place 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 activities, 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).

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

From them on, all interaction with and the activities performed by the students was based on the online system provided by the university or using social networking services. All participants were Japanese native speakers but they were required to perform the journaling activity in English, as part of the pre-college preparatory activities. Participants submitted the journals electronically on a weekly basis. No further constraints were imposed regarding the contents or length of their responses. 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.

Participants were asked to continue working on their diaries for 9 weeks (from the end of December 2018 to March 2019). Participants were ensured that all data would be kept confidential and only used in anonymized form for the purposes of scientific research. There was no financial compensation involved.

***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 the 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 examined 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 the individual disposition in experiencing the emotion of gratitude, conceptualized as an affective trait reflecting one’s tendency to attend 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 and finances. Satisfaction with life is thought to be a fundamental component of the construct of subjective well-being (Diener, 1984). The SWLS has been largely applied to clinical and non-clinical populations across 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 POMS individual scales and the TMD score have been used in the past to monitor natural changes in mood state, 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 from the SDT proposed by Deci and Ryan (1985), which identifies “several distinct types of motivation” (Ryan & Deci, 2000) in a continuum, from amotivation and unwillingness to act, to passive compliance, to active personal commitment. The AMS consists of 28 items subdivided into seven subscales assessing three types of intrinsic motivation (intrinsic motivation to know, to accomplish to 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 and continue one’s university studies (Wilkesmann et al., 2012).

**Results**

Participants were divided randomly into two groups: 17 people 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), but 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 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 that personality traits would change in any substantial way during 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 towards 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) neither journal type (F(1, 32) = 0.502, p = 0.484). Results also failed to detect a 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 as the intervention developed, in both groups.

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 interaction between week and group was found (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 none of the pairs of weeks. Results are summarized in Figure 1.

**<FIGURE 1 HERE>**

Results showed a significant main effect for week, but there were no differences between journal types nor an interaction between week and journal type. In summary, they indicate that participants’ life satisfaction increased as the intervention developed 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, as performed in (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 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. Results are summarized in Figure 2.

**<FIGURE 2 HERE>**

For all POMS components (AH, CB, DD, FI, TA, VA), there was no difference between 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 developed; moreover, decreases in the scores of CB, FI and TA were driving the observed effect.

Academic Motivation Scale (AMS)

The AMS was used to measure the participants’ motivation towards learning activities in the school context. As with the other measures, participants were asked to complete all 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 was calculated as the weighted sum of each one of the AMS components by 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 summarizes the SDI scores by diary type.

**<FIGURE 3 HERE>**

First, we verified that there were no latent differences in the mean SDI between groups at the start of the study (Figure 3, Week 0); as expected, that turned out to be not significant (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), plus 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 further conducted. We first compared the SDI scores between groups at each timepoint 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 examined for simple main effects of week using the data from in each group individually. Although we failed to detected 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), Week 1 vs. Week 9 (p = 0.001). Interestingly, the overall pattern that emerges from these pairwise comparisons indicate that the SDI scores collected from the positive journal group decreased as the intervention developed.

To obtain further insights on the mechanisms underlying the decrease in the SDI scores of the participants in the positive journal group, we performed an exploratory analysis by breaking down the SDI scores 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)). Such analysis should reveal 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 an strengthening of the 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 submitted to a two-way repeated measures ANOVA analysis. 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 in the positive subscores (F(3.711, 59.369) = 4.815**,** p = 0.002) but not in the negative subscores (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 that there was a significantly difference between the sample collected on Week 2 (mean = 15.044, s.e. = 0.566) and Week 9 (mean = 13.824, s.e., 0.662) (p < 0.05), signaling that the positive subscores had 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 the sum of the intrinsic motivation and identified regulation, whereas the negative subscore was the sum of the average of introjected and external regulation and amotivation. Results from this analysis were qualitatively identical to the original analysis, confirming that the weights had little influence on the results.

In summary, these results indicate that the SDI of the participants in the positive journal group, but not the gratitude journal group, significantly decreased during the time of the intervention. Furthermore, exploratory analysis showed that such an effect 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 in the present study was that when high schoolers were asked to complete “gratitude journals” and “positive journals” for 9 weeks, the only significant difference that emerged between the two groups was with regards to a measure of academic motivation. Whereas the academic motivation of participants in the gratitude group remained unchanged, the AMS (SDI) scores significantly decreased over time for participants in the control group, who were asked to write about “positive events” experienced during the period of the intervention. As mentioned above, given that the journaling activity was given as an assignment to students, and some of them were specifically prompted if they did not turn it in, there was a certain number of participants in the study who worked on the diary because they were required to do so. In this sense, the gradual decline in academic motivation can be considered to be quite natural; however, it is quite remarkable that individuals in the gratitude group were shielded from that effect. At face value, the current results indicate that engaging with a gratitude journaling activity may contribute to prevent a natural decline in motivation, which has been observed, for instance, in young cohorts as they grow older (Gottfried et al., 2001; Gnambs & Hanfstingl, 2016).

Based on the results of 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 to a certain extent result in similar effects, given that at the most basic level, all participants would tend to write about events with 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 that there is at least a partial overlap between these constructs. Given that the only significant effect found was associated with the AMS, and in the absence of statistically significant differences in the other measurements, i.e., GQ-6, POMS 2, and SWLS, it follows that these constructs did not directly play prominent roles in preventing the decrease in AMS observed among participants in the control group.

There are some limitations in the present study that must be highlighted. First and foremost, because the current results were obtained from a single study, it must first withstand the test of replication before further generalizations are made. It is of fundamental importance that similar interventions regarding duration and intensity are attempted in the future, ideally nvolving high school students from diverse social and cultural backgrounds, and empirical data are adequately accumulated to allow a more in depth and broad verification of potential effects.

Another limitation of the current study is that we did not have access to the entries input in the respective journals by participants. Quantitative and qualitative analysis of that data could provide further insights on 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 that is experienced in real life.

Although the present study was not able to compare gender differences due to a lack of statistical power, previous research findings regarding gender and gratitude in high school student populations have found that female students tended to have higher levels of gratitude compared to male students (Froh, Emmons, Card, Bono & Wilson, 2010), though 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 new perspective on gender differences.

Results in the article that originally proposed 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 current results showed that an aggregate index of self-determination based on the AMS scores decreased over the course of the intervention among participants in the control group. Such discrepancy can be attributed to the fact that the intervention here lasted much longer (9 weeks) than the period used to test temporal stability (4 weeks); in addition, even though participants in the control group were not targets of the manipulation of interest, they also did have to actively comply with a daily task, in contrast with 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 such as the AMS over much longer periods of time to determine whether there are circumstantial or seasonal oscillations affecting the motivation of students throughout the course of a schoolyear.

Finally, though the current results indicated that keeping a gratitude journal helped prevent a decline in academic motivation compared to a positive journal, it remains to be established that such effect is accompanied by actual improvements in subsequent academic performance. Though it is likely that improvements in academic motivation eventually leads to enhancements in actual performance (Steinmayr & Spinath, 2009), future work should directly address the question of whether gratitude interventions do result in better school performance. Such studies will likely need to adopt broader definitions of academic performance in order to reveal the true extent of the impact of gratitude interventions.

**Conclusions**

In this study, 34 Japanese high school seniors pre-admitted into a university science department were either asked to write a “gratitude journal” or a “positive journal” (control group), in English, for 9 weeks. No significant differences were detected with regard to the disposition in experiencing the emotion of gratitude (GQ-6), satisfaction with life (SWLS), or general mood (POMS) after the intervention. The only difference found between groups was related to a measure of academic motivation (SDI); while the SDI scores remained unchanged in the gratitude group, the scores for the individuals in the control group (positive journal) declined significantly. Given that engaging with a gratitude journaling activity or a positive journaling activity will usually involve the recall of daily life events that most of the time should have a positive valence, it was no surprise that the results of the analysis showed no significant differences in the majority of the assessed constructs. However, an important finding of the present study is that academic motivation was found to develop distinctively 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 (9 weeks) and intensity (daily activity), we hope that future studies will inspect further 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 not 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

