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Need satisfaction in episodic memories impacts mood at retrieval and well-being over time

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ABSTRACT

Recalling important episodic memories influences mood, notably through their level of need satisfaction. Moreover, as those memories are repeatedly recalled, their repetitive impact on mood should lead to changes in well-being over time. Thus, need satisfaction in memories with the greatest impact on mood when recalled should have the greatest impact on well-being over time. Participants rated their mood and general well-being, and were assigned to describe a positive or negative memory. They rated their memory valence and need satisfaction, and reevaluated their mood. Three months later, participants reassessed their well-being. In both conditions, memory need satisfaction predicted an increase in positive mood after the memory description and an increase in well-being over time. However, the greater the increase in positive mood upon the recall, the more need satisfaction led to increases in well-being. When mood decreased, need satisfaction did not predict increases in well-being. These results suggest that need satisfaction in memories that lead to significant increases in mood when recalled facilitates well-being.

1. Introduction

Important episodic memories are mostly about significant and emotionally charged past events (Philippe, Koestner, Beaulieu-Pelletier, Lecours, and Lekes, 2012; Tulving, 2002). In addition, whenever they are recalled, they lead to a re-experience in the here and now of their associated experiential components (i.e., emotional charge, motivational properties) (Conway and Pleydell-Pearce, 2000; LeDoux, 1992; Schwartz, Weinberger, and Singer, 1981). Past research has shown that this re-experience can affect situational well-being and current mood (Josephson, Singer, and Salovey, 1996; Philippe et al., 2012). Furthermore, episodic memories have been found to influence people's stable sense of well-being over time (Milyavskaya, Philippe, and Koestner, 2013; Philippe et al., 2012; Sutin and Robins, 2005). A growing amount of studies have been reported on how memories can influence people's mood, but little has been done in regard to the processes through which memories can influence well-being over time. The purpose of the present research was to investigate if memories that have the greatest impact on mood upon recall are the ones that affect the most well-being over time.

1.1. Episodic memories and mood

Episodic memories can be activated and recalled in everyday life through different processes. They can be consciously and deliberately recalled: for example, a person can intentionally decide to remember a specific memory and describe it to someone. However, episodic memories are also often activated by external cues in the environment. This occurs when certain characteristics of the environment match the memory of an event presenting similar characteristics, such as a same location or a same person (e.g., Ferguson and Bargh, 2004). When a memory is activated by external cues, it does not necessarily lead to an experience of conscious reminiscence (Conway and Pleydell-Pearce, 2000). Memory activation can be automatic and unconscious, but it will nevertheless influence the person in the situation that triggered that memory.

The deliberate recall of an episodic memory, as well as its unconscious activation, have been found to alter mood. A well-known memory component that can greatly influence mood upon memory recollection is the valence of the memory. Indeed, past research has shown that positive memories can be recalled, deliberately or automatically, as a way to repair negative mood (Josephson et al., 1996; Joormann, Siemer, and Gotlib, 2007; Parrott and Sabini, 1990). Gillihan, Kessler, and Farah (2007) showed that participants (n = 326) who were randomly assigned to recall positive episodic memories reported a significantly greater mood after memory recollection than participants who were randomly assigned to recall negative memories. In another study (Baker and Guttfreund, 1993), 80 community college students rated their negative mood, were randomly assigned to think

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of two positive or two negative memories, and finally rated their negative mood again. Participants who recalled negative memories reported an increase in their negative mood after the recall, whereas participants who recalled positive memories reported a negative mood decrease. Thus, the recall of a memory can lead individuals to experience a change in their mood, as a function of the valence characterizing this memory.

1.2. Need satisfaction in episodic memories

Past research (e.g., Philippe, Koestner, Beaulieu-Pelletier & Lecours, 2011b) has also found that another important basic experiential component of episodic memories, that is also triggered when the memory is activated, is the level of psychological need satisfaction experienced during the initial event of the memory. Self-determination theory (Deci and Ryan, 2000) posits that people continually seek to fulfill three basic psychological needs in their everyday life, which are needs for autonomy, competence, and relatedness. Autonomy is the need to feel free and authentic in one's choices and actions, competence is the need to feel efficient and effective, and relatedness is the need to feel connected and to care for others, as well as being cared for by others. Many studies have confirmed the fundamental nature of these three needs across diverse domains and cultures (Deci et al., 2001; Sheldon, Elliot, Kim, and Kasser, 2001; Tay and Diener, 2011). Moreover, the satisfaction of the needs of autonomy, competence, and relatedness in life is positively associated with diverse dimensions of well-being, such as psychological growth, life satisfaction, and purpose in life (Reis, Sheldon, Gable, Roscoe, and Ryan, 2000; Sheldon, Ryan, and Reis, 1996; Tay and Diener, 2011).

Because of its fundamental importance, the level of need satisfaction characterizing a memory should affect, upon its activation, people's mood and well-being accordingly (Philippe et al., 2011b; Philippe, Koestner, Lecours, Beaulieu-Pelletier, and Bois, 2011a; Philippe et al., 2012). Indeed, the recall of a need-satisfying memory should signal possibilities for psychological growth and opportunities to build and expand the self (Deci and Ryan, 2000; Hodgins and Knee, 2002), and thus should lead to greater positive mood and well-being. Conversely, the recall of a need-thwarting memory should signal a potential threat to the person's self and integrity (Deci and Ryan, 2000; Hodgins and Knee, 2002), which should be conducive to a lower positive mood and lower well-being.

However, one could argue that the level of need satisfaction characterizing an episodic memory and the valence of this memory represent basically the same memory component, and that a negative memory should be characterized by need thwarting, whereas a positive memory should be characterized by need satisfaction. In this regard, investigating the impact of memory need satisfaction on mood would be the same as investigating the impact of memory valence. However, past research has refuted this assumption and has shown that need satisfaction and valence are relatively independent aspects of memories. Indeed, a certain level of need satisfaction can be experienced in a negative memory (Philippe et al., 2011b, 2011a; Philippe et al., 2012). For example, someone can report the memory of a negative event, in which he/she felt supported by another person after having failed at an important task. In this generally negative situation, this person's need of relatedness would have been satisfied, whereas his/her need of competence would have been thwarted. Thus, in negative memories as well as in positive ones, the level of need satisfaction experienced can be variable and affect the person accordingly, over and above the effect of the general memory valence.

Empirical evidence also supports this assertion. In a study (Philippe et al., 2012, Study 3), 151 undergraduates described a significant memory and were implicitly primed with this memory two weeks later. Results showed that priming memories characterized by need satisfaction led to an immediate increase in participants' positive mood, whereas priming need-thwarting memories led to a decrease in positive mood. In addition, these results held after controlling for memory valence. Need satisfaction in memories thus seems to be a predictor of mood that is independent of the valence of memories.

1.3. Episodic memories and well-being over time

It has been recently shown that need satisfaction in episodic memories can not only affect people's mood upon recall, but that it can also induce enduring changes in well-being over time. Indeed, the level of need satisfaction characterizing an important memory has been found to predict increases in well-being over a 1-month period (Milyavskaya et al., 2013, Study 3), as well as over a 1-year period (Philippe et al., 2012, Study 4). In a recent study, Philippe and Bernard-Desrosiers (in press, Study 2) contacted 275 university students before the Winter holiday period and measured their well-being. Participants were contacted again after the holidays: their well-being was measured again and they were asked to describe the memory of an event that happened during their holidays. Subsequently, participants' well-being was measured each month, for three months. Results showed that the need satisfaction in the holiday memory predicted increases in well-being directly after the holiday period, and continued to predict further increases over the next two months, thus having a cumulative impact on well-being over time. In sum, there is empirical evidence supporting the idea that memories' need satisfaction can influence people's well-being over time. However, the underlying processes through which this occurs remain unclear.

One theoretical explanation for this phenomenon is that episodic memories are frequently and repetitively activated across diverse situations, through conscious recalls, as well as through automatic activation by external cues. As the activation of a significant memory can lead to changes in mood, we can expect that frequent activations of this memory over time will lead to repetitive changes in mood, and thus to consolidations and stable changes in well-being over time. For instance, the frequent activations of a need-satisfying memory should lead to repeated situational increases in positive mood, and over these repeated activations, this need-satisfying memory should positively affect one's stable sense of well-being (Adler, Lodi-Smith, Philippe, and Houle, 2016; Philippe et al., 2012). Following this reasoning, memories characterized by the greatest level of need satisfaction should lead to the greatest immediate increase in positive mood upon recall. In addition, supposedly through their frequent activations over time, need satisfaction in memories with the greatest impact on mood upon recall should predict the greatest increases in well-being over time.

1.4. Purpose of the present study

The purpose of the present research was to assess the impact of need satisfaction in a frequently activated memory on situational mood and well-being over time. Moreover, we investigated if the prospective relationship between need satisfaction and well-being was function of the strength of the effect of the memory on situational mood.

In this study, participants rated their current positive mood and completed a measure of general well-being. Next, they were randomly assigned to describe a positive or a negative self-defining memory. Self-defining memories represent an especially important and frequently recalled type of episodic memory (Singer and Salovey, 1993). Participants rated their memory valence and need satisfaction, and reevaluated their positive mood. Three months later, they responded to the same measure of general well-being again.

In line with past findings (e.g., Baker and Guttfreund, 1993), it was hypothesized that describing a positive memory would lead to an increase in positive mood right after the memory description, whereas describing a negative memory would lead to a decrease in positive mood (Hypothesis 1). Additionally, we hypothesized that need satisfaction characterizing the memory would predict mood change in both conditions (positive or negative memory description), such that greater need satisfaction would predict increases in positive mood, whereas

greater need thwarting would predict decreases in positive mood (Hypothesis 2). Finally, it was expected that need satisfaction would predict increases in well-being over a 3-month period, independently of condition assignment at Phase 1. It was also predicted that mood change after the memory description would moderate the relationship between need satisfaction and well-being. Specifically, only memories characterized by need satisfaction that led to a significant increase in positive mood at Phase 1 should predict increases in well-being at Phase 2 (Hypothesis 3).

2. Method

2.1. Participants and procedures

The expected effect size was based on a past study by Milyavskaya et al. (2013, Study 3), who found an effect size of $f^2 = 0.075$ for the prediction of need satisfaction in memories on changes in well-being over time (over a 4-week period). The power analysis suggested a sample size of 107 participants for multiple regressions with a statistical power of 0.80, at an alpha of 0.05. Accordingly, at Phase 1, 158 undergraduate students from a Canadian university were randomly recruited from a list composed of students from various departments. They were recruited through their university e-mail and invited to take part in a study about memories and well-being. They completed an online questionnaire in which they rated their current positive mood and responded to a general well-being measure. They were then randomly assigned to write about a positive or a negative self-defining memory and rated this memory for valence and need satisfaction. Next, they rated their positive mood again. Between three and four months later ($M = 3.86$ months, $SD = 20.77$ days),[1] participants were contacted again and completed the same measure of general well-being they had completed during Phase 1. A total of 118 students took part in this second phase, for a response rate of 75%. Independent-samples *t* tests were conducted to investigate if there were significant differences between participants who responded to the second phase and those who did not on all study variables. There were no significant mean differences. Finally, two participants were excluded from the analyses, as they were multivariate outliers. Thus, the final sample was composed of 116 participants (93 women, 23 men), with a mean age of 29.72 years old, $SD = 9.38$. As an incentive, participants were entered into a draw of three prizes of $125.

2.2. Measures, Phase 1

2.2.1. Pre- and post-description positive mood

Participants were asked to rate their current positive mood on the single item "Right now, my mood is…", by positioning a slider button on a line ranging from *very unpleasant* to *very pleasant*. Their rating was attributed a value between 0 and 100 and was recorded by the computer. However, this value was hidden from participants. This type of scale was used to capture subtle subjective changes in mood. Two measurement moments were used: (1) at the beginning of Phase 1 and (2) after the description of the self-defining memory.

2.2.2. Well-being

A short version of the Psychological Well-Being Scale (PWB; Ryff and Keyes, 1995) was used to measure well-being. This scale assesses six dimensions of well-being with three items for each dimension. In the present study, only three dimensions were used: self-acceptance, purpose in life, and personal growth. The others dimensions (autonomy, mastery, and relatedness) were not used, as they are very closely related to the three psychological needs. Each item was rated on a 7-point Likert scale (1 = *disagree strongly*, 7 = *agree strongly*). An index of well-being was computed by averaging all nine items. Cronbach's alpha coefficient for this scale was 0.67 in this study. This type of well-being measurement was used to avoid any confound with mood, which is a component often included in more hedonic perspective of well-being (Diener et al., 2009).

2.2.3. Self-defining memory

Participants were randomly assigned to describe either a positive or negative memory using the follow instructions. "*Please describe a personal POSITIVE (or NEGATIVE depending on the assigned condition) memory of a specific event, that is at least six months old, and that is significant (important) for you. This memory should reflect your identity or who you are and should reveal something about how you perceive yourself generally. Choose a memory that often comes to your mind. Describe generally what happened, where it happened, who you were with (if anyone), and how you and other people reacted. What was your role and what were the consequences of your reaction and/or your behavior during this event. Provide enough details so that we can understand what happened, like if you had to tell it to someone.*" Those instructions were adapted from previous studies on self-defining memories (Singer and Salovey, 1993; Sutin and Robins, 2005; Philippe et al., 2011b, 2011a).

2.2.4. Valence of the memory

Participants were asked to rate their personal valence of the event described in their self-defining memory on a 7-point Likert scale, ranging from −3 (*very negative*) to +3 (*very positive*).

2.2.5. Need satisfaction in the memory

Participants rated the level of psychological need satisfaction they experienced when the event of their memory occurred. Participants made their ratings on a 7-point Likert-type scale, ranging from −3 (*strongly disagree*) to +3 (*strongly agree*), with 0 representing *do not agree or disagree or not applicable*—this latter option indicating that the event was both need satisfying and need thwarting, or that need satisfaction was not present in the event. Participants responded to two items for each of the three psychological needs of self-determination theory, which are autonomy, competence, and relatedness (for a total of six items). Sample items include "I felt free to do things and to think how I wanted" (autonomy), "I felt skillful or capable" (competence), and "I felt connected to one or more people" (relatedness). These items were used in past research (e.g., Philippe et al., 2011b, 2011a; Philippe et al., 2012). An index of need satisfaction in the memory was computed by averaging all items. Cronbach's alpha coefficient was 0.91 in the present study.

2.3. Measure, Phase 2

2.3.1. Well-being

The same measure of well-being used at Phase 1 was again administered to participants. Cronbach's alpha coefficient was 0.72 in Phase 2.

3. Results

3.1. Manipulation checks on the experimental conditions

Independent-samples *t* tests showed that the means of memory valence and need satisfaction were significantly higher in the positive memory condition (valence: $M = 2.87$, $SD = 0.39$, need satisfaction: $M = 2.27$, $SD = 0.72$) compared to the negative memory condition (valence: $M = -2.15$, $SD = 1.30$, $t(114) = 28.84$, $p < 0.001$; need satisfaction: $M = -0.99$, $SD = 1.28$, $t(114) = 17.12$, $p < 0.001$). These results confirm that the experimental conditions were successful. Despite the fact that both valence and need satisfaction varied greatly as a function of conditions, these variables were only weakly correlated in each condition (negative condition: $r = 0.15$, $p = 0.26$; positive condition: $r = 0.34$, $p = 0.01$), thus confirming their relative independence.

[1] We examined if the time between the two phases impacted the results. However, the inclusion of this variable in the analyses did not change or moderate the results obtained.

Table 1
Hierarchical regression analysis of mood pre-description, conditions, memory need satisfaction, and the interaction term memory need-satisfaction × condition on mood post-description.

	Mood post-description					
	Model R^2	B	95% CI	β	*t*	*p*
Step 1	0.50					
Mood pre-description		0.79	[0.65, 0.94]	0.71	10.66**	0.001
Step 2	0.74					
Conditions (pos = 1; neg = 0)		22.99	[18.53, 27.44]	0.50	10.22**	0.001
Step 3	0.76					
Memory NS		5.39	[1.74, 9.04]	0.25	2.92**	0.001
Step 4	0.76					
Memory NS × condition		4.90	[−3.93, 13.74]	0.11	1.10	0.27

Note. $n = 116$, NS = need satisfaction.
** $p < 0.01$.

3.2. Experimental conditions and changes in mood (Hypothesis 1)

To assess the impact of the experimental conditions (positive or negative memory) on change in mood after the memory description, a 2 (Conditions: positive vs. negative) × 2 (Mood: pre-description vs. post-description) mixed ANOVA with repeated measures on the last factor was conducted. Results showed that there was a significant main effect of mood, $F(1, 114) = 4.76$, $p = 0.03$, $\eta_p^2 = 0.04$, (Pre: $M = 64.98$, $SD = 20.68$, Post: $M = 61.55$, $SD = 23.22$). Positive mood was generally lower after the memory description than before. However, there was also a significant Conditions × Mood interaction, $F(1, 114) = 73.43$, $p < 0.001$, $\eta_p^2 = 0.39$. Positive mood significantly increased in the positive memory condition (Pre: $M = 68.26$, $SD = 19.43$, Post: $M = 76.17$, $SD = 17.36$, $t(52) = 4.37$, $p < 0.001$, 95% CI [4.32; 11.49]), whereas it significantly decreased in the negative memory condition (Pre: $M = 62.13$, $SD = 21.47$, Post: $M = 48.82$, $SD = 20.02$, $t(60) = -7.88$, $p < 0.001$, 95% CI [−16.65; −9.96]). Thus, participants who described a positive memory experienced an increase in their positive mood right after the memory description, whereas participants who described a negative memory experienced a decrease in their positive mood.

3.3. Need satisfaction and changes in mood (Hypothesis 2)

To study the impact of need satisfaction on change in positive mood after the memory description, a hierarchical multiple regression analysis was conducted on mood post-description. At Step 1, mood pre-description was entered to control for the initial mood at the beginning of the study. At Step 2, a dummy variable accounting for assigned conditions—negative memory (0) or positive memory (1)—was included, and at Step 3, need satisfaction in the memory was entered. The interaction term need satisfaction × condition was included at Step 4.

Table 1 shows that at Step 1, mood pre-description was positively related to mood post-description, explaining 50% of its variance. At Step 2, assigned conditions were positively associated with an increase in positive mood, explaining 24% of its variance, $F_{change}(1113) = 104.48$, $p < 0.001$. At Step 3, memory need satisfaction was positively related to an increase in positive mood, explaining 2% of its variance, $F_{change}(1112) = 8.54$, $p = 0.004$. At Step 4, the interaction term need satisfaction × condition was not significant.

The reported effect size for need satisfaction reflects its prediction of mood post-description, for which 50% of its variance is already explained by mood pre-description. The effect size of need satisfaction in explaining the variance of mood change only (i.e., the difference between post-description and pre-description), after controlling for condition is $R^2 = 0.03$. Overall, both the valence (conditions: positive vs. negative) and the need satisfaction in the memory were positively and independently associated with mood change after the memory description. There was no interaction between those two variables, such that describing a positive memory led to an increase in positive mood, whereas describing a negative memory led to a decrease in positive mood. In addition, greater need satisfaction in the described memory led to a greater increase in positive mood in both conditions (with the inverse being also true; greater need thwarting led to a greater decrease in positive mood across conditions).[2] An alternative explanation for these results could be that participants who are generally happier and who reported a greater level of well-being at the beginning of the study would generally report greater need satisfaction in their memory, even in a negative one, and thus would experiment a greater increase in their positive mood after the memory description. However, well-being at Phase 1 was not associated with memory need satisfaction ($r = -0.11$, $p = 0.25$), and its inclusion in the regression on mood post-description did not alter the results. Moreover, participants' mood at the beginning of the study was not significantly associated with memory need satisfaction ($r = 0.18$, $p = 0.06$). Thus, this alternative explanation appears to be unlikely.

3.4. Memory, mood change, and well-being (Hypothesis 3)

A hierarchical regression analysis was performed on well-being at Phase 2 to assess the impact of the experimental conditions and of memory need satisfaction on changes in well-being over a 3-month period. In addition, this analysis aimed to test if mood change would act as a moderator in the expected association between memory need satisfaction and the increase in well-being over time. To examine this hypothesis, a score of mood change was computed by subtracting the positive mood at the beginning of the study (Pre-description) from the positive mood after the memory description (Post-description): a negative score represented a mood decrease after the memory description, while a positive score represented a mood increase.

At Step 1, well-being at Phase 1 was entered, to control for the initial level of well-being, and conditions were also included as a dummy coded variable. At Step 2, memory need satisfaction was included, and at Step 3, the score of mood change was entered. The interaction term need satisfaction × mood change was entered at Step 4.

Table 2 shows that, at Step 1, well-being at Phase 1 was positively associated with well-being three months later, while experimental conditions were not significant. Thus, while being randomly assigned to describe a positive or a negative memory influenced participants' mood after their memory description at Phase 1, there was no enduring impact of conditions on well-being over time. At Step 2, memory need satisfaction was positively associated with an increase in well-being, explaining 1% of its variance, $F_{change}(1112) = 4.99$, $p = 0.03$, and 4% of its variance of change. Therefore, the level of need satisfaction characterizing the memory described at Phase 1 was associated with a significant increase in well-being over three months. At Step 3, mood change

[2] This analysis used conditions as a variable to control for assigned conditions at Phase 1. To assess if the results obtained were due to the dichotomous nature of this variable, the same analysis was performed with the rated memory valence (ranging from −3 to +3) at Step 2. Results remained virtually the same.

Table 2
Hierarchical regression analysis of well-being Phase 1, conditions, memory need satisfaction, mood change, and the interaction term memory need satisfaction × mood change on well-being Phase 2.

	Well-being, Phase 2					
	Model R^2	B	95% CI	β	*t*	*p*
Step 1	0.62					
Well-being, Phase 1		0.82	[0.70, 0.94]	0.79	13.20**	0.001
Conditions (pos = 1; neg = 0)		0.03	[−0.13, 0.19]	0.02	0.39	0.70
Step 2	0.63					
Memory NS		0.15	[0.02, 0.28]	0.24	2.23*	0.03
Step 3	0.63					
Mood change		0.03	[−0.10, 0.17]	0.04	0.51	0.61
Step 4	0.66					
Memory NS × mood change		0.16	[0.06, 0.27]	0.18	3.05**	0.003

Note. $n = 116$, NS = need satisfaction.
* $p < 0.05$.
** $p < 0.01$.

was not associated with well-being at Phase 2. However, at Step 4, the interaction term need satisfaction × mood change was significant and explained 3% of well-being at Phase 2, F_{change} (1110) = 9.32, p = 0.003, and 7% of its variance of change.

Probing of this interaction revealed that, for memories that led to greater positive mood increased following the memory description (+1 SD), need satisfaction was significantly related to an increase in well-being three months later ($t = 3.63$, $p < 0.001$, B = 0.32, 95% CI [0.15; 0.50]). When mood changed moderately (mean level of mood change) after the memory description, need satisfaction was also associated with an increase in well-being at Phase 2 ($t = 2.39$, $p = 0.02$, B = 0.16, 95% CI [0.03, 0.29]). However, need satisfaction was not associated with an increase in well-being at Phase 2 for memories that lowered positive mood after memory description (−1 SD), ($t = -0.04$, $p = 0.97$, B = −0.003, 95% CI [−0.17; 0.16]). Overall, these results show that the level of need satisfaction in a memory is associated with changes in well-being over time. However, this memory needs to have the capacity to increase the person's mood situationally for this effect to occur.

4. Discussion

The purpose of the present research was to investigate if the level of need satisfaction characterizing a significant episodic memory had an impact on mood upon memory recall, and on well-being over a 3-month period. More importantly, we assessed if the level of change in mood upon memory recall would influence the impact of need satisfaction in that memory on well-being over time.

Participants who were assigned to describe a positive memory reported an increase in their positive mood after the memory description, whereas participants in the negative memory condition reported a decrease in their positive mood, thus confirming the impact that remembering a positive or negative memory can have on people's mood. In this sense, the present findings have methodological implications, as they provide additional evidence that the recall of a positive or negative memory can serve as an effective method to induce changes in people's mood.

In addition, memory need satisfaction was associated with changes in mood in both conditions. This result demonstrates that need satisfaction in memories can have a situational impact on mood upon recall and induce increases in positive mood, even for memories of negative events. Hence, it supports the idea that need satisfaction is a key component of memories that is different and independent from valence. In this regard, this result contributes to expand our comprehension of episodic memories and of the way through which they can influence people in the here and now and over time. It highlights that the level of need satisfaction experienced in the initial event of a memory is an important experiential component that is encoded in the memory, and that remains attached to it. The activation of a memory thus also reactivates the experienced need satisfaction in the here and now, which influences the person's mood accordingly. However, the investigation of need satisfaction in memories is a relatively recent area of research, but seems like a promising one, as we intended to show in the present paper. It is our hope that a growing amount of studies will strive to grasp the extent to which need satisfaction in memories can influence people in their everyday life and over time.

The present study showed that memory need satisfaction was associated with an increase in well-being three months later, regardless of condition assignment at Phase 1. It thus replicated recent studies on the effect of need satisfaction in memories on well-being over time (Milyavskaya et al., 2013; Philippe et al., 2012). However, we demonstrated that this association was function of the level of mood change experienced by participants after the memory description. The more the activation of the memory led to an increase in positive mood, through the level of need satisfaction characterizing it, the more need satisfaction predicted an increase in well-being over time. Contrariwise, if the recall of the memory induced a decrease in positive mood, then memory need satisfaction did not predict changes in well-being over time. This result supports the hypothesis that the repetitive activation of a memory should lead to repetitive increases in positive mood, that should in turn lead to consolidations and changes in well-being over time. However, there is a potential limitation to this interpretation of our results. The method used in the present study does not allow us to ensure that the memories described by participants were truly frequently activated in their everyday lives or not. Future research should directly address this hypothesized process. For example, a previously described memory could be activated each day outside of participants' awareness using a priming method and daily experience samplings of mood and well-being could be collected. This could directly test if chronic changes in mood instantiated by activating a need-satisfying memory build up into stable changes in well-being. Nevertheless, our study is the first to investigate the process through which need satisfaction in episodic memories can influence well-being over time, by proposing that it is through the repetitive situational changes in mood that need satisfaction can greatly influence well-being over time.

4.1. Limitations and conclusion

Some other limitations of the present study need to be underscored. First, the present findings need to be generalized with caution, as there were more females than males in our sample. In addition, females might have been more interested in participating in a study on memory than males, thus creating a self-selection bias. The sample was also composed of university students who do not represent the general population. Therefore, the present results would need to be replicated with a more representative sample before being generalized. Second, the memory valence was imposed to participants, as they were instructed to describe a positive or a negative memory, according to their assigned

condition. This methodology was used to ensure that an approximately equal amount of participants would describe either a positive or a negative memory. However, it is possible that some people randomly assigned to the negative memory condition had in fact more positive memories that were chronically activated in their everyday life than negative ones. In consequence, this frequent activation of mostly positive memories should lead to a general increase in well-being over time. Thus, for these people, their described negative memory could have a relatively more limited impact on their general well-being compared to people who typically hold more negative chronic memories. Reverse case scenarios are also possible. Future research is needed to confirm our results in a design where participants would be free to choose their memory valence.

In sum, the present study highlights the important impact that need satisfaction in episodic memories can have on people's situational mood and general well-being over time. It also suggests that the greater the increase in situational positive mood upon memory recall, the greater this memory's need satisfaction will lead to an increase in well-being over time.

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