Self-determination theory: The roles of emotion and trait mindfulness in motivation

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Abstract
Within the framework of Self-determination theory, influences of emotions on motivation are largely neglected. And when considering the recent findings that mindfulness is associated with emotional management, it is unknown how mindfulness may buffer emotions in relation to autonomous and controlled motivations. The present study examined the relationship between the two dimensions of emotion (i.e., pleasantness and arousal) and relative autonomous-oriented motivation, and the moderation effect of trait mindfulness on such relationship. A hundred and seventy-one students of a Swedish university participated in the survey. It was found that pleasantness, arousal and trait mindfulness were correlated positively with relative autonomous-oriented motivation, and that trait mindfulness moderated the relationship between pleasantness and the motivation. The findings suggest that pleasant and arousal emotions, and dispositional mindfulness may have positive effects on autonomous motivation.

Keywords: Self-determination theory, autonomous motivation, controlled motivation, emotion, mindfulness

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Self-determination theory: 
The roles of emotion and trait mindfulness in motivation

How can emotions affect motivation? Within the framework of Self-determination theory (SDT) (Deci & Ryan, 1985; Deci & Ryan, 2008; Ryan & Deci, 2002), numerous works were devoted to investigate the relationship between psychological need satisfaction and motivation (e.g., Jackson-Kersey & Spray, 2016; Katz, Kaplan, & Gueta, 2010; Wilson, Rodgers, Blanchard, & Gessell, 2003). However, relatively little attention is given to the role of emotion despite of its recognized importance to the development of self-determined or non-self-determined behaviours (Deci & Ryan, 2002). SDT proposes that emotions cue information to guide motives and behaviours (Deci & Ryan, 1985). For example, as always maintained by SDT, people will be intrinsically motivated to participate in self-determined activities that bring them the feelings of interest and excitement. On the other hand, when people automatically respond to their emotions, they may produce non-self-determined behaviours (Deci & Ryan, 1985).

In addition, research has been increasingly employing the concept of mindfulness into the studies of SDT. Mindfulness, an attribute rooted in Buddhism, comprises a consciousness quality of self-attention and self-awareness that may facilitate self-regulation of behaviours and hence self-determined or autonomous behaviours (Brown & Ryan, 2003). Nevertheless, those studies focused largely on the effect of mindfulness on the cognitive aspects of motivation (e.g., Levesque & Brown, 2007; Radel, Sarrazin, Legrain, & Gobancé, 2009). Yet, when considering that mindfulness is consistently suggested to associate with improvement in emotion, such as emotional regulation (Arch & Craske, 2006), emotional exposure (Shapiro, Carlson, Astin, & Freedman, 2006), or emotional acceptance (Teper & Inzlicht, 2013), a question of whether and how mindfulness will influence the emotional aspect of self-determination is intriguing. Therefore, the present study aimed at examining the relationship between emotions and motivation within the SDT framework, and investigating whether trait mindfulness would moderate such relationship.

Autonomous and Controlled motivations

Being self-determined is to have free choices of behaviours that primarily differentiate intrinsic motivation from extrinsic motivation in SDT. Extrinsically motivated people are driven by external pressure, reinforcements or punishments, but they do not necessarily behave without autonomy (Deci & Ryan, 1985; Ryan & Deci,
2002). According to the theory, the development of self-determination depends on the degree of internalization of behavioural values and regulations. Thus, motivation not only can be categorized in terms of forms, but also along a continuum of self-determination, ranging from amotivation (i.e., a state lacking motivation) to controlled motivation, and to autonomous motivation (Deci & Ryan, 1985; Ryan & Deci, 2002). When people accept the values and regulations to be part of the self (i.e., high internalization), they tend to have internal locus of causality. People will perceive more self-determination of behaviours and focus more on attaining self-endorsed needs and values known as autonomous motivation. In contrast, controlled motivation arises with low internalization that leads to external locus of causality. People tend to perceive less free choices but more external pressure (e.g., expectations from others), and focus more on attaining positive or avoiding negative outcomes (Deci & Ryan, 1985; Ryan & Deci, 2002). Hence, autonomous motivation that involves intrinsic motivation and highly internalized extrinsic motivation is more self-determined than controlled motivation that consists of extrinsic motivation with low internalization.

A score known as Relative Autonomy Index (RAI), the mathematical difference between the scale scores of autonomous and controlled motivation, was constructed to assess the degree to which individuals were oriented towards autonomous or controlled motivation (Grolnick & Ryan, 1987). The present study employed both the forms of motivation (i.e., autonomous and controlled motivations) and the amount of relative autonomous-oriented motivation (i.e., RAI) because the former allowed for a deeper understanding of the function of each motivation (Koestner & Losier, 2002) and the latter for a methodological convenience (Vallerand & Ratelle, 2002).

Emotion and motivation

Feelings of interest and excitement are fundamental to the development of intrinsic motivation (Deci & Ryan, 1985). Individuals will be intrinsically motivated to engage in enjoyable activities because they desire to experience positive feelings from the activities. Emotion of other kinds, according to SDT, may also motivate self-determined and non-self-determined behaviours. People can be autonomously motivated when they want to attain or avoid some kind of emotional states (Deci & Ryan, 1985). An example could be that a student may choose to do revision in order to reduce the stress for a coming examination. In contrast, this student may also snack during revision because of an automatic response to stress, resulting in a less or even non-self-determined behaviour. Although there is a body of research
examining the relationship between emotion and motivation, emotion is generally taken as an outcome variable rather than an antecedent of motivation. In particular, little is known about how various emotions would contribute to different styles of motivation within SDT.

Frijda and colleagues proposes that people experience emotions when they appraise events as beneficial or harmful to their personal interests, and that different emotions contain different states of action readiness, defined as "the individual's readiness or unreadiness to engage in interaction with the environment" (Frijda, Kuipers, & ter Schure, 1989, p. 213). In other words, emotions prepare individuals to respond to the environment adaptively, like fear may prepare people to run away and anger may prepare confrontation. Moreover, it is possible that event appraisal acts like the component of cognitive evaluation in most motivational theories, implying that appraisal process and its subsequent emotional feedback share some of the importance with cognitive evaluation in eliciting motivated behaviours (Vandercammen, Hofmans, Theuns, & Kuppens, 2014).

In the work of Seo, Barrett, and Bartunek (2004), emotion is further suggested to influence motivated behaviours in three ways. First, they argue that the pleasantness dimension of emotional experiences affects the direction of motivated behaviours because emotions will lead people to overestimate behavioural outcomes: people with pleasant feeling will tend to believe that outcomes are more attractive, whereas outcomes will be perceived more unattractive by people with unpleasant feeling; Thus, pleasant feeling will contribute more to exploring and approaching behaviours, while unpleasant feeling will contribute more to avoiding behaviours. Second, the arousal dimension of emotional experiences will influence the intensity of motivated behaviours. Emotions of high arousal will be likely to make people feel more active and energetic, and in turn lead them to put more effort in behaviours, or vice versa (Seo et al., 2004). Last, they suggest that emotion will influence the persistence of motivated behaviours. Specifically, pleasant feeling will induce people to continue the ongoing behaviours, but unpleasant feeling will lead people to stop or modify them.

This conceptual framework receives some empirical evidence. A path analysis (Seo, Bartunek, & Barrett, 2010) showed that pleasantness was positively and indirectly related to the generative (exploring and approaching) behavioural orientation and persistence, and that arousal was positively, and both directly and indirectly related to intensity. Another experimental study also demonstrated that four
emotions with different dimensions [i.e., happiness (pleasant and arousal), relaxation (pleasant and inactive), anxiety (unpleasant and arousal), and depression (unpleasant and inactive)] would generally cause people differ in their willingness to participate in the autonomously (intrinsic) motivated task (Vandercammen et al., 2014). In specific, it was found that people who felt happy would have more autonomous motivation than those who felt anxious, and with marginal significance, people who felt anxious would have less autonomous motivation than those who felt relaxed; but people who felt depressed showed no difference in motivation when compared to other emotionally manipulated groups.

Taken together, it is reasonable to argue that autonomous motivation may be more consistent with generative behaviours that are likely elicited by pleasant feeling, whereas controlled motivation may be more consistent with avoiding behaviours that are likely produced by unpleasant feeling.

**Mindfulness and motivation**

Current literature has not reached a consensus of the characteristics of mindfulness, but this study adopted the definition of Brown and Ryan (2003) that mindfulness is a state of consciousness in which one highly attends to and accepts the internal and external experiences of the present moment. Although this definition is not free from criticisms (e.g., Grossman & Van Dam, 2011), it is still believed to capture some basic concepts of mindfulness (Brown, Ryan, & Creswell, 2007). This definition does not conceptually equate mindfulness with self-awareness, but highlights that they are closely related (Brown et al., 2007), and hence provides a common ground for connecting mindfulness with SDT. It has long been argued that self-awareness may facilitate conscious processing of information and conscious selection of behaviours, and in turn self-determination (Deci & Ryan, 1980). In particular, with self-awareness one is more likely to realize the innate needs, potential satisfaction and alternative choices, and to escape from obligated beliefs to become self-determined (Deci & Ryan, 1985). As such, Brown and Ryan (2003) suggest that an enhanced self-awareness in mindfulness may nurture "attention to prompts arising from basic needs, making one more likely to regulate behavior in a way that fulfills such needs" (p. 824). Alternatively, disengagement may account for why mindfulness favours the development of self-determination. Disengagement is a process of 'jumping out' of or withdrawing from habitual feelings, thoughts and behaviours, and allows more novel choices (Brown et al., 2007). Likewise, Shapiro and colleagues
(2006) refer it as a meta-cognitive mechanism known as "reperceiving", in which one does not immediately respond to personal experiences, but "stand back and simply witness" them (p. 377). In this way, mindful people may be more able to disengage from their habitual feelings, thoughts and behaviours deriving from controlled regulation, and in turn engage in more autonomous regulation (Brown & Ryan, 2003). The positive relationship between mindfulness and autonomous motivation is supported by some studies (e.g., Brown & Ryan, 2003; Levesque & Brown, 2007; Radel et al., 2009; Ruffault, Bernier, Juge, & Fournier, 2016).

According to Brown and Ryan (2003), it is possible that there are individual differences in the tendency to act in a mindful way despite that mindfulness is inherently defined as a consciousness state. They theorize that mindfulness involves trait- and state-like qualities, with the former referring to a propensity to behave mindfully, while the latter to momentary fluctuations of mindfulness level. It was found that trait mindfulness could predict state mindfulness, and that both trait and state measures of mindfulness associated with daily autonomous behaviours (Brown & Ryan, 2003). Considering the methodological limitation, experience sampling was not applicable for the present study, so it was not valid to use mindful state but rather mindful trait as the measure. Additionally, since the development of motivation could be relatively stable, trait mindfulness may show a stronger relationship with it as compared to state mindfulness. Therefore, dispositional mindfulness would be one focus of the present study.

*Mindfulness, emotion, and motivation*

Mindfulness may not only exert the direct effect on behavioural regulation in motivation, it may also moderate the effect of emotion on motivation. Deci and Ryan (2002) state two styles of emotional management: emotional regulation and emotional control. The former occurs when emotions are attended to and evaluated, in contrast to the latter in which emotions are suppressed and neglected. Emotional regulation is argued to reflect greater self-determination because it requires awareness of feelings and need satisfaction (Deci & Ryan, 2002).

Emotional regulation has been discussed extensively in mindfulness-related literature. One approach is introduced by Shapiro et al. (2006), proposing that mindfulness may help people reperceive their emotions by means of four sub-mechanisms including self-regulation, values clarification, enhanced flexibility and exposure. In short, mindful people may be able to experience and manage their
emotions from more objective and diverse perspectives, and to re-evaluate and utilize the implicit information among the emotions, instead of habitually responding to and being controlled by them (Shapiro et al., 2006). Interestingly, one study revealed that trait mindfulness had a stronger negative relationship with daily unpleasant affects than a positive relationship with the pleasant affects, implying that mindfulness might primarily help one to recover from aversive emotional states to an equilibrium state, rather than foster one's pleasant feelings (Brown & Ryan, 2003). Notwithstanding, as previously stated, the influence of mindfulness on emotion regulation in relation to motivation receives insufficient attention.

Hypotheses

Based on the literature reviewed above, this study formulated the following four hypotheses. First, since pleasantness may be positively associated with autonomous motivation and negatively with controlled motivation, it was hypothesized that (H1) pleasantness would be positively associated with relative autonomous-oriented motivation. Second, arousal may be able to increase both autonomous and controlled motivations that are different from amotivation, so it was predicted that (H2) arousal would be unrelated to relative autonomous-oriented motivation, because its effect on autonomous and controlled motivations would be in the same direction and the effect on relative autonomous-oriented motivation may be counteracted. It was also hypothesized that (H3) trait mindfulness and relative autonomous-oriented motivation would be in a positive relationship, and that (H4) trait mindfulness would moderate the effect of emotion on relative autonomous-oriented motivation. In particular, it was expected that people with high and low level of trait mindfulness would show difference in the effects of pleasantness and arousal on the amount of self-determined motivation.

Method

Participants

One hundred and seventy-one students (59.1% female; age, Mdn = 23, IQR = 22-26) at a university in southern Sweden participated in the present study. They were from programs of Nursing, Social Work, Psychology, English Teaching and Mechanics. These programs were selected because of their large class sizes.

Procedure

The lecturers were contacted in advance to obtain permission to conduct the survey in their classes. The survey was held either before or after class, and has
continued for three weeks. Except for one class, the researcher remained present
during the whole survey process. Students were introduced that this survey was about
learning attitude, and that participation was voluntary and upon their consent.

Materials

An English questionnaire comprising three demographic items (age, gender and
studying program) and three scales was developed for the present study. The scales
were as below:

Mindful Attention Aware Scale (MAAS; Brown & Ryan, 2003): Trait mindfulness
was measured by this scale, which consisted of 15 items. Considering that some
individuals may not have driving experiences, an additional action "walk to" was
included in item 12 as "I drive or walk to places on "automatic pilot" and then wonder
why I went there." Three filler items were also added to the scale. The response was
on a 6-point Likert scale (Almost always, Very frequently, Somewhat frequently,
Somewhat infrequently, Very infrequently, Almost never), with higher scores
indicating higher level of trait mindfulness. This scale demonstrated adequate
convergent, discriminant and incremental validity, and test-retest reliability (Brown &
Ryan, 2003). Cronbach's alpha was .86 indicating good internal consistency in the
current sample.

Learning Self-Regulation Questionnaire (SRQ-L; Black & Deci, 2000; Williams &
Deci, 1996): This scale was adapted to measure learning motivation of the
participants. Since it was originally developed for medical and chemistry students, the
instruction and items 1, 4, 8, 9, 10 and 11 were modified so as to be applicable for
unspecific studying subjects (see Appendix A). For example, in item 10 "chemistry
problems" was changed to "problems related to the course". The participants used a
7-point Likert scale (1 = not at all true, 4 = neutral, 7 = very true) to rate how true of
their reasons for participating in the classes at the university. It involved two
sub-scales: autonomous (items 1, 4, 8, 9, 10) and controlled (items 2, 3, 5, 6, 7, 11, 12)
motivations. An additional continuous variable, Relative Autonomy Index (RAI;
Grolnick & Ryan, 1987), was formed to assess relative autonomous-oriented
motivation. It was obtained by subtracting the average score of controlled subscale
from that of autonomous subscale, and thus the higher the score, the more the
relative autonomous-oriented motivation should be. The original scale showed good
construct validity and internal consistency (Williams & Deci, 1996). The adapted
subscales also had good reliability (autonomous, $\alpha = .78$; controlled, $\alpha = .73$) for this sample.

Affect Grid (Russell, Weiss, & Mendelsohn, 1989): The participants were asked to reflect their general feeling about the current study by marking a "X" on the Affect Grid (see Appendix B). It was a single-item scale assessing the two dimensions of emotions, i.e., pleasantness and arousal, simultaneously. However, the original words "pleasant" or "unpleasant", and "arousal" or "sleepiness" were changed into "happy" or "unhappy", and "active" or "inactive", respectively, for the English proficiency of Swedish students. To make the present survey shorter in length and less time-consuming, the original written instruction was abandoned. Instead, three graphic examples of different feelings (neither happy nor unhappy and neither active nor inactive, extremely happy and active, slightly happy but very active) were applied to illustrate how to use the grid. The X-axis of the grid used a 9-point scale to represent happiness, from the left side "unhappy" to the right side "happy", and a higher score would be given to the marker toward the right side along the X-axis. The Y-axis also used the same scale to represent active feeling, from the bottom side "inactive" to the top side "active", and a higher score would be given to the marker toward the top side along the Y-axis. The Affect Grid had evidence of acceptable reliability, convergent and discriminant validity (Russell et al., 1989).

Results

Prior to analysis, 31 cases (more than 5% of the sample) with missing data were found among the variables of Trait mindfulness, Pleasantness, Arousal, and Autonomous and Controlled motivations. Little’s MCAR test indicated that the data may be missing completely at random, $\chi^2 (19) = 18.76$, n.s.. Therefore, expectation maximization was employed to manage the missing data. Analysis was also repeated to compare the results with and without missing data, but no substantial change was found except for those specified below.

Standard multiple regression using SPSS was performed to analyze the data. The assumptions of independence, normality and homoscedasticity of residuals were met. The largest variance inflation factor (VIF) and average VIF were 1.12 and 1.07 respectively, and no tolerance was below 0.2, implying that multicollinearity may not be a concern. Seven cases (about 4%) with standardized residuals higher than 2 were identified as outliers, but none of them had a Cook’s distance greater than 1,
indicating that they were not influential in the regression model and hence kept for the analysis.

Table 1 shows the correlation coefficients between the variables and their descriptive statistics ($M$ and $SD$). It was found that pleasantness was correlated positively with autonomous motivation ($r = .16, p = .02$) and negatively with controlled motivation ($r = -.15, p = .03$). In addition, arousal was correlated positively with both autonomous motivation ($r = .33, p < .001$) and controlled motivation ($r = .13, p = .04$). On the other hand, trait mindfulness was associated negatively with controlled motivation ($r = -.33, p < .001$), but not significantly associated with autonomous motivation ($r = .04, n.s.$). Moreover, there were no extremely strong correlations between the variables, so multicollinearity was less likely to be a problem for the regression analysis. Also note that pleasantness was not correlated with arousal, supporting that these two emotion dimensions could be conceptually independent (Russell et al., 1989).

Table 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Autonomous motivation</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>2 Controlled motivation</td>
<td>.37**</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>3 Relative Autonomy Index (RAI)</td>
<td>.61**</td>
<td>.52**</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>4 Pleasantness</td>
<td>.16*</td>
<td>-.15*</td>
<td>.28*</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
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<tr>
<td>5 Arousal</td>
<td>.33**</td>
<td>.13**</td>
<td>.19**</td>
<td>-.08*</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>6 Trait mindfulness</td>
<td>.04</td>
<td>-.33**</td>
<td>.32**</td>
<td>.23**</td>
<td>.21**</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>7 Pleasantness X Trait mindfulness*</td>
<td>.06</td>
<td>-.11</td>
<td>.16**</td>
<td>-.09</td>
<td>-.04</td>
<td>.02</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>8 Arousal X Trait mindfulness*</td>
<td>-.04</td>
<td>-.03</td>
<td>-.01</td>
<td>-.04</td>
<td>-.04</td>
<td>-.10</td>
<td>.05</td>
<td>—</td>
</tr>
<tr>
<td>Mean</td>
<td>5.31</td>
<td>4.15</td>
<td>1.16</td>
<td>5.78</td>
<td>6.02</td>
<td>4.02</td>
<td>0.32</td>
<td>0.26</td>
</tr>
<tr>
<td>SD</td>
<td>1.07</td>
<td>0.99</td>
<td>1.16</td>
<td>1.82</td>
<td>1.66</td>
<td>0.76</td>
<td>1.48</td>
<td>1.35</td>
</tr>
</tbody>
</table>

Note. $N = 171$; *Pleasantness, arousal & trait mindfulness were mean-centered for variables 7 & 8. *$p<.05$ **$p<.01$ (1-tailed)

Since one of the moderation terms (i.e., arousal X mindfulness) was not significantly associated with the outcome variable (i.e., Relative Autonomy Index), it was removed for the subsequent regression analysis. The results showed that the model explained around 18% of the variance in relative autonomous-oriented motivation (RAI) by the predictors (pleasantness and arousal), moderator (trait
mindfulness), and moderation effect (pleasantness \( X \) trait mindfulness), \( F(4, 166) = 10.51, p < .001 \) (see Table 2). According to Cohen (1992), its effect size (\( f^2 = .22 \)) was medium to large. Furthermore, pleasantness (\( t(166) = 3.57, p < .001 \)), arousal (\( t(166) = 2.44, p = .02 \)), trait mindfulness (\( t(166) = 2.94, p < .01 \)) and the moderation effect between pleasantness and trait mindfulness (\( t(166) = 2.62, p = .01 \)) made significant contributions to the model. The findings that pleasantness, arousal, trait mindfulness and the moderation effect between pleasantness and trait mindfulness were positively correlated with relative autonomous-oriented motivation were consistent with hypotheses H1 and H3, and H4 partially, but not H2. But note that arousal (\( t(135) = 1.99, p = .048 \)) and trait mindfulness (\( t(135) = 1.95, p = .053 \)) were marginally significant in the model with missing data despite of their similar regression coefficients.

**Table 2**  
Unstandardized regression coefficients (\( B \)), standard error, confidence intervals, standardized regression coefficients (\( \beta \)) of Pleasantness, Arousal, Trait mindfulness, the moderation term (Pleasantness \( X \) Trait mindfulness) on RAI

<table>
<thead>
<tr>
<th>Variables</th>
<th>( B )</th>
<th>SE</th>
<th>CI</th>
<th>( \beta )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.11***</td>
<td>0.08</td>
<td>0.95-1.27</td>
<td></td>
</tr>
<tr>
<td>Pleasantness*</td>
<td>0.17***</td>
<td>0.05</td>
<td>0.07-0.26</td>
<td>0.26</td>
</tr>
<tr>
<td>Arousal*</td>
<td>0.12*</td>
<td>0.05</td>
<td>0.02-0.22</td>
<td>0.18</td>
</tr>
<tr>
<td>Trait mindfulness*</td>
<td>0.33**</td>
<td>0.11</td>
<td>0.11-0.55</td>
<td>0.22</td>
</tr>
<tr>
<td>Pleasantness ( X ) Trait mindfulness*</td>
<td>0.14*</td>
<td>0.05</td>
<td>0.04-0.25</td>
<td>0.18</td>
</tr>
</tbody>
</table>

\( R^2 = .20, \text{ Adjusted } R^2 = .18 \)

*Note. \( N = 171 \); *Pleasantness, arousal & Trait mindfulness were mean-centered.
*\( p < .05 \) **\( p < .01 \) ***\( p < .001 \)

**PROCESS** (Hayes, 2013), a statistical add-on to SPSS, was performed to further analyze the conditional moderation effect of trait mindfulness on the relationship between pleasantness and relative autonomous-oriented motivation. It was found that such moderation effect uniquely explained around 3.3\% (\( F(1, 166) = 6.88, p < .01 \)) of the variance in relative autonomous-oriented motivation. In other words, the moderation effect significantly increased in the variance in the outcome variable. The slopes of the moderation effect for trait mindfulness at the mean [0.16, \( t(166) = 3.55, p < .001 \), 95\% CI (0.07, 0.26)] and 1 SD above the mean [0.27, \( t(166) = 4.18, p < .001 \), 95\% CI (0.14, 0.40)] were significantly different from zero. But the slope was
insignificant when the moderator at 1 SD below the mean (0.06, t(166)= .95, n.s.). Figure 1 displays the visual representation of these conditional effects. The Johnson-Neyman technique (Hayes, 2013) also revealed that the conditional effect was not significant for all the observed values of trait mindfulness, but only significant when it was equal to or greater than the value of 3.56, which was also about 1 SD below the mean.

![Figure 1](image_url)

**Figure 1.** The conditional moderation effect of trait mindfulness on the relationship between pleasantness and relative autonomous-oriented motivation

Discussion

In general, this study provided some evidence to support the roles of emotion and mindfulness on motivation in SDT framework. As hypothesized, pleasantness showed a positive relationship with relative autonomous-oriented motivation. It may imply that pleasant emotions would be likely to elicit autonomous motivation, supporting SDT that feelings of interest and excitement are important to the developments of self-determination and intrinsic motivated behaviours (Deci & Ryan, 1985). This may be due to that pleasant feeling increases generative behaviours, but unpleasant feeling increases avoiding behaviours (Seo et al., 2004). Nevertheless, arousal
dimension was associated positively with relative autonomous-oriented motivation that was inconsistent with the hypothesis. It was expected that arousal would be as strongly correlated with autonomous motivation as with controlled motivation, but a stronger relationship was actually found with the former. In other words, active emotion would be more likely to produce autonomous motivation than controlled motivation. Given that autonomous motivation involves behaving to attain self-endorsed goals and controlled motivation involves behaving to avoid unwanted outcomes (Ryan & Deci, 2002), it is possible that feeling active is more required by the former than the latter to produce sufficient behavioural efforts. It may also be related to that perceived active environments facilitate the psychological need fulfilment of competence and in turn intrinsic motivation (Benware & Deci, 1984). Summing up the findings regarding the emotion dimensions, some evidence may be added to SDT that people can be motivated for anticipated emotional states (Deci & Ryan, 1985), and to the theoretical works of Frijda et al. (1989) and Seo et al. (2004) that emotions contain evaluative information to prepare and direct the subsequent behaviours.

The result also supported the hypothesis that trait mindfulness would predict relative autonomous-oriented motivation positively. This consistency with the previous studies may indicate that mindfulness would be able to increase self-regulation and hence self-determination by means of enhanced self-awareness (Brown & Ryan, 2003) and disengagement (Brown et al., 2007). When analyzing the relationship between trait mindfulness and each form of motivation independently, it was however found that trait mindfulness was merely correlated negatively with controlled motivation, but insignificantly with autonomous motivation. One possible reason is that being mindful may undermine controlled motivation by improving awareness of and disengagement from controlled self-regulatory styles, but may not necessarily turn non-self-endorsed values and needs into self-endorsed ones that are essential for the formation of autonomous motivation. For example, a mindful student may become less controlled motivated in study because (s)he realizes that keeping an image of 'good student' is no longer important, but this realization may not make the student feel interested in and cherish the study. Further research will help to address this issue.

Last but not the least, the present study demonstrated how trait mindfulness may moderate the effect of emotion on relative autonomous-oriented motivation. The result showed that the positive effect of pleasantness on the motivational orientation would
be larger when the level of trait mindfulness increased. To put it simply, a more mindful individual would be more likely than a less mindful one to be autonomously motivated even if they both experience the same degree of pleasant emotion. Such moderation effect is presumably the result of heightened self-awareness with a mindful disposition. Since mindful people may be more able to be alert of, attend to and accept arising emotions, they could 'see into' the emotions more clearly and use the information learnt from them to guide behaviours (Brown et al., 2007; Shapiro et al., 2006). As such, mindful people may take advantage of pleasant emotions to consolidate more of their interests and self-endorsed values and beliefs, and in turn be more relatively autonomously motivated. The insignificant moderation effect of lower level of trait mindfulness (i.e., 1 SD below the mean) may also be meaningful in this sense because it can imply that less mindful people was unlikely to be aware of pleasant emotions and use them to influence their motivations. Yet, it could also be theoretically reasonable that mindful people having unpleasant emotions may result in more controlled motivation. But based on the present result, it would be beyond the range of data and hence little confidence was given to make such inference. It was unexpected that the moderation between arousal and trait mindfulness was not correlated with relative autonomous-oriented motivation. Since arousal dimension is referred to the subjective feeling of physiological state (Russell et al., 1989), it might not be as susceptible as pleasantness dimension to mindfulness in relation to motivation.

Limitations and future research

Some limitations should be considered when interpreting the findings. First, the participants of this study were not randomly sampled and targeted on Swedish university students. This can pose considerable threats to its external validity. In addition, values, needs and motivational forms can be varied across cultures (Ryan & Deci, 2002), the present findings may not be generalized to other ethnic groups. Second, no causal inference can be made between the variables. Since this study was correlational, it would be methodologically inappropriate to conclude any causality. Though the present study was to predict motivation from emotions and mindfulness, their relationships can be interconnected in reality. For instance, Langer (1989) notes that choices would make people more mindful, implying that self-determination may also be an antecedent of mindfulness. Third, the reliability and internal validity of the scales used may be affected. To make the scales more
applicable to the social context of the current study, some items were revised without knowing if the internal consistency and validity of the original scales were undermined. Moreover, mindfulness was defined as a psychological state involving enhanced self-awareness and accepting attitude in this study, but the scale for assessing mindfulness (MAAS) engaged the aspect of attention deeply, leaving the acceptance aspect untouched. As some scholars criticize, the MAAS does not fully reflect the characteristics of mindfulness (Grossman & Van Dam, 2011).

Few directions for future research were suggested. The present study may highlight the importance of emotion and mindfulness on self-determination and autonomous motivation. However, emotion and cognition could indeed function as a reciprocal mechanism in guiding motivation (Vandercammen et al., 2014). In particular, the evidence supporting causal relationships between emotion and motivation remains insufficient. Therefore, future investigation may focus on how emotional and cognitive feedback interact with each other, and in turn how they influence the development of motivation. Besides, the unexpected findings that trait mindfulness was not associated with autonomous motivation, and that trait mindfulness did not moderate the relationship between arousal and motivation may need further examination. These issues may be due to methodological shortcomings, but may also be the case that there are theoretical implications awaiting for exploration. Lastly, the findings might carries important implications to other contexts. Recently, scholars have been incorporating the ideas of positive psychology and mindfulness into work psychology. For example, Froman (2010) proposes relationships between positive emotion and work motivation; Glomb and colleagues discuss effects of mindfulness-based practices on employees' emotional regulation and thus job performance (Glomb, Duffy, Bono, & Tao, 2011). Although this study operationalized motivation in relation to learning, it may have demonstrated conceptual relationships among pleasant and arousal emotions, trait mindfulness, and autonomous motivation that can be examined in the applied research of work psychology.
References


Appendix A

The adapted instruction and items from Learning Self-Regulation Questionnaire

Instruction: The following questions relate to your reasons for participating actively in your current course. Different people have different reasons for their participation in such a class, and we want to know how true each of the reasons is for you. Please use the following scale to indicate how true each reason is for you: indicate to what extent do you agree with the following statements.

A. I will participate actively in my current course:
   1. Because I feel like it's a good way to improve my understanding of the course content.
   4. Because a solid understanding of this course is important to my intellectual growth.

B. I am likely to follow my instructor’s suggestions for studying the current course:
   8. Because he/she seems to have insight about how best to learn from the course.

C. The reason that I will work to expand my knowledge of the current course is:
   9. Because it’s interesting to learn more about the knowledge covered in this course.
   10. Because it's a challenge to really understand how to solve problems related to the course.
   11. Because a good grade in the current course will look positive on my record.
Appendix B
The adapted Affect Grid

Instruction: Please mark a 'X' on the below 'grid' to describe your general feeling about your current study.

Example 1: If you feel neither happy nor unhappy, and neither active nor inactive, you may mark your feeling on the grid like:

Example 2: If you feel extremely happy and active, you may mark your feeling on the grid like:

Example 3: If you feel slightly unhappy but very active, you may mark your feeling on the grid like:

Your general feeling about the current study is: