


Trait Hedonism and the Distribution of Savoring and Positive Emotion States in Everyday Life

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Abstract

The present study aimed at (1) identifying the emotion regulation processes that can explain the trait hedonism positive emotions relationship, and (2) determining whether this relationship varies according to which part of the distribution of positive emotions is considered. To this end, the intensity of the positive emotions felt by 84 adult participants, and the intensity of their engagement in savoring, were assessed twice a day over a month period, using an Experience Sampling Method. Participants' distributions of these variables were then related to their level of trait hedonism, assessed with a common questionnaire. Results suggested that, as expected, the trait hedonism positive emotions relationship varied according to which part of the distribution of positive emotions was considered. In their worst times (i.e., first centiles of each individual's distribution), individuals with low versus high trait hedonism differed very little from each other. By contrast, in more favorable times (i.e., following centiles), individuals with high levels of trait hedonism experienced more intense positive emotions than individuals with low levels of trait hedonism. This phenomenon was mediated by individuals' engagement in savoring. These results are discussed in light of current theories on emotion dynamics.

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Keywords

positive emotions, savoring, hedonism, orientation to happiness, quantile regression, emotion dynamics

Introduction

Individuals durably differ from each other on their wish to maximize pleasure in their daily lives (Peterson et al., 2005; Vanderlande et al., 2020). These differences in hedonism have received considerable attention, as they are thought to engender between-individuals differences in other important life domains, such as wellbeing and health (Martin-Krumm et al., 2015; Yang et al., 2017). In particular, depending on their level of trait hedonism, individuals have robustly been shown to differ from each other on the intensity of the positive emotions they experience in their daily lives (Anić & Tončić, 2013; Chan, 2013; Yang et al., 2017). Despite these studies examining the trait hedonism-positive emotions relationship, there are many unresolved questions.

First, the strength of the trait hedonism-positive emotions relationship may vary, depending on which part of the distribution of positive emotions is considered. Dauvier et al. (2019) recently observed this for the extraversion-positive emotion relationship. The intensity of the positive emotions individuals felt during their worst times¹ (i.e., times of their lives marked by very weak positive emotions compared with their usual experience of positive emotions) was virtually the same, whatever their level of extraversion. By contrast, the intensity of the positive emotions they felt during their best times (i.e., the times of their lives marked by far more intense positive emotions than usual) differed. More specifically, the most extraverted individuals experienced the greatest intensity. These individuals therefore seem capable of experiencing intense feelings of positive emotions that their more introverted counterparts struggle to achieve. Theoretical arguments led us to assume that there is a similar difference between individuals with different levels of trait hedonism.

Second, little is known about the mechanism linking individuals' levels of trait hedonism to their actual experiences of positive emotions, thus hindering our understanding of the reasons why individuals with greater trait hedonism feel more positive emotions. In particular, although the use of emotion regulation strategies has frequently been shown to mediate the link between personality traits and the experience of one type of emotion or another (Kobylińska et al., 2020; Vaughan et al., 2019; Wang et al., 2009), to our knowledge no study has examined whether the use of strategies to upregulate positive emotions mediates the link between trait hedonism and positive emotions.

The present study was designed to address both issues. More specifically, by assessing trait hedonism with a traditional self-report questionnaire (i.e., Orientation To Happiness Questionnaire; Peterson et al., 2005, 2007), and by repeatedly assessing positive emotions and the savoring emotion regulation strategy over a 32-day period using an experience sampling method (Hektner et al., 2006), we sought to pinpoint the

relationship between trait hedonism and the distribution of positive emotions and savoring in everyday life. We tested the hypothesis of a mediated moderation, whereby the effect on positive emotion intensity of the interaction between trait hedonism and the part of the distribution being considered is mediated by savoring.

Trait Hedonism, Positive Emotions, and Savoring

Trait hedonism is a motivational attribute. It corresponds to the degree to which individuals pursue the goal of maximizing pleasure and minimizing pain (Chen, 2010; Peterson et al., 2005). Although it is conceptually close to traits related to approach temperament (e.g., extraversion, approach motivation; Quilty et al., 2014), trait hedonism is commonly assessed using the Orientation to Happiness Questionnaire (Peterson et al., 2005, 2007), with items such as “In choosing what to do, I always take into account whether it will be pleasurable”.

Consistent with the idea that valuing a goal increases the likelihood of attaining it (Austin & Vancouver, 1996), individuals’ level of trait hedonism has robustly been shown to relate positively to their emotional wellbeing (i.e., intense experience of positive emotions and/or nonintense experiences of negative emotions). More specifically, it appears to relate to their experiences of positive emotions rather than their experiences of negative emotions (Anić & Tončić, 2013; Chan, 2013; Vella-Brodrick et al., 2009; Yang et al., 2017).

To our knowledge, no study has so far examined the main processes that may mediate the relationship between trait hedonism and the experience of positive emotions, thus hindering an in-depth understanding of this relationship. The use of emotion regulation strategies could be one such mediating process, for two main reasons. First, at the theoretical level, emotion regulation strategies are defined as the means through which individuals attempt to attain their emotional goals (Gross, 2015; Pavani et al., 2019; Quoidbach et al., 2015). Second, at the empirical level, the use of such strategies has already been shown to mediate the relationship between personality traits and emotional experiences (Kobylińska et al., 2020; Vaughan et al., 2019; Wang et al., 2009). In the present study, we chose to focus specifically on the emotion regulation strategy of *savoring* (also labelled *appreciation* by some researchers; Adler & Fagley, 2005; Pavani et al., 2017, 2019), as recent studies suggest that this is the most effective strategy for upregulating positive emotions (Colombo et al., 2020; Jose et al., 2012; Pavani et al., 2017, 2019).

Savoring consists in focusing on and appreciating those positive aspects of life that one might otherwise overlook or rush through (Bryant & Veroff, 2006; Seligman et al., 2006). Engaging in this emotion regulation strategy requires individuals to focus on the present moment and the immediate experience, and either concentrate on the positive aspects of their environment, or reappraise seemingly neutral events by considering their possible positive features (Erisman & Roemer, 2010; Pavani et al., 2017). Cross-sectional, longitudinal, and experimental studies converge to suggest that engaging in this strategy moderately to strongly increases the intensity of the positive emotions that

are experienced (Adler & Fagley, 2005; Colombo et al., 2020; Jose et al., 2012; Pavani et al., 2017; Seligman et al., 2006). In addition, the mean tendency to engage in this strategy has been shown to relate positively to some personality traits that, like trait hedonism, are implicated in the value assigned to positive emotional experiences (e.g., extraversion and emotional stability; Fagley, 2012). Nevertheless, as detailed below, restricting our attention to individuals' mean tendency to engage in savoring has potential limitations. More specifically, depending on the part of the distribution of an individual's savoring behaviors (e.g., first vs. tenth decile) that is considered, trait hedonism may relate differently to savoring. This reasoning may also apply to the experience of positive emotions, for the reasons set out below.

Trait Hedonism and the Distribution of Positive Emotions and Savoring Behaviors

When a state variable (e.g., positive emotion intensity) is repeatedly assessed over time (e.g., several times a day over a 1-month period), the distribution of this variable, from its minimum value to its maximum value through all the quantiles, can be computed for each individual. These within-individual distributions can sometimes be subject to very complex between-individuals differences (Dauvier et al., 2019; Koenker & Bassett, 1978; Lee et al., 2021). For instance, two individuals can have the same minimum value of positive emotion intensity (e.g., 5/100), the same median value of positive emotion intensity (e.g., 55/100), but very different maximum values of positive emotion intensity (e.g., 70/100 for one individual and 90/100 for the other).

In addition, depending on which part of the distribution is considered, the relationship between the state variable of interest (e.g., positive emotion intensity) and another variable can vary considerably (Dauvier et al., 2019; Lee et al., 2021). This observation inspired the development of so-called *quantile regression* techniques (Koenker & Bassett, 1978). To give but one example, when Dauvier et al. (2019) examined between-individual differences on the fifth centile of individuals' distribution of positive emotion states, the relationship they found between positive emotion intensity and extraversion was negligible and nonsignificant. However, this relationship became stronger and significant when they examined between-individual differences on the 95th centile. In other words, individuals experienced the same low levels of positive emotions during their *worst times* regardless of their level of extraversion. By contrast, during their *best times*, extraverted individuals² felt more intense positive emotions than their more introverted peers.

In the present study, we supposed that the relationship between trait hedonism and the distribution of positive emotion states and savoring behaviors would follow the same pattern as the extraversion-positive emotions relationship found by Dauvier et al. (2019). Our hypotheses were mainly inspired by theoretical arguments, based on the two main forces that drive emotion and emotion regulation dynamics according to Kuppens and Verduyn (2017; see also Garland et al., 2010; Pavani et al., 2017).

The first force can be described as *regulatory*. It is the force that brings individuals' emotional states closer to their emotional goals, partly through the emotion regulation strategies that individuals use to attain these goals (Kuppens & Verduyn, 2017). In other words, individuals who have different emotional goals are also likely to differ in their actual emotional experiences and emotion regulation behaviors. For instance, individuals who value intense experiences of positive emotions more than others do are supposed to generally feel more intense positive emotions, and generally make more intense use of strategies (e.g., savoring) to upregulate their positive emotions. As between-individual differences in emotional goals are known to be relatively stable over time (e.g., Martin-Krumm et al., 2015; Peterson et al., 2005, 2007), those individuals who value intense positive emotional experiences more than others are likely to report more intense positive emotion feelings and greater use of savoring regardless of whether they are having a *bad time* or a *good time*. By definition, individuals with high levels of trait hedonism value intense positive emotion experiences more than individuals with low levels of trait hedonism do. Therefore, the regulatory force should lead them to display more intense positive emotions and greater savoring behaviors than individuals with low levels of trait hedonism, regardless of which part of the distribution is considered.

The second force can be described as *self-perpetuating*, in line with Garland and Fredrickson (Garland et al., 2010); see also Kuppens & Verduyn, 2017, who label this force *inertia*. It refers to the tendency of an individual's emotions and behaviors (e.g., use of emotion regulation strategies) to mutually reinforce each other over time, leading both to *upward spirals* (i.e., an emotional state and a behavior mutually increasing each other) and *downward spirals* (i.e., the lack of this emotion and the lack of this behavior mutually reinforcing their absence). The strength of this force has been shown to differ between individuals (Pavani et al., 2017), leading some to display more variable emotional states and emotion regulation behaviors than others (Dauvier et al., 2019). Compared with an individual who is less prone to them, an individual who is more prone to the above-mentioned upward and downward spirals will, by definition, experience both lower (during bad times) and higher (during good times) levels of the relevant emotion or emotion regulation behavior. To the best of our knowledge, no study has so far examined how mutual relationships between positive emotions and savoring differ between individuals according to their level of trait hedonism. Nevertheless, studies of personality traits that assign value to pleasant experiences (e.g., extraversion, behavioral activation system), albeit less directly than trait hedonism, have already been conducted, and all suggest that the higher the level of such traits, the stronger an individual's self-perpetuating force with regard to positive emotions and positive emotion regulation behaviors (Fulford et al., 2010; Hirsh et al., 2010; Johnson et al., 2012; Pavani et al., 2017).

By simultaneously considering these two forces, we were able to propose the following expectations. During individuals' *worst times* (e.g., first decile of their distributions of positive emotions and savoring), the regulatory force would, as mentioned above, lead individuals with high levels of trait hedonism to display more

intense positive emotions and more savoring behaviors than their peers with lower levels of trait hedonism. However, their heightened sensitivity to the self-perpetuating force, and the greater downward spirals, would lead them to display less intense positive emotions and fewer savoring behaviors. Therefore, during these *bad times*, the two forces would cancel each other out, leading to few differences between individuals according to their level of trait hedonism. By contrast, during individuals' *best times* (i.e., highest deciles of the distributions of positive emotions and savoring), the effects of the regulatory and self-perpetuating forces would go in the same direction. Once again, the regulatory force would lead individuals with a high level of trait hedonism to experience more intense positive emotions than peers with a low level of this trait. Furthermore, their heightened sensitivity to the self-perpetuating force, and the accompanying upward spirals, would produce the same effect, heightening the difference between individuals with high versus low levels of trait hedonism.

The Present Study

The present study was designed to deepen current understanding of the relationship between trait hedonism and positive emotion experiences. To this end, we examined (1) whether this relationship is moderated by the part of the distribution (i.e., centile) of the state variable being considered, and (2) whether the effect on the intensity of positive emotion of the interaction between trait hedonism and the centile being considered is mediated by savoring. To capture each individual's distribution of savoring behaviors and positive emotion experiences, we implemented an experience sampling method (Hektner et al., 2006) over a 32-day period. By contrast, trait hedonism was assessed using a standard self-report questionnaire.

Based on the arguments reported above, we formulated three hypotheses. First, we predicted that the relationship between individuals' level of trait hedonism and the intensity of their experiences of positive emotions would be moderated by the centile of the distribution of their positive emotions, such that the higher the centile, the stronger the relationship between trait hedonism and positive emotion intensity (Hypothesis 1). Second, the relationship between individuals' level of trait hedonism and the intensity of their engagement in savoring would be moderated by the centile of the distribution of savoring, such that the higher the centile, the stronger the positive relationship between trait hedonism and savoring (Hypothesis 2). Third, the interaction effect of trait hedonism and the centile considered for positive emotions would be mediated by savoring (Hypothesis 3). For clarity's sake, this third hypothesis is depicted in [Figure 1](#).

Method

Participants

A total of 84 French adults (79% female, 21% male)³ aged 19–63 years ($M = 33.81$, $SD = 12.55$) took part in the study on a voluntary basis. Their education levels varied

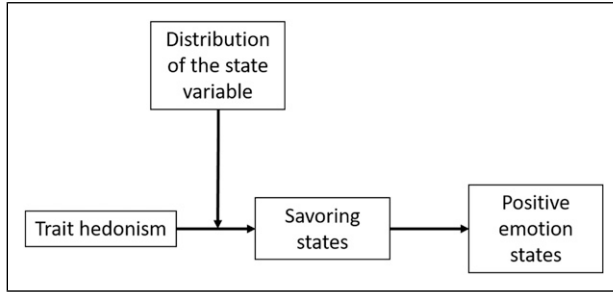


Figure 1. Graphical representation of the mediated moderation hypothesis formulated in the present study.

widely (i.e., 4% had no diploma, 5% had a vocational high-school diploma, 15% had a general high-school diploma, 46% had completed 2 or 3 years of higher education, and 30% had completed more than 3 years of higher education). The study was introduced to potential participants as a scientific inquiry into emotions in everyday life. Experimenters recruited participants via their own social media, and by posting advertisements on social media pages devoted to emotions, wellbeing, and personal growth. Participants had to be aged at least 18 years, and not to have any disorder that might impact their emotion regulation (e.g., major depressive disorder, generalized anxiety disorder, autism spectrum disorder). The present study's sample size was decided on the basis of a statistical power analysis. As the main analyses performed in this study were linear mixed-effects models, we computed power analysis using the R package *simr* (Green & MacLeod, 2016). Moreover, as the present study's data analytic strategy was innovative, the parameters on which it was based were computed on data collected from our first 20 participants. Simulations performed with *simr* suggested that, for our effect of interest that required the strongest sample size to be significant at the $p < 0.001$ threshold,⁴ 80% of power was reached with $n = 80$. To collect data on at least 80 participants, we had to recruit 94 individuals. In other words, 10 participants dropped-out from the study. The participants who dropped-out did not differ from the individuals who completed the study on any of the variables assessed before the experience-sampling period: sex ($\chi^2 = 0.78, p = 0.380$), age ($t = 1.81, p = 0.091$), education level ($t = 1.60, p = 0.136$), and trait hedonism ($t = 0.79, p = 0.445$).

Procedure

The present study was conducted in accordance with the 1964 Declaration of Helsinki and its later amendments, and the 2016 APA Ethical Principles of Psychologists and Code of Conduct. Written informed consent was obtained from each participant.

The procedure comprised two phases. In the first phase, participants were asked to complete a questionnaire battery that included a sociodemographic questionnaire about their gender, age and education level, a questionnaire assessing trait hedonism, and a

more original questionnaire. This original questionnaire was intended to control for the considerable differences between individuals on emotion labeling, as done in previous studies (Pavani et al., 2017). It was motivated by the ideas advanced by Nesselroade and Molenaar (2017), about the importance of tailoring a construct to each individual, all the while leading all the individuals to assign the same core meaning to that construct. More specifically, for each positive emotion-related item, as well as the savoring item we wanted to include in the brief questionnaire of the second phase (see below), participants were each given three wording options, and asked to choose the wording they felt best described the item. These choices were stored and subsequently used to create the individualized brief questionnaire that each participant would subsequently be invited to complete in the second phase. Wording options were extracted from previous studies having provided evidence supported their effectiveness in assessing the same constructs (e.g., Le Vigouroux et al., 2017; Pavani et al., 2017).

In the second phase, participants were submitted to an experience-sampling method. To cover a sufficiently long period, the protocol lasted approximately 1 month (i.e., 32 consecutive days). During this period, participants received the above-mentioned brief questionnaire twice a day (i.e., at noon and at 7 p.m.). A hyperlink to this questionnaire was sent by SMS or e-mail, according to participants' preferences. In the brief questionnaire, participants were asked to provide information about their immediate emotional feelings, and the intensity with which they had engaged in savoring since the previous assessment point. Participants were asked to respond to this questionnaire within 2 hours of receiving the link (i.e., before 2 p.m. for the first questionnaire of the day, and before 9 p.m. for the second questionnaire of the day), so that the two consecutive daily assessments were neither too close nor too far apart. Participants responded to 4604 of the 5376 brief questionnaires sent (i.e., 86%).

Materials

State Positive Emotions. Participants' positive emotion experiences were assessed with five items in the brief experience-sampling questionnaire. These items were designed to cover the five types of positive emotions identified in the 12-point circumplex model (Yik et al., 2011), namely, highly activated, activated, neither activated nor deactivated, deactivated, and highly deactivated positive emotions. The wording options were *Dynamic*, *Energized*, and *Full of vigor* for highly activated positive emotions; *Enthusiastic*, *Joyful*, and *Cheerful* for activated positive emotions; *Satisfied*, *Happy*, and *Contented* for neither activated nor deactivated positive emotions; *Serene*, *Soothed*, and *Peaceful* for deactivated positive emotions; and *Relaxed*, *Calm*, and *Tranquillized* for highly deactivated positive emotions. At each assessment, participants were asked to indicate the intensity with which they currently felt each of the five types of emotions, on visual analogue scales yielding scores ranging from 0 to 100. A number of previous studies had provided evidence supporting the factorial and criterion validity of the above-mentioned items for assessing positive emotions (e.g., Le Vigouroux et al., 2017; Pavani et al., 2017, 2019). On this basis, we computed an indicator of positive

emotions by averaging scores on the five items ($\alpha = 0.81$ at the within-individual level, and 0.93 at the between-individual level). Internal consistency at the within-individual level was computed on the items after person mean centering them ($N = 4604$), whereas internal consistency at the between-individuals level was computed on the items after averaging them across individuals ($N = 84$).

Savoring Behaviors. Participants' engagement in savoring was assessed with a single item in the brief experience-sampling questionnaire. The wording options given to participants for the savoring-related item were *I have taken time to savor a small moment of my day, I have tried to be more sensitive to the small blessings of my life than I usually do, I have fully appreciated a moment I was living.*

Trait Hedonism. Participants' level of trait hedonism was assessed in the initial questionnaire battery with the Orientation to Happiness Questionnaire (Peterson et al., 2005, 2007). The French validation of this questionnaire (Martin-Krumm et al., 2015) contains four items assessing trait hedonism (e.g., In choosing what to do, I always take into account whether it will be pleasurable). Participants are asked to indicate the degree to which they agree with each item on a 5-point Likert scale ranging from 1 (*Very much unlike me*) to 5 (*Very much like me*). Scores on these items were averaged to yield the indicator of trait hedonism used in this study ($\alpha = 0.70$).

Data Analysis Strategy

Data were analyzed using R, (R Core Team, 2020). The R code used, as well as the data on which our analyses were based, are available at https://osf.io/m5ebj/?view_only=f3330b1ca3434498a262ffc00a2afd02. To take account of the data's hierarchical structure (i.e., several assessments nested within several individuals), all the models reported below were linear mixed-effects models, fitted with maximum likelihood estimation. These models shared two characteristics. First, they all contained one random intercept per participant, to take into consideration the above-mentioned hierarchical nature of the data. Second, they all contained the same sociodemographic control variables as predictors, namely gender (dichotomous variable), age (grand-mean-centered numerical variable), and education level (grand-mean-centered ordinal variable with the five modalities described above).

A three-step data analysis strategy was applied. The first step was designed to test *Hypothesis 1*. More specifically, it tested whether the relationship between trait hedonism and positive emotion intensity depends on the part of the distribution of positive emotions considered, using the quantile regression strategy recently implemented by Dauvier et al. (2019). First, a *centile* variable, reflecting the part of the distribution considered, was created. To this end, scores for positive emotions were assigned a rank for each individual. For example, for an individual having responded to 62 assessments, the time where he or she reported the least intense positive emotions was assigned a score of 1, the penultimate time where he or she reported the least intense positive

emotions was assigned a score of 2, and so on until the time where he or she reported the most intense positive emotions which was assigned a score of 62. To convert these ranks into centiles, they were divided by the number of assessments to which the individual responded, and multiplied by 100 (e.g., $62/62 * 100 = 100^{\text{th}}$ centile). Second, a linear mixed-effects model was calculated, using the *lmerTest* R package (Kuznetsova et al., 2017). This contained positive emotions score as the outcome, and trait hedonism, centile, and the interaction between these two variables as predictors. Like Dauvier et al. (2019), to capture possible complex effects, we examined the linear and quadratic effects of centile, by including polynomials of degrees 1 and 2 among the predictors. For clarity's sake, these variables are referred to hereafter as *linear centile* and *nonlinear centile*.⁵

The second step served to test Hypothesis 2. It tested whether the relationship between trait hedonism and savoring depends on which part of the distribution of savoring is considered, with a strategy identical to that used in the first step. A second linear mixed-effects model was calculated, with savoring as outcome variable. It contained the same predictor variables as the first linear mixed-effects model.

The third step served to test Hypothesis 3. It tested whether the effect of the interaction between trait hedonism and centile on positive emotions was mediated by the effect of the interaction between these two variables on savoring, in a prototypical case of mediated moderation (Muller et al., 2005). We therefore ran a mediated moderation analysis using the *lavaan* R package (Rosseel, 2012). In this analysis, the outcome variable was positive emotions, the mediator variable was savoring, the predictor variables were the interaction effect between trait hedonism and linear centile, and the interaction effect between trait hedonism and nonlinear centile.

Results

Descriptive Statistics

Descriptive statistics are set out in Table 1. Trait hedonism was moderately correlated with the mean of individuals' distribution of positive emotion and savoring states.

Table 1. Descriptive Statistics and Intercorrelations for the Variables of Interest in the Present Study.

Variable	<i>M</i>	<i>SD</i>	<i>Sk</i>	<i>ICC</i>	<i>1</i>	<i>2</i>
1. Positive emotions	43.84	21.31	0.16	0.52		0.36***
2. Savoring	48.19	31.97	-0.02	0.43	0.44***	
3. Hedonism	3.85	0.73	-0.57		0.30**	0.37***

Note. *M*: mean; *SD*: standard deviation; *Sk*: skewness; *ICC*: intraclass correlation. Correlations below the diagonal were computed at the between-individuals level ($n = 84$). The correlation above the diagonal was computed at the within-individual level ($n = 4604$).

** $p < 0.01$. *** $p < 0.001$.

Table 2. Results of the Linear Mixed-Effects Models Computed to Test Hypothesis 1.

Predictor	Model 1 (DV = PE)			Model 2 (DV = Sav)		
	β	SE	p	β	SE	p
Intercept	0.007	0.072	0.925	0.000	0.065	0.994
Centile L	0.621	0.004	<0.001***	0.645	0.006	<0.001***
Centile NL	-0.013	0.004	0.002**	-0.009	0.009	0.113*
Hedonism	0.239	0.078	0.002**	0.280	0.070	<0.001***
Centile L * Hedonism	0.069	0.004	<0.001***	0.067	0.006	<0.001***
Centile NL * Hedonism	-0.036	0.004	<0.001***	-0.066	0.006	<0.001***

Note. DV: dependent variable; SE: standard error; L: linear; NL: nonlinear.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

The following analyses examined whether these relationships changed if other parts of the distributions were considered.

Effect of Trait Hedonism on Positive Emotions Depending on the Centile Considered

Results of the linear mixed-effects model calculated to test Hypotheses 1 and 2 are set out in Table 2. Consistent with our hypothesis, trait hedonism was significantly related to positive emotions ($\beta^6 = 0.24$, $p < 0.01$) and savoring ($\beta = 0.28$, $p < 0.001$). Thus, the higher the individuals' level of trait hedonism, the more intense their positive emotions and engagement in savoring in general during the experience-sampling period. More importantly, linear centile and nonlinear centile significantly moderated the relationship between trait hedonism and positive emotions ($\beta = 0.07$ and $\beta = -0.04$, $ps < 0.001$), as well as the relationship between trait hedonism and savoring ($\beta = 0.06$ and $\beta = -0.07$, $ps < 0.001$). To make these relationships easier to understand, predictions were made on the basis of the coefficients estimated by the models for a fictitious individual with a low level of trait hedonism and a fictitious individual with a high level of trait hedonism (i.e., one standard deviation below and above the mean). These predictions are depicted in Figure 2.

Figure 2(a) shows that at the points in the experience-sampling period where individuals experienced far less intense positive emotions than usual (i.e., Centiles 0–10)⁷, individuals with low versus high trait hedonism differed very little from each other on the intensity of their positive emotions. Within this part of the distribution, the intensity of the positive emotions felt by individuals with low trait hedonism was approximately equal to 20, while the intensity of the positive emotions felt by individuals with high trait hedonism was approximately equal to 23. Greater differences between these individuals were observed within the subsequent centiles, continuing to increase up to approximately the 50th centile, after which they plateaued. Figure 2(b) shows a similar pattern for savoring.

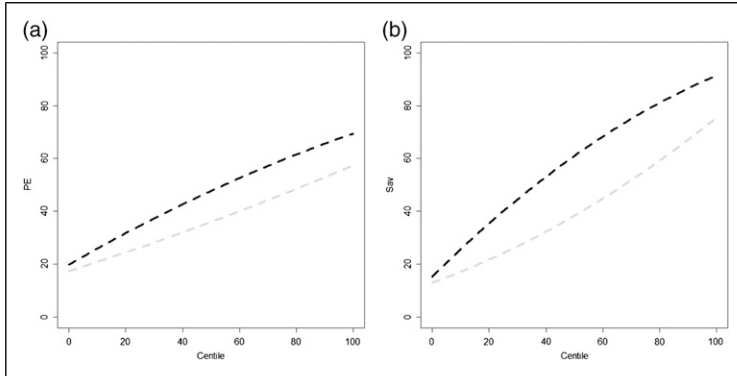


Figure 2. Intensity of positive emotions and savoring as a function of centile and trait hedonism. *Note.* PE: positive emotions; Sav: savoring. Individuals with a low level of trait hedonism (one standard deviation below the mean) are represented by the dashed gray line. Individuals with a high level of trait hedonism (one standard deviation above the mean) are represented by the black line.

Put differently, during the times in their daily lives where individuals experienced far less intense positive emotions than usual or engage far less in savoring than usual (e.g., first centiles), a high level of trait hedonism did not appear to prevent individuals from reaching low levels of positive emotions or savoring. By contrast, at better times in their daily lives (i.e., when they showed slightly less intense or more intense positive emotions or savoring than usual), a high level of trait hedonism was accompanied by more intense positive emotion experiences and savoring. Consequently, individuals with high trait hedonism seemed to cross a boundary of positive emotions and savoring that individuals with lower levels of trait hedonism struggled to cross.

Effect of Trait Hedonism on Positive Emotions Depending on the Centile Considered via Savoring

Results of the multilevel mediated moderation analysis performed to test Hypothesis 3 are set out in [Table 3](#). These results were consistent with our hypothesis. The interaction between trait hedonism and linear centile predicted positive emotion intensity ($\beta = 0.07$, $p < 0.001$). Furthermore, 41% of this relationship was mediated by the effect of the interaction between trait hedonism and linear centile on savoring ($\beta = 0.03$, $p < 0.001$). The interaction between trait hedonism and nonlinear centile also predicted positive emotion intensity ($\beta = -0.04$, $p < 0.001$), and 78% of this relationship was mediated by savoring ($\beta = -0.03$, $p < 0.001$).

Table 3. Results of the Mediated Moderation Analysis Performed to Test Hypothesis 2.

Indicator	Linear Effect			Nonlinear Effect		
	β	SE	p	β	SE	p
Total effect	0.069	0.012	<0.001***	-0.036	0.012	0.002**
Direct effect	0.041	0.011	<0.001***	-0.008	0.011	0.756
Indirect effect	0.028	0.005	<0.001***	-0.028	0.005	<0.001***
% Mediated	0.412	0.076	<0.001***	0.780	0.230	0.001**

Note. Linear effect: mediation of the interaction effect of trait hedonism and linear centiles on positive emotions by the effect of this interaction on savoring; Nonlinear effect: mediation of the interaction effect of trait hedonism and quadratic centiles on positive emotions by the effect of this interaction on savoring. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Discussion

Interpretation of Results

Results were consistent with our hypotheses. For a start, the trait hedonism-positive emotions relationship varied according to the part of the distribution of positive emotions considered. Similarly, the trait hedonism-savoring relationship varied according to the part of the distribution of savoring considered. Interestingly, in both cases, the relationship of interest was negligible for the first centiles of the distribution, and nonlinearly increased across the centiles. In other words, in the worst times (i.e., times in their daily lives where they displayed far less intense positive emotions and savoring behaviors than usual), a higher level of trait hedonism did not appear to prevent participants from experiencing low levels of positive emotions and savoring behaviors. By contrast, in the best times (e.g., when their positive emotion experiences and savoring behaviors were higher than usual), a higher level of trait hedonism was accompanied by more intense levels of these variables. Consequently, in their experience of positive emotions and engagement in savoring, participants with high trait hedonism seemed to be able to attain levels of intensity that participants with lower trait hedonism struggled to attain. Finally, consistent with previous findings suggesting that emotion regulation behaviors can partly mediate the relationship between personality traits and emotional experiences (Kobylińska et al., 2020; Vaughan et al., 2019; Wang et al., 2009), the above-mentioned effect on positive emotions of the interaction between trait hedonism and the part of the distribution examined was mediated by its effect on savoring.

Until recently (e.g., Dauvier et al., 2019; Lee et al., 2021), the idea that the relationship between two variables can vary, according to the part of the distribution of one of the two variables being considered, has received little attention in psychology research. Thus, to our knowledge, no theory has specifically been developed to attempt to explain this variation. For this reason, the above-mentioned results may, at first glance, seem hard to interpret. Nevertheless, these results are consistent with the

hypotheses we formulated on the basis of our understanding of trait hedonism, as well as the two forces that mainly drive emotion and emotion regulation dynamics, according to [Kuppens and Verduyn \(2017\)](#); see also [Garland et al., 2010](#); [Pavani et al., 2017](#)).

The first force is goal-driven. By definition, compared with individuals with low trait hedonism, individuals with high trait hedonism wish to feel more intense positive emotions ([Peterson et al., 2005, 2007](#)). Such emotional goals generally lead them to use more strategies that enable them to attain this goal (e.g., savoring), and consequently experience more intense positive emotions than peers with low levels of trait hedonism. If this force were considered on its own, individuals with different levels of trait hedonism would differ in their use of savoring and their experiences of positive emotions, whichever part of the distribution of these variables was considered.

However, as suggested earlier (e.g., [Hirsh et al., 2010](#); [Johnson et al., 2012](#); [Pavani et al., 2017](#)), compared with individuals with low trait hedonism, individuals with high trait hedonism may also be more sensitive to the second force identified by [Kuppens and Verduyn \(2017\)](#). This force refers to the tendency to experience self-perpetuating relationships (i.e., downward or upward spirals; [Garland et al., 2010](#)) between some emotions and behaviors. Heightened sensitivity to this force may lead these individuals to have more variable positive emotions and positive emotion regulation behaviors than their counterparts with lower trait hedonism. In other words, if this second force were considered on its own, individuals with high trait hedonism would display lower levels of positive emotions and savoring behaviors at their worst times than peers with lower levels of trait hedonism, and higher levels of positive emotions and savoring behaviors at their best times.

The present study's findings confirmed predictions about what would happen were the two forces simultaneously considered. During their worst times, the wish to experience more intense positive emotions and the increased probability of experiencing downward spirals of positive emotions would cancel each other out in individuals with high levels of trait hedonism, meaning that they would not differ from individuals with lower levels. By contrast, during more favorable times, their wish to experience more intense positive emotions and their increased probability of experiencing upward spirals of positive emotions would have an additive effect, leading them to differ substantially from individuals with lower levels. This is what we identified in this study.

Implications

Taken together, the above-mentioned results may have both theoretical and practical implications. At a theoretical level, regarding the relationship between personality traits and wellbeing states, the results we obtained encourage the construction of more complex theories than those that are currently available. In particular, although this idea is overlooked in positive psychology research, differences between one individual and another on personality traits (e.g., trait hedonism) may be related to differences between

these individuals on some parts, but not all, of the distribution of the relevant variable of interest (e.g., intensity of positive emotions).

At a practical level, it appears that some of the content of wellbeing-enhancing interventions is inspired by the personality traits displayed by the happiest individuals, in that it is designed to encourage individuals to engage in the ways of thinking and acting that are exhibited by these very happy individuals (Lyubomirsky & Layous, 2013; Seligman et al., 2006), including those with the highest levels of trait hedonism (e.g., anticipating and seeking pleasant outcomes; Schueller, 2010). By so doing, these interventions may enable individuals to reach more intense levels of positive emotions in general, as well as in their best times, although they may not prevent individuals from experiencing very weak levels of positive emotions in their worst times. This should be investigated, and if it is indeed observed, it should be explained to individuals who wish to follow a positive psychology intervention. Providing this information might avoid individuals concluding that any moment of low positive emotion is a sign that the intervention is not effective, and thus quitting an intervention that could otherwise have helped them achieve their emotional goals.

Limitations

A first limitation relates to generalizability. The size of our sample, albeit based on statistical power analyses and comparable to those in previous studies of emotions in everyday life (e.g., Brans et al., 2013; Colombo et al., 2020) could be perceived as relatively small. Furthermore, it was mainly made up of female participants. The female majority was not judged to be an urgent problem requiring resolution, as there are currently no theoretical arguments to suggest that our variables of interest display different relationships according to gender. However, further investigations of this issue with more balanced gender ratios would serve to establish the robustness of our findings.

A second limitation concerns the restricted scope of our hypotheses. For instance, although the use of various emotion regulation strategies can mediate the link between personality traits and emotional experiences (Kobylińska et al., 2020; Vaughan et al., 2019; Wang et al., 2009), we only analyzed savoring. We focused on savoring in this initial study because of its considerable effectiveness in helping individuals to upregulate the intensity of their positive emotions (Colombo et al., 2020; Jose et al., 2012), but each individual has many more emotion regulation strategies to upregulate positive emotions (Livingstone & Srivastava, 2012; Quoidbach et al., 2015). Examining multiple emotion regulation strategies in future studies might therefore allow us to deepen our understanding of the processes that mediate the phenomenon examined in the present study. Moreover, although nonintense experiences of negative emotions represent an important component of emotional wellbeing, only positive emotions were examined in the present study. This choice was based on previous findings suggesting that trait hedonism is negligibly related to negative emotions (Anić & Tončić, 2013; Chan, 2013; Vella-Brodrick et al., 2009; Yang et al., 2017). This negligible relationship

is nonetheless surprising, given that trait hedonism is defined as the wish not only to maximize pleasure, but also to minimize pain (Peterson et al., 2005, 2007). Further studies may thus be needed to assess the link between individuals' level of trait hedonism and the whole distribution of their negative emotions in their daily lives, to understand these surprising findings.

A third limitation is our focus on trait hedonism. Hedonism is not the only pathway to wellbeing that individuals can follow. Eudemonic pathways are also available (Peterson et al., 2005). Importantly, trait hedonism and eudemonism are positively related, with moderate effect sizes (e.g., Anić & Tončić, 2013; Chan, 2013). Consequently, if it is not controlled for, eudemonism can be a possible confounding variable in findings about hedonism. Studies simultaneously examining trait hedonism and eudemonism should therefore be conducted to determine their respective contributions to the distribution of positive emotion and savoring states in everyday life.

A fourth limitation regards measurement validity. First, savoring was assessed with a single item. As single items reduce the burden that repeated measurements place on participants, they are frequently used in studies pertaining to emotion regulation strategy implementation in everyday life (e.g., Brans et al., 2013; Brockman et al., 2017; Colombo et al., 2021). Furthermore, in the present study, to reduce the risk of this single item being contaminated by major measurement errors, we used one savoring-related item that had already shown evidence of its criterion validity (Pavani et al., 2017, 2019). Nevertheless, multiple-item questionnaires of savoring states may be developed in the future, to test the robustness of our findings. Another measurement validity issue is the wording-option strategy used for emotion- and savoring-related items. Such a strategy is assumed to neutralize between-individual differences in emotion labelling. Furthermore, evidence supporting the wording options we used is provided in previous studies (Le Vigouroux et al., 2017; Pavani et al., 2017). Nevertheless, empirical arguments suggesting that implementing this costly measurement strategy produces more valid assessments than implementing a more usual assessment strategy, and future psychometric studies are required to address this issue.

Conclusion

Three main findings emerged in the present study. First, the trait hedonism-positive emotions relationship varied according to the part of the distribution of positive emotions that was considered. More specifically, this relationship was negligible for the first centiles of the distribution, and increased nonlinearly across the centiles. Second, the trait hedonism-savoring relationship also varied as a function of the part of the distribution of savoring that was considered. The shape of this moderation effect was similar to that observed for the trait hedonism-positive emotions relationship. Third, a mediated moderation effect was identified, whereby the effect on positive emotions of the interaction between trait hedonism and the part of the distribution of the relevant state variable was partly mediated by savoring.

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Data Availability

Data, material, and analysis code have been made publicly available at the OSF and can be accessed at https://osf.io/m5ebj/?view_only=f3330b1ca3434498a262ffc00a2afd02.

Consent to Participate

Informed consent was explicitly obtained for all participants.

Consent for Publication

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Notes

1. The informal expressions *worst times* and *best times* are used here and in other sections for clarity's sake. Although they suggest the existence of distinct categories, the different intensities of the positive emotion states felt by an individual over a period of time are actually distributed along a continuum running from the least intense moment of positive emotions to the most intense moment through all the quantiles. A more rigorous alternative expression would be *the higher the centile of positive emotion examined, the stronger its relationship with extraversion*.
2. Between-individual differences in extraversion cannot be reduced to the introverted versus extroverted distinction. Rather, they are distributed along a continuum running from a high level of introversion to a high level of extraversion. We nevertheless used this distinction for clarity's sake. We did the same for trait hedonism, referring to individuals with high or low levels, even though they actually differ from one another along a continuum of trait hedonism.
3. Participants were asked to indicate their gender. No participant chose the option *other*.
4. The size of this effect was identical to the one obtained with our 84 participants up to two digits after the decimal point.
5. Formulated with the language used in the *lmerTest* R package (Kuznetsova et al., 2017), the model was as follows.

Positive emotions \sim Trait hedonism * (Linear Centile + Nonlinear centile) + (1 | Participant), where “(1 | Participant)” corresponds to a random intercept per participant.

6. Row variables were on very different scales (i.e., trait hedonism on a scale of 1–5, positive emotions on a scale of 0–100). To make the relationships easier to grasp, all these variables were standardized ($M = 0$, $SD = 1$) in the models reported here.
7. There were no qualitative differences between the phenomena observed within the first ten centiles and the phenomena observed within the following centiles. We chose to highlight these first centiles solely for clarity’s sake, as it allowed us to clearly explain that differences between individuals with low versus high trait hedonism became increasingly small toward the left part of the distribution.

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