Received: 14 August 2023 | Revised: 23 November 2023 | Accepted: 11 December 2023

DOI: 10.1111/jopy.12914

ORIGINAL ARTICLE

WILEY

Seeking solitude skills: Do memories of intrinsic goals enhance enjoyment of alone time?

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Abstract

Objective: Further investigate the application of *self-determination theory* (SDT) to experiences of solitude by examining the effects of recalling intrinsic versus non-intrinsic memories.

Background: SDT research indicates that recalling memories associated with intrinsic goals (e.g., personal growth, relationships, altruism) enhances present moment wellness by satisfying basic psychological needs.

Method: Two studies were conducted with American adults. Study 1 included 465 participants (age = 49.49 [*SD* = 19.01], 49.46% female) and Study 2 comprised 490 participants (age = 54.16 [*SD* = 18.89], 51.84% female). Both studies assessed the impact of recalling intrinsic versus non-intrinsic memories prior to a five-minute solitude session.

Results: Study 1 found intrinsic memories were linked to more basic psychological need satisfaction than non-intrinsic memories, but both memory types resulted in similar wellness improvements. Contrary to expectations, Study 2 revealed extrinsic memories (e.g., wealth, fame, image) led to the highest basic psychological need satisfaction and least need frustration compared to intrinsic and neutral memories, with all memory conditions showing similar wellness gains.

Conclusions: Solitude appears beneficial regardless of memory content. While different memories vary in need satisfying quality, this does not seem to impact the benefits of solitude. These findings suggest further exploration is needed before developing a "solitude skill set" for use during inevitable periods of solitude.

KEYWORDS

autonomy, extrinsic, loneliness, mindfulness, motivation

1 | INTRODUCTION

Historically, solitude has been an understudied psychological experience (Long & Averill, 2003). Perhaps solitude has been overlooked because it is usually rather unremarkable. When experiences of solitude *are* noteworthy, it tends to be because they are thought to be negative (Kim et al., 2016). Indeed, solitude is often equated with the aversive experience of loneliness. Even dictionary definitions conflate solitude with loneliness (Long & Averill, 2003). Yet, while solitude *does* require being alone it *does not* necessitate loneliness. One can be in solitude

without feeling lonely and one can feel lonely while in company; solitude and loneliness are differentiable. In addition, while loneliness has clear costs (Park et al., 2020; Rico-Uribe et al., 2018), the *benefits* of solitude—such as enhanced creativity and spirituality—have gained traction in psychological research (Long & Averill, 2003; Nguyen et al., 2019). Despite the purported upsides of solitude, humans can find it repellent. In one famous psychological experiment many participants—in particular, most males—preferred mild electrocutions to sitting alone quietly for just fifteen minutes (Wilson et al., 2014). Ideally, people would have a more productive skill set to employ during solitude. The discovery of some such skills is the aim of the present research.

1.1 | Solitude and evidence from self-determination theory

Studies of solitude have commonly defined the experience as involving being physically alone as well as free from specific, focused activities (Nguyen et al., 2021), a state to which humans are generally averse. One way to enhance pleasure during experiences of solitude is to approach them with a sense of choice and autonomy (Nguyen et al., 2019; Thomas & Azmitia, 2019). However, solitude is not always self-selected. This is especially salient now because experiences of social isolation have increased due to the COVID-19 pandemic. When solitude is forced upon people it can be experienced as controlling and oppressive, compromising people's present moment wellness and their feelings about spending time alone. In their studies of solitude, Wilson et al. (2014) reported that people struggle to "think in enjoyable ways" (p. 76), even when provided with the time and freedom to do so, instead tending to ruminate, which detracts from the experience of solitude. There is obvious benefit in finding ways for people to derive positive—rather than negative—experiences during solitude.

There is evidence that the content of people's cognitions is one of the factors affecting their time in solitude. However, much of this research has focused on explaining why solitude can be unpleasant. For example, Slepian et al. (2019) showed that reflecting on secrets during solitude made the experience feel tiring and isolating. These results pose the question of whether people can learn to approach their cognitions during solitude to enhance rather than diminish the experience.

One possible enhancement strategy comes from emerging evidence in *self-determination theory* (SDT, Ryan & Deci, 2017), which suggests that people's present moment enjoyment can be enhanced or undermined as a function of what they think about, specifically, what they remember. Philippe and colleagues (2009, 2012), Philippe, Koestner, Beaulieu-Pelletier, et al. (2011), and Philippe and Bernard-Desrosiers (2017) have shown that the content of episodic memories can predict well-being "in the here and now" (Philippe et al., 2012, p. 505). Specifically, memories associated with *basic psychological need satisfaction* have been found to bolster present moment and future happiness. Within SDT, the basic psychological needs for *autonomy* (i.e., volition and agency), *competence* (i.e., ability and effectiveness), and *relatedness* (i.e., closeness with others) represent a limited set of fundamental prerequisites for human flourishing. When people recall need satisfying memories those need satisfactions are reexperienced and boost happiness in the present moment. We suppose that the spontaneous or primed invocation of need satisfying memories may override people's tendencies to brood thus having a bolstering effect on their enjoyment of solitude.

The need satisfaction and memory research may be complicated by the fact that memories associated with basic psychological need satisfaction tend to be "positive" while those associated with basic psychological need frustration tend to be "negative." It could be the case that need satisfying memories reflect periods of success, and need frustrating memories are times of failure, and the success/failure dichotomy explains the differential effects. Thus, the role of "positivity" needs to be addressed when assessing the link between need satisfying and need frustrating memories and present moment experiences. In this research, we accounted for positivity by focusing on people's memories of prior goal accomplishments.

SDT's theory of goals specifies that the pursuit of *intrinsic goals* such as attaining personal growth, close relationships, and helping one's community are more conducive to need satisfaction than *extrinsic goals* for things such as wealth, fame, and image (Bradshaw, Conigrave, et al., 2022). Extending this, some evidence has demonstrated that recall of memories associated with intrinsic goals (vs. non-intrinsic goals) leads to present moment and future wellness, explained largely by their need satisfying quality (Lekes et al., 2014). Additionally, while intrinsic and extrinsic memories have been found to be equivalent in terms of their need satisfying quality, only need satisfaction from intrinsic memories incrementally enhanced present moment experience (Lekes et al., 2014). In other words, even if people recalled experiencing their extrinsic goal accomplishments as need satisfying, recollection of that satisfaction did not bolster present moment wellness. Perhaps the need satisfactions from extrinsic aspirations are not enduring or authentic enough to be reexperienced in the here and now. The finding that extrinsic goal recollections can be perceived as need satisfying without boosting wellness could be informed by emerging evidence that such attainments are something of a double-edged sword,

prompting both adaptive and maladaptive outcomes (Bradshaw et al., 2021; Bradshaw, Conigrave, et al., 2022; Ryan, 2023). An assessment of basic psychological need frustration from memories, in addition to need satisfaction, would shine further light on these pathways and possible mechanisms.

A thorough assessment of memory basic psychological need frustration may also inform emerging evidence supporting the so-called *dual-process model* (Bradshaw, Duineveld, et al., 2022; Donald et al., 2021; Jang et al., 2016). Some of the studies (though not all e.g., van der Kaap-Deeder et al., 2016) examining the effects of need satisfying and need frustrating memories have had participants rate the degree of need satisfaction experienced in the memory on a −3 (strongly disagree) to +3 (strongly agree) scale (Philippe, Koestner, Lecours, et al., 2011). Positive scores were thus thought to reflect need satisfaction, negative scores reflect need frustration, and a score of zero indicates an equal amount of need satisfaction and frustration. However, in the dual-process model, need satisfaction and need frustration have been shown to be distinct phenomena, rather than opposite ends of a spectrum. That is, low need satisfaction is distinct from need frustration. Thus, separate assessments of memory need satisfaction and need frustration—such as offered by the Basic Psychological Need Satisfaction and Frustration Scale (Chen et al., 2015)—could further illuminate the mechanisms by which different types of memories affect present moment experiences.

Following from the pattern of evidence outlined above, the present research tested the propositions that (a) the tendency to recall memories associated with intrinsic goals is associated with enjoyment of time in solitude (Study 1) compared to non-intrinsic memories, and that (b) people can be primed to think in ways that are more (i.e., intrinsic) or less (i.e., extrinsic) conducive to enjoyment of solitude (Study 2). Across the two studies the aim was to test the expectation that people with a natural tendency to conjure memories of intrinsic goals tend to enjoy and benefit more from solitude than those who conjure other memories (Study 1), but also that intrinsic goal remembering is a state that can be induced—with beneficial consequences—even if it is not one's general inclination (Study 2).

1.2 | Preference of solitude and mindfulness

Individuals' initial levels of mindfulness and preference for solitude are likely to affect their enjoyment of solitude, regardless of their memory content tendencies or their experimental condition. Trait mindfulness, defined as the tendency to adopt a receptive and nonjudgemental approach to the present moment, is relatively stable within-person (Brown & Ryan, 2003). Individual differences in preference for solitude are also relatively stable (Burger, 1995). Thus, people high in trait mindfulness and/or those with a preference for solitude are likely equipped, to some degree, to cope or even flourish during solitude. As a result, in these studies we controlled for these theoretically relevant covariates when predicting outcomes.

Studies have measured preference for solitude using a variety of measures, though some scales index concepts in addition to one's tendency to take pleasure in time alone doing nothing. For example, the revised version of the Preference for Solitude Scale (Toyoshima & Kusumi, 2021) includes items that conceive of "working alone" as solitude, such as "Working alone leads to good progress when performing a difficult task". Burger's (1995) Preference for Solitude Scale included items like "When I have to spend several hours alone, I find the time productive and pleasant" and "I often have a strong desire to get away by myself", which tap solitude as consistent with Nguyen et al.'s (2021) definition. However, the same scale also assessed something closer to introversion using items such as "I do not have a strong need to be around other people". Leary et al. (2003) drew preference for solitude items from Pedersen's (1979) dimensions of privacy such as "I am never happier than when I am alone", though, as the title of their research indicates, some of Pedersen's (1979) items measure preference for privacy more so than for solitude with items like "I like to be home alone where it is peaceful and quiet". Of course, the theoretical association of solitude, working alone, introversion, and privacy is clear. However, our aim was to understand people's preference for (as a control variable) and enjoyment of (as an outcome variable) solitude, which required the development of an item set (comprising both adapted and original items) that assesses individuals' preferences for and enjoyment of spending time alone doing nothing in particular.

1.3 | Present research

Across two studies this research shed light on the effect of: (a) spontaneous intrinsic or non-intrinsic goal accomplishment memory content (Study 1) and (b) experimentally primed intrinsic and extrinsic goal accomplishment memories (Study 2), on vitality, depletion, and affect post-solitude and self-reported enjoyment of solitude. In Study 1, we expected that people who spontaneously recalled intrinsic goal accomplishments before spending time in solitude would report higher memory-specific basic psychological need

satisfaction and, in turn, more vitality (Hypothesis 1), more positive affect (Hypothesis 2), less negative affect (Hypothesis 3), less depletion (Hypothesis 4), and more enjoyment of solitude (Hypothesis 5) compared to individuals who recalled non-intrinsic memories. In Study 2, we expected that participants in the intrinsic memory priming condition would have higher memory basic psychological need satisfaction and, in turn, report more vitality (Hypothesis 1), more positive affect (Hypothesis 2), less negative affect (Hypothesis 3), less depletion (Hypothesis 4), and more enjoyment of solitude (Hypothesis 5) compared to individuals in the extrinsic goal and neutral memory priming conditions. In Study 2 we also examined, in an exploratory way, group differences in basic psychological need frustration. Extrinsic goal accomplishments may be associated with basic psychological need frustrations, accounting for their previously demonstrated inability to support wellness in the here and now.

2 | STUDY 1

2.1 | Method

2.1.1 | Ethical approval

Our study protocol was approved by the Australian Catholic University's Human Research Ethics Committee (ACU HREC) on July 15, 2022, under application number 2022-2683E.

2.1.2 | Sampling plan

To capture fixed effects, main effects and interaction effects using linear regression, detecting a typical effect size in psychological research (i.e., $r = 0.21$, Richard et al., 2003, which is reflected in a critical F value of 3.02), with an alpha level of 0.05, power of 0.95, with two groups and multiple covariates, G*Power (Faul et al., 2009) indicates the minimum total sample size required is 354, which was achievable within our budgetary constraints.

2.1.3 | Participants

Participants were recruited online by Qualtrics, a professional online survey provider. Initially, our sample included 601 participants. However, 102 were removed from the dataset because they reported that they had not adhered to the instructions to complete a full five minutes of solitude or had been distracted with or engaged in other tasks. A further 34 participants were removed due to evidence of straight-line responding, indicated by a standard deviation of zero on more than half of the time one questionnaires. An additional 58 participants were excluded because they did not report a memory of a goal accomplishment. Accordingly, the final sample for Study 1 included 407 participants ($M = 50.07$, $SD = 19.17$), which exceeds that which was required according to our power analyses. The sample had a balance of females ($N = 199$) and males ($N = 204$) as well as four participants who selected "other" or "prefer not to say". The ethnicity composition of the sample mapped roughly on that reported by the U.S. Census Bureau (2021) with 76.66% white participants, 11.54% Black or African American participants, 8.60% Hispanic (which is lower than the Census Bureau's report of 18.9%), 3.39% Asian, and 7.86% American Indian or Alaska Native, Native Hawaiian or Pacific Islander, or other.

2.1.4 | Materials

2.1.4.1 | *Mindfulness and preference for solitude*

Participants completed the 15-item Mindful Attention and Awareness Scale (Brown & Ryan, 2003). Items assessed individual differences in the frequency of mindful states over time, using the sentence stem "In your life in general, please rate how often you have each of the below experiences ..." and a 1 (Almost never) to 7 (Almost always) response scale. Item examples included "I find it difficult to stay focused on what's happening in the present", "I find myself preoccupied with the past or the future", and "I rush through activities without being really attentive to them". The scale demonstrated good reliability ($\alpha = 0.92$). Mindfulness items were reversed scored so that higher scores reflect higher levels of mindfulness.

Participants also answered items designed to assess their preference for solitude. We drew/adapted six items measuring preference for solitude from previous studies including "I often have a strong desire to be by myself" (Nguyen, Weinstein, et al., 2018), "I am never happier than when I am alone" (Pedersen, 1979), "I enjoy being by myself", "When I have to spend several hours alone, I find the time pleasant", "If I were on a several-hour plane trip, I would like to spend the time quietly on my own" (Burger, 1995), "Sometimes I need to be alone" (Leary et al., 2003). We also included three novel items designed to encapsulate the "doing nothing" aspect of the current definition of solitude including "I enjoy being alone and doing nothing at all", "I quite like being by myself and doing nothing in particular", "I find pleasure in just sitting alone with my thoughts". This scale was answered on a 1 (Strongly disagree) to 7 (Strongly agree) scale, and showed good internal reliability ($\alpha = 0.91$).

2.1.4.2 | *Baseline measures*

To assess change in wellness indices from baseline to post-solitude, participants answered three items measuring vitality, three items measuring depletion, and 12 items assessing emotional experiences, using the sentence stem "Indicate the extent you feel this way right now …" and a 1 (Not at all) to 7 (Very much) response scale. The six vitality and depletion items were developed by our team and adapted from the Subjective Vitality Scale (Ryan & Frederick, 1997), they were "I feel alive and vital", "I have a lot of positive energy and initiative", and "I feel a sense of liveliness and spark". The depletion items were: "I seem to have lost my 'get up and go'", "I feel drained", and "I feel lifeless and unenthused". Both scales had adequate reliability (vitality: $\alpha = 0.79$; depletion: $\alpha = 0.70$). Consistent with recent studies of affect in the context of solitude (Nguyen et al., 2022; Nguyen, Ryan, et al., 2018), our assessment of emotional experiences asked participants to respond to three high arousal positive affect items (i.e., happy, elated, and excited), three high arousal negative items (i.e., afraid, worried, and angry), three low arousal positive affect items (i.e., calm, relaxed, and at ease), and three low arousal negative affect items (i.e., bored, lonely, drained), all taken from the Scale of Positive and Negative Experience Scale (Diener et al., 2010). The scales assessing positive affect were reliable (low arousal: $\alpha = 0.84$; high arousal: $\alpha = 0.76$), as were the scales for negative affect (low arousal: $\alpha = 0.73$; high arousal: $\alpha = 0.79$).

2.1.4.3 | *Memory instructions*

Following baseline measures, participants were asked to write about a personal memory using these instructions (adapted from Lekes et al., 2014; Philippe, Koestner, Beaulieu-Pelletier, et al., 2011):

> Please spend a few minutes describing in detail a personal memory of an important goal that you accomplished at least six months ago. Ideally, the memory of this accomplishment will reflect who you are and reveal something about how you feel about yourself generally. Please choose a memory that often comes to your mind.

Then, to ensure that participants engaged with the descriptive memory task to a meaningful extent for priming, they were asked to describe various aspects of the memory using these prompts: "How old were you when you accomplished the goal in this memory?", "Where were you when you accomplished this goal?", "With whom were you when you accomplished this goal? How did they react?", "How did you feel when you accomplished this goal?", and "Why is the accomplishment of this goal important to you?"

2.1.4.4 | *Post-memory induction*

After outlining the memory, participants indicated the extent that they experienced the memory as need satisfying using items drawn/adapted from Lekes et al. (2014) and Chen et al. (2015). Following the sentence stem "When the event in this memory occurred I felt …", participants responded to these six items: "Free to do things and to think how I wanted", "A sense of choice and freedom" (autonomy satisfaction), "Skilful or capable", "Like I could successfully do challenging things" (competence satisfaction), "I felt close and connected to one or more people", and "I felt that that people I care about also care about me" (relatedness satisfaction), on a 1 (Not at all true) to 7 (Very true) scale. Responses to these six items were averaged into a need satisfaction variable that showed good internal consistency ($\alpha = 0.83$).

2.1.4.5 | *Solitude instructions*

After the memory task, participants were asked to partake in a period of solitude using these instructions (adapted from Wilson et al., 2014):

> For the next, and the most important part of the study, please sit alone and entertain yourself with your thoughts for a period of 5 minutes. Please stay seated, remain awake, ensure that you will not be interrupted, and that you are able to spend this time by yourself, doing nothing in particular. During this period please do not use or engage with any person or any devices or listen to music. Your participation in this part of the study is crucial to the results being meaningful, so we ask that you please do your very best to follow these instructions. If you understand and agree to these instructions, press the arrow below to continue. You will hear a bell when the 5 minutes begins (please ensure your sound is on to hear the bell). The survey will auto advance when the five minutes are complete. [On the next page] Before you begin, please reflect on the memory you just recalled. It is OK if your mind wanders while you sit by yourself.

2.1.4.6 | *Post-solitude experience*

To detect changes in wellness and mood states, participants completed the same vitality, depletion, and affect items as described above. All scales were again found to have adequate internal reliability (vitality:

$\alpha = 0.86$; depletion: $\alpha = 0.74$; low arousal positive affect: $\alpha = 0.87$; high arousal positive affect: $\alpha = 0.80$; low arousal negative affect: $\alpha = 0.74$; high arousal negative affect: $\alpha = 0.80$). As an explicit indicator of enjoyment in solitude, participants also answered these two questions: "I enjoyed my time alone with my thoughts" and "I found the past 5 minutes an enjoyable experience", each responded to on a 1 (Strongly agree) to 7 (Strongly disagree) scale, these two items were highly internally consistent ($\alpha = 0.90$), so we analyzed their mean. To detect noncompliance participants answered these questions: "Regardless of how you answer this question, you will receive credit for participating. Please be honest, did you really sit and do nothing (no computer work or social media) for the full 5 minutes of solitude?" (answered on a three-point scale: "No, I did not", "Yes, but only for part of the time", and "Yes, for the full 5 minutes") and "During the 5 minute task I got up from my chair, fell asleep, checked my phone, talked to someone, or engaged in another external activity" (answered on a binary 1 (no)/2 (yes) scale). Those who said they "Did not" comply or answered "Yes" that they were distracted, were omitted from the analyses.

2.1.5 | Memory coding

To maintain consistency with past studies of intrinsic and extrinsic memories, need satisfaction, and present moment happiness, we coded the participants' memories using the strategy described by Lekes et al. (2014). Two coders, both expert in SDT and blind to each other's ratings and to the participants' self-report scores, coded each memory according to whether its content was: (a) intrinsic, (b) non-intrinsic and non-extrinsic, (d) both intrinsic and extrinsic, or (d) extrinsic. The coders both have experience in coding qualitative content for intrinsic and/or extrinsic themes because of their previous research (Bradshaw et al., 2018; Ferber, 2022). Consistent with the Aspiration Index (Kasser & Ryan, 1993, 1996, 2001)—the most widely used measure of intrinsic and extrinsic goals—intrinsic content was reflected in themes for self-acceptance and self-understanding, as well as experiences of meaning, and of learning or "deepening one's knowledge about something" (Lekes et al., 2014, p. 105), helping someone, or a group or community, and/or developing or meaningfully maintaining a close personal relationship. Memories were coded as extrinsic if they contained content related to social recognition, the winning of an award or prize, attainment of popularity or status, wealth or financial gains and success, and/or recognition of beauty and attractiveness.

Consistent with previous research by Lekes et al. (2014), our study had an insufficient amount of spontaneous extrinsic memories. Consequently, we compared two groups of memories when conducting our analyses: (a) intrinsic and (b) non-intrinsic (extrinsic, non-intrinsic and non-extrinsic, and both intrinsic and extrinsic). Across the intrinsic and non-intrinsic ratings there was a high degree of inter-rater agreement (Cohen's kappa = 0.91). As memories could not be classified into more than one group; the two raters then reached perfect agreement by resolving all decisional conflicts through discussion and negotiation.

2.1.6 | Analysis plan

The theoretical model is shown below in Figure 1. All analyses were conducted in R (R Core Team, 2021). The data were first screened for quality. Straight-line responders, those who indicated noncompliance, and participants who did not recall a goal accomplishment were omitted from the analysis. Forced choice responding was used within the online survey platform to ensure there was no missingness in the self-report responses. A column was added to the data to reflect one of two memory categories: intrinsic and non-intrinsic (i.e., extrinsic, both intrinsic and extrinsic, and neither intrinsic nor extrinsic). We used this two-level dummy variable as a predictor of the post-solitude outcomes (i.e., vitality, affect, and enjoyment of solitude), controlling for baseline levels of these same outcomes and the control variables (i.e., mindfulness and preference for solitude) using linear regression.

2.2 | Results

2.2.1 | Intercorrelations and group differences for the baseline covariates

The intercorrelations for the pre-solitude variables for the full sample are shown in Table 1, and post-solitude variables are in Table 2. Both matrices show theoretically consistent patterns of results, though we note the negative link between preference for solitude and mindfulness. We did not have hypotheses pertaining to this link, but it is perhaps unintuitive. Of the 407 participants, 270 reported an intrinsic goal accomplishment memory (e.g., "... helping my daughter when she needed me" and "... I love to read. I set a goal of reading 50 books for the first half of the year. I have read 60 books.") and 137 reported a non-intrinsic goal accomplishment memory (e.g., "Finally saving $1000 dollars" (extrinsic) and "I finished getting my irrigation system installed" (neither intrinsic nor extrinsic)). ANOVA results showed that there were

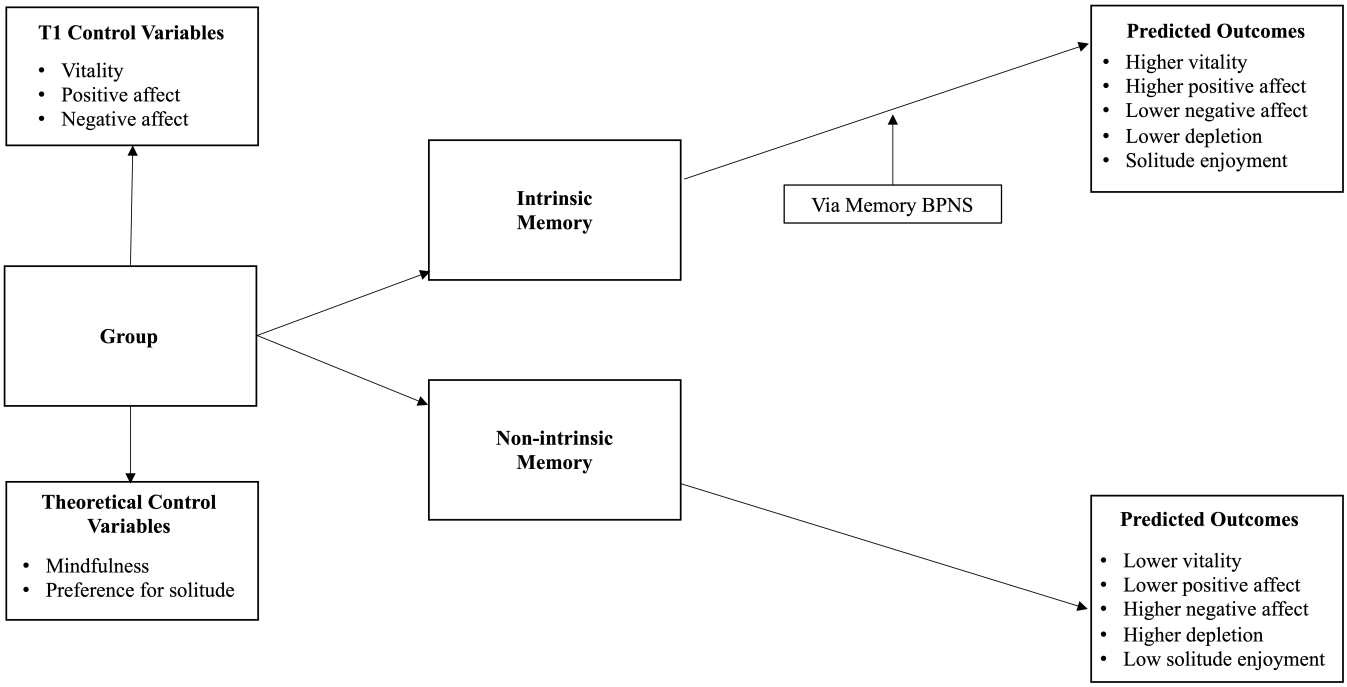

FIGURE 1 The theoretical model for Study 1 using group (i.e., intrinsic vs. non-intrinsic memory groups) as the primary predictor of indices of enjoyment of solitude, controlling for theoretically relevant control variables, and Time 1 reports of the outcome variables.

TABLE 1 Intercorrelations for the pre-solitude variables in Study 1.

Variable	1	2	3	4	5	6	7
1. Preference for solitude	–						
2. Mindfulness	−0.17***	–					
3. Low arousal positive affect	0.19***	0.22***	–				
4. High arousal positive affect	0.02	−0.01	0.58***	–			
5. Low arousal negative affect	0.07	−0.52***	−0.47***	−0.28***	–		
6. High arousal negative affect	0.04	−0.51***	−0.51***	−0.22***	0.70***	–	
7. Vitality	0.14**	0.09	0.61***	0.72***	−0.34***	−0.28***	–
8. Depletion	0.07	−0.45***	−0.44***	−0.37***	0.69***	0.66***	−0.46***

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

no statistically significant differences in mindfulness ($F(1, 405) = 0.34$, $p = 0.56$) or preference for solitude ($F(1, 405) = 0.42$, $p = 0.52$) across the intrinsic and non-intrinsic groups.

2.2.2 | Hypothesis testing

ANOVA results indicated that individuals who recalled intrinsic memories reported experiencing the memories as more need satisfying ($M = 5.75$, $SD = 1.06$) than those who recalled a non-intrinsic memory ($M = 5.51$, $SD = 1.13$) ($F(1, 405) = 4.46$, $p = 0.03$). A series of Bonferroni corrected *t*-tests were run to see if there were changes in vitality, depletion, and affect from pre- to post-solitude. As per the means in Table 3, there was a statistically significant increase in low arousal positive affect ($t(406) = 5.37$, $p < 0.001$). There were statistically significant decreases in low arousal negative affect ($t(406) = -5.86$, $p < 0.001$), high arousal negative affect ($t(406) = -7.44$, $p < 0.001$), and depletion ($t(406) = -6.93$, $p < 0.001$). There were no statistically significant changes in high arousal positive affect ($t(406) = 1.96$, $p = 0.05$) or vitality ($t(406) = 1.84$, $p = 0.06$) from pre- to post-solitude.

However, despite reporting more need satisfaction from memories and counter to our hypotheses, regression analyses indicated that the intrinsic group did not experience more post-solitude benefits compared to the non-intrinsic group. In models using group (i.e., intrinsic and non-intrinsic) as the predictor of the outcome

TABLE 2 Intercorrelations for the post-solitude variables in Study 1.

Variable	1	2	3	4	5	6	7
1. BPNS	–						
2. Low arousal positive affect	0.33***	–					
3. High arousal positive affect	0.29***	0.55***	–				
4. Low arousal negative affect	−0.22***	−0.57***	−0.45***	–			
5. High arousal negative affect	−0.25***	−0.59***	−0.29***	0.68***	–		
6. Vitality	0.31***	0.62***	0.80***	−0.53***	−0.39***	–	
7. Depletion	−0.31***	−0.51***	−0.42***	0.73***	0.66***	−0.50***	–
8. Enjoyment of solitude	0.28**	0.49***	0.50***	−0.39***	−0.26***	0.52***	−0.31***

Abbreviation: BPNS, basic psychological need satisfaction.

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

TABLE 3 Pre- and post-solitude means and standard deviations for affect, vitality, and depletion for the total sample and across the intrinsic and non-intrinsic memory groups in Study 1.

	Total		Intrinsic		Non-intrinsic	
	Pre	Post	Pre	Post	Pre	Post
	M [*SD*]	*M* [*SD*]	*M* [*SD*]	*M* [*SD*]	*M* [*SD*]	*M* [*SD*]
LA PA	4.82 [1.45]	5.16 [1.56]	4.86 [1.40]	5.17 [1.56]	4.75 [1.55]	5.13 [1.58]
HA PA	4.12 [1.39]	4.24 [1.51]	4.20 [1.39]	4.34 [1.51]	3.96 [1.36]	4.05 [1.52]
LA NA	3.52 [1.57]	3.10 [1.59]	3.51 [1.52]	3.09 [1.55]	3.54 [1.66]	3.13 [1.67]
HA NA	3.01 [1.57]	2.51 [1.47]	2.93 [1.53]	2.47 [1.41]	3.17 [1.63]	2.57 [1.60]
Vitality	4.38 [1.43]	4.50 [1.54]	4.34 [1.42]	4.52 [1.55]	4.45 [1.47]	4.46 [1.53]
Depletion	3.53 [1.70]	3.00 [1.72]	3.56 [1.66]	3.01 [1.66]	3.48 [1.79]	2.98 [1.83]

Note: Gray shading indicates variables that differed statistically significantly from pre- to post-solitude.

Abbreviations: HA, high arousal; LA, low arousal; NA, negative affect; PA, positive affect.

TABLE 4 Post-solitude regression results by group, controlling for preference for solitude, mindfulness, and the outcome at the pre-solitude time point in Study 1.

	LA PA	HA PA	LA NA	HA NA	Vitality	Depletion
Intercept	0.00	0.03	−0.01	0.00	0.03	−0.01
Group	0.01	−0.08	0.02	0.00	−0.09	0.02
Pre	0.62***	0.64***	0.56***	0.54***	0.59***	0.57***
Mindfulness	0.08	0.02	−0.07	−0.13**	0.06	−0.06
Pref. Sol.	0.07	−0.04	−0.09*	−0.08	0.02	−0.04
Adj. R^2	0.42	0.41	0.35	0.37	0.36	0.35
Model summary	$F(4, 402) = 74.76$	$F(4, 402) = 70.36$	$F(4, 402) = 56.27$	$F(4, 402) = 60.75$	$F(4, 402) = 57.42$	$F(4, 402) = 54.83$
p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Note: Group: the two-level memory group variable, with intrinsic as the reference group; Pre: pre-solitude scores on the outcome variable; Pref. Sol: preference for solitude.

Abbreviations: HA, high arousal; LA, low arousal; NA, negative affect; PA, positive affect.

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

variables while controlling for the outcome at the pre-experiment time point, as well as mindfulness and preference for solitude, the improvements in low arousal positive affect, low arousal negative affect, high arousal negative affect, and depletion, did not differ by group as shown in Table 4. Participants in the intrinsic and

non-intrinsic memory groups also did not differ on their enjoyment of the solitude experience ($b = -0.04$, $p = 0.66$), controlling for mindfulness ($b = -0.07$, $p = 0.15$) and preference for solitude ($b = 0.21$, $p < 0.001$), $F(3, 403) = 7.91$, $p < 0.001$).

3 | STUDY 2

3.1 | Method

3.1.1 | Ethical approval

The procedures for ethical approval were the same for Study 2 as reported above in Study 1 and the application was approved by the Australian Catholic University's Human Research Ethics Committee (ACU HREC) on July 15, 2022, under application number 2022-2683E.

3.1.2 | Sampling plan

As per Study 1, to capture fixed effects, main effects and interaction effects using linear regression, detecting a typical effect size in psychological research (i.e., $r = 0.21$, Richard et al., 2003, which is reflected in a critical F value of 3.02), with an alpha level of 0.05, power of 0.95, with three groups and multiple covariates, G*Power (Faul et al., 2009) indicates the minimum total sample size required is 354.

3.1.3 | Participants

Participants were recruited online by Qualtrics, a professional online survey provider. Initially, the Study 2 sample included 613 participants. However, 104 were removed from the dataset because they reported that they had not adhered to the instructions to complete a full five minutes of solitude or had been distracted with or engaged in other tasks. A further 19 participants were removed due to evidence of straight-line responding, indicated by a standard deviation on more than half of the time one questionnaires. Accordingly, the final sample for Study 2 included 490 participants ($M = 54.16$, $SD = 18.89$), which exceeds the required sample according to our power analyses. The sample was 51.84% female ($N = 232$, males $N = 232$, and four participants who selected "other" or "prefer not to say"). The ethnicity composition of the sample mapped roughly on that reported by the U.S. Census Bureau (2021) with 78.78% white participants, 13.88% Black or African American participants, 7.35% Hispanic (which, as in Study 1, is lower than the Census Bureau's report of 18.9%), 3.47% Asian, and 3.88% American Indian or Alaska Native, Native Hawaiian or Pacific Islander, or other.

3.1.4 | Materials

3.1.4.1 | *Demographics*

As in Study 1, participants completed a basic demographic survey including their age, sex, and ethnicity.

3.1.4.2 | *Baseline control variables*

Consistent with Study 1, participants completed the 15-item Mindful Attention and Awareness Scale (Brown & Ryan, 2003), and the preference for solitude items reported above. Both scales again demonstrated good internal reliability (mindfulness: $\alpha = 0.93$; preference for solitude: $\alpha = 0.90$).

3.1.4.3 | *Baseline*

Following from Study 1, at baseline participants were asked to report their present experience of vitality, depletion, and affect using the same items as reported in Study 1. Adequate reliability was shown for positive affect (low arousal $\alpha = 0.84$; high arousal $\alpha = 0.73$), negative affect (low arousal $\alpha = 0.71$; high arousal $\alpha = 0.78$), vitality ($\alpha = 0.81$), and depletion scale ($\alpha = 0.70$).

3.1.4.4 | *Memory instructions*

Following baseline measures, participants were randomly allocated to one of three memory conditions: intrinsic, extrinsic, or neutral, and asked to write about a personal memory using the condition specific instructions below (adapted from Lekes et al., 2014; Philippe, Koestner, Beaulieu-Pelletier, et al., 2011). Then, like Study 1, to promote a meaningful priming effect, participants in the intrinsic and extrinsic conditions were asked to elaborate upon where the memory took place, how old they were, whom they were with, and how they felt. Participants in the neutral condition were not asked follow-up questions, as we were not seeking a priming effect in the neutral group.

3.1.4.5 | *Intrinsic memories*

Participants allocated to the intrinsic memories group were asked to type their memory into a text-box after reading the following instructions: "Using the text box, please describe in detail a personal memory of a time during which you accomplished goals such as a better understanding of yourself; acceptance of something about yourself; finding meaning in your life; learning something new or deepening your knowledge about something; helping someone, a group or a community; developing or meaningfully maintaining a close or romantic relationship with someone."

3.1.4.6 | *Extrinsic memories*

Participants allocated to the extrinsic memories group were asked to type their memory into a text-box after reading the following instructions: "Using the text box, please describe in detail a personal memory of a time during which you accomplished goals such as receiving sought out social recognition from one or more people or after receiving a prize or award; popularity; a financial gain (whether through working, winning a prize, or receiving money as a gift); impressing someone; or being recognized for your physical attractiveness."

3.1.4.7 | *Neutral memories*

Participants allocated to the neutral memories group were asked to type their memory into a text-box after reading the following instructions: "Using the text-box, please describe in detail your memory of a typical day at work in a job you have had in the past, or if you've not had a formal job, think back to your days in school or college and recall the basic elements of a typical day for you."

3.1.4.8 | *Post-memory induction*

As in Study 1, after outlining the memory, participants were asked to indicate the extent that they experienced the memory as need satisfying using the same items reported above. In addition, Study 2 also assessed the degree of basic psychological need frustration associated with the memories. Following the sentence stem "When the event in this memory occurred I felt …" participants were asked to respond to these six items, each adapted from (Chen et al., 2015): "Like I 'had to'", "Pressured to do things I didn't want to do" (autonomy frustration), "Doubtful about my ability to do things well", "Disappointed with my abilities" (competence frustration), "That my relationships are only superficial", and "That people don't like me" (relatedness frustration).

3.1.4.9 | *Solitude instructions*

After the memory task, participants were asked to partake in a period of solitude using the same instructions provided above in Study 1.

3.1.4.10 | *Post-solitude experience*

Finally, participants again completed items measuring affect, vitality, depletion, and enjoyment of solitude items, as well as the indicators of noncompliance from Study 1. The post-solitude scales had good internal consistency (low arousal positive affect: $\alpha = 0.85$; high arousal positive affect: $\alpha = 0.83$; low arousal negative affect: $\alpha = 0.74$; high arousal negative affect: $\alpha = 0.81$; vitality: $\alpha = 0.88$; depletion: $\alpha = 0.74$, enjoyment of solitude: $\alpha = 0.93$).

3.1.5 | Analysis plan

The theoretical model is shown below in Figure 2. As in Study 1, the data were first screened for quality. Straight-line responders and participants who indicated that they did not comply with the solitude task, were excluded from the analysis. The analysis for Study 2 follows from Study 1, though the group variable comprised three levels (i.e., intrinsic, neutral, and extrinsic) rather than two as in Study 1 (i.e., intrinsic and non-intrinsic).

3.2 | Results

3.2.1 | Intercorrelations and group differences for the baseline covariates

The intercorrelations for the pre-solitude variables for the full sample are shown in Table 5, and post-solitude variables are in Table 6. Both matrices show theoretically consistent patterns of results, though again we observed that mindfulness and preference for solitude were negatively linked. ANOVA results showed that there were no statistically significant differences in mindfulness ($F(1, 487) = 0.31$, $p = 0.73$) or preference for solitude ($F(1, 487) = 1.56$, $p = 0.21$) across the intrinsic (e.g., "… when I graduated from high school"), extrinsic (e.g., "I once saved money to buy a race car), or neutral memory conditions (e.g., "I would wake up get dressed and get the bus to school"). Exploratorily, we compared the average word length of the memories in the intrinsic ($M = 337.54$), extrinsic ($M = 289.46$), and neutral ($M = 296.88$) conditions, though they were not statistically significantly different ($F(2, 1836) = 0.52$, $p = 0.59$).

3.2.2 | Hypothesis testing

ANOVA results indicated that there was a statistically significant effect of group on ratings of memory need satisfaction, $F(2, 487) = 3.35$, $p = 0.03$. Counter to our expectations, Tukey's post hoc comparisons revealed that participants in the extrinsic group reported higher levels of need satisfaction compared to the neutral condition (MD = 0.28, $p < 0.05$). There were no statistically significant differences in mean levels of need satisfaction between the intrinsic group ($M = 5.43$, $SD = 1.33$) compared to the extrinsic group ($M = 5.66$, $SD = 1.21$, MD = −0.17, $p = 0.24$) or the neutral group ($M = 5.29$, $SD = 1.39$, MD = 0.10, $p = 0.61$). We also compared the degree of need frustration participants recalled, again finding a statistically significant effect of group, $F(2, 487) = 5.29$, $p < 0.01$. However, as was the case with

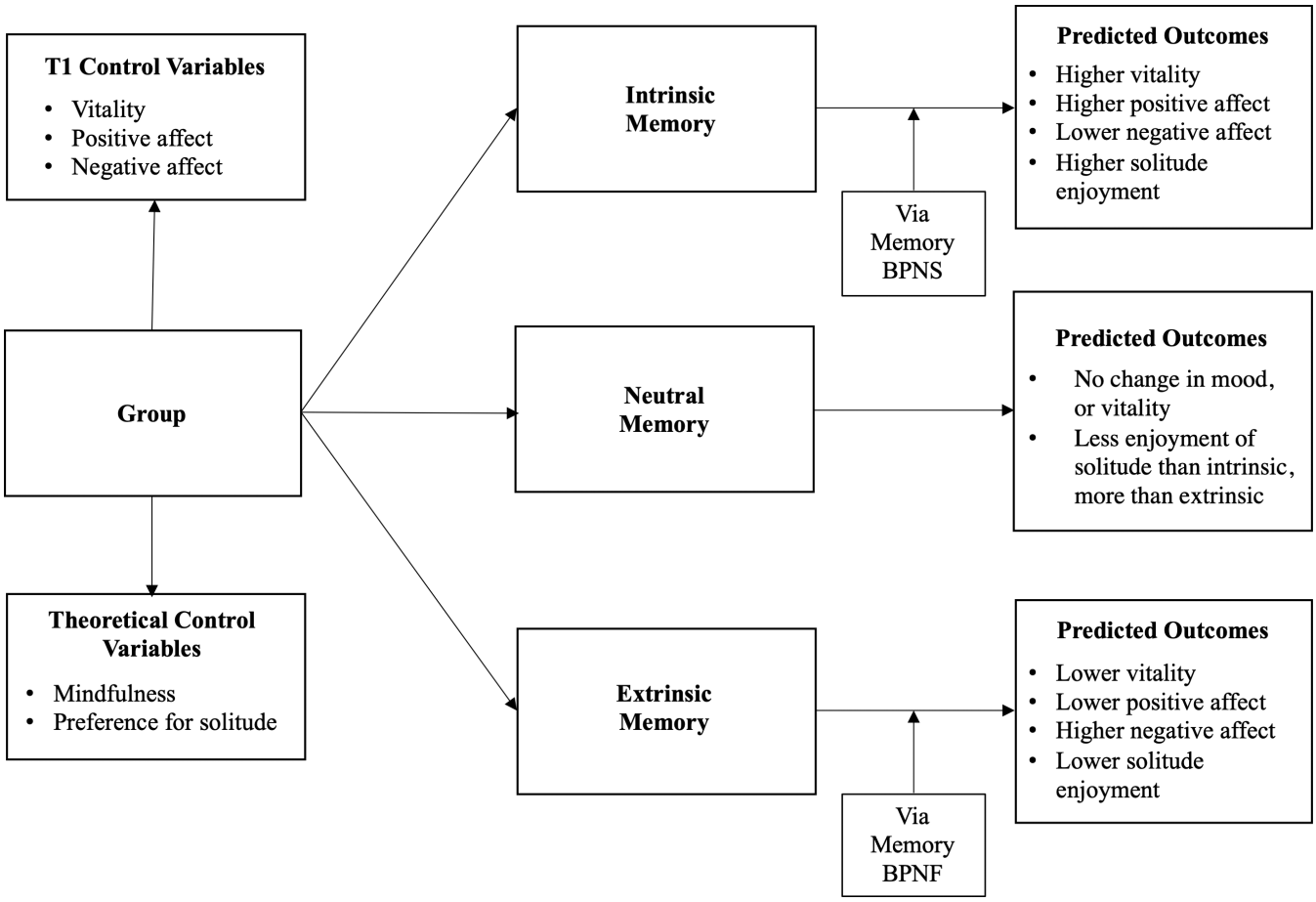

FIGURE 2 The theoretical model for Study 2 using group (i.e., intrinsic vs. neutral vs. extrinsic memory conditions) as the primary predictor of indices of enjoyment of solitude, controlling for theoretically relevant control variables, and Time 1 reports of the outcome variables.

TABLE 5 Intercorrelations for the pre-solitude variables in Study 2.

Variable	1	2	3	4	5	6	7
1. Preference for solitude	–						
2. Mindfulness	−0.20***	–					
3. Low arousal positive affect	0.10*	0.13**	–				
4. High arousal positive affect	0	−0.08	0.57***	–			
5. Low arousal negative affect	0.10*	−0.46***	−0.43***	−0.21***	–		
6. High arousal negative affect	0.11*	−0.42***	−0.42***	−0.16***	0.65***	–	
7. Vitality	−0.04	0.05	0.67***	0.79***	−0.32***	−0.29***	–
8. Depletion	0.16***	−0.45***	−0.42***	−0.30***	0.66***	0.52***	−0.44***

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

need satisfaction, the post hoc comparisons were the opposite of our expectations. The extrinsic group was found to have lower levels of memory need frustration ($M = 2.70$, $SD = 1.42$) compared to both the intrinsic ($M = 3.14$, $SD = 1.62$, MD = −0.29, $p < 0.05$) and neutral groups ($M = 3.21$, $SD = 1.57$, MD = 0.33, $p < 0.01$). The difference in mean levels of need frustration between the intrinsic and neutral groups was not statistically significant (MD = 0.04, $p = 0.92$).

Bonferroni corrected *t*-tests were used to assess whether there were any statistically significant changes in affect, vitality, and depletion from pre- and post-solitude. As per the means in Table 7, and consistent with the pattern of results in Study 1, there was a statistically significant

TABLE 6 Intercorrelations for the post-solitude variables in Study 2.

Variable	1	2	3	4	5	6	7	8
1. BPNS	–							
2. BPNF	−0.40***	–						
3. Low arousal positive affect	0.32***	−0.10*	–					
4. High arousal positive affect	0.28***	0.04	0.61***	–				
5. Low arousal negative affect	−0.21***	0.32***	−0.40***	−0.37***	–			
6. High arousal negative affect	−0.17***	0.39***	−0.42***	−0.21***	0.65***	–		
7. Vitality	0.31***	−0.01	0.64***	0.84***	−0.41***	−0.23***	–	
8. Depletion	−0.24***	0.38***	−0.40***	−0.36***	0.70***	0.63***	−0.43***	–
9. Enjoyment of solitude	0.24***	0.03	0.46***	0.48***	−0.28***	−0.17***	0.45***	−0.22***

Abbreviation: BPNS/BPNF, basic psychological need satisfaction and frustration.

***$p < 0.001$; *$p < 0.05$.

TABLE 7 Pre- and post-solitude means and standard deviations for affect, vitality, and depletion for the total sample and across the intrinsic, extrinsic, and neutral memory groups in Study 2.

	Total		Intrinsic		Extrinsic		Neutral	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
	M [*SD*]	*M* [*SD*]	*M* [*SD*]	*M* [*SD*]	*M* [*SD*]	*M* [*SD*]	*M* [*SD*]	*M* [*SD*]
LA PA	4.99 [1.46]	5.37 [1.50]	5.10 [1.51]	5.44 [1.43]	4.82 [1.43]	5.41 [1.51]	5.05 [1.42]	5.25 [1.56]
HA PA	4.32 [1.41]	4.42 [1.61]	4.42 [1.36]	4.44 [1.63]	4.17 [1.40]	4.52 [1.60]	4.36 [1.46]	4.30 [1.62]
LA NA	3.36 [1.57]	2.91 [1.58]	3.30 [1.55]	2.93 [1.62]	3.30 [1.57]	2.79 [1.57]	3.47 [1.59]	3.01 [1.56]
HA NA	2.97 [1.59]	2.41 [1.53]	2.95 [1.57]	2.41 [1.47]	2.91 [1.55]	2.27 [1.48]	3.03 [1.66]	2.53 [1.64]
Vitality	4.60 [1.48]	4.69 [1.66]	4.64 [1.54]	4.75 [1.61]	4.43 [1.48]	4.72 [1.71]	4.71 [1.42]	4.59 [1.68]
Depletion	3.34 [1.70]	2.92 [1.75]	3.29 [1.72]	2.89 [1.75]	3.37 [1.72]	2.78 [1.67]	3.36 [1.68]	3.09 [1.82]

Note: Gray shading indicates variables that differed statistically significantly from pre- to post-solitude.

Abbreviations: HA, high arousal; LA, low arousal; NA, negative affect; PA, positive affect.

TABLE 8 Post-solitude regression results by group, controlling for preference for solitude, mindfulness, and the outcome at the pre-solitude time point in Study 2.

	LA PA	HA PA	LA NA	HA NA	Vitality	Depletion
Group (Ext)	0.09	0.13*	−0.05	−0.06	0.09	−0.08
Group (Int)	−0.00	−0.04	0.03	0.02	0.02	−0.00
Group (Neu)	−0.10	−0.10	0.02	0.05	−0.11	0.09
Pre	0.52***	0.66***	0.58***	0.62***	0.66***	0.56***
Mindfulness	0.09*	0.02	−0.03	−0.08*	0.00	−0.12**
Pref. Sol.	0.09*	0.05	0.04	0.05	0.01	0.03
Adj. R^2	0.31	0.43	0.36	0.44	0.43	0.40
Model Summary	$F(6, 484) = 37.04$	$F(6, 484) = 61.55$	$F(6, 484) = 46.11$	$F(6, 484) = 66.26$	$F(6, 484) = 62.80$	$F(6, 484) = 54.39$
p	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Note: Group: the three-level memory group variable; (Ext): the extrinsic memory condition; (Int): the intrinsic memory condition; (Neu): the neutral memory condition; Pre: pre-solitude scores on the outcome variable; Pref. Sol: preference for solitude.

Abbreviations: HA, high arousal; LA, low arousal; NA, negative affect; PA, positive affect.

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

increase in low arousal positive affect ($t(489) = 5.99$, $p < 0.001$), and statistically significant decreases in low arousal negative affect ($t(489) = -7.02$, $p < 0.001$), high arousal negative affect ($t(489) = -9.63$, $p < 0.001$), and depletion ($t(489) = -6.18$, $p < 0.001$). There were no changes in high arousal positive affect ($t(489) = 1.81$, $p = 0.07$) or vitality ($t(489) = 1.60$, $p = 0.11$) post-solitude.

In linear models using group (i.e., intrinsic, extrinsic, and neutral) as the predictor of the outcome variables while controlling for the outcome at the pre-solitude time point, as well as mindfulness and preference for solitude, the improvements in low arousal positive affect, low arousal negative affect, high arousal negative affect, and depletion, did not differ by group as shown in Table 8. Participants in the intrinsic, extrinsic, and neutral memory groups also did not differ on their enjoyment of the solitude experience controlling for mindfulness and preference for solitude ($F(2, 485) = 0.04$, $p = 0.96$).

4 | DISCUSSION

We evaluated evidence testing our prediction that recalling memories of intrinsic goal accomplishments would bolster people's present moment wellness and their experiences of solitude, compared to memories of non-intrinsic (in Study 1) or extrinsic (in Study 2) goal accomplishments. In Study 1, participants who recalled an intrinsic memory reported that their memories were associated with more basic psychological need satisfaction than those who recalled a non-intrinsic memory. However, in Study 2, participants in the extrinsic memory condition reported more need satisfaction than those in the neutral memory condition, and less need frustration than both the intrinsic and neutral memory groups. Moreover, despite observing post-solitude benefits in low arousal positive affect, high and low arousal negative affect, and depletion across the two studies, these effects applied regardless of memory condition. Safe to say, our results did not support our hypotheses and require further exploration in future research.

4.1 | Solitude's deactivation effect and the activating effect of goals

While we aimed to contribute knowledge about how people could better cope when presented with unavoidable solitude, our results suggest that some people's aversion to solitude may be inconsistent with the benefits it can confer. The results of our two studies indicated that just five minutes of solitude can boost low arousal positive affect and reduce negative affect and depletion, regardless of cognition content.

Our results were only partially consistent with the previously observed "deactivation effect" of solitude. Nguyen, Ryan, et al. (2018, p. 92) showed that experiences of solitude and solitary activities can lead to deactivation (i.e., decreases) in high arousal affective experiences (like elation and anger), as well as increases in low arousal affective experiences (like relaxation but also states like boredom). Consistent with the deactivation effect, we did show decreases in high arousal negative affect (e.g., fear and worry). However, there was no change (i.e., no decrease, as in the deactivation effect) in high arousal positive affect (e.g., excited and elated). Consistent with Nguyen, Ryan, et al.'s (2018) results, we also found an increase in low arousal positive affect (e.g., calm and ease), yet we saw a decrease (rather than an increase as in Nguyen, Ryan, et al., 2018) in low arousal negative affect (e.g., feeling lonely or drained). This divergent pattern of results could reflect the more relatively activating effect of thinking about goal accomplishments or activities before or during solitude. That is, having an active instruction to re-experience an accomplishment, be it intrinsic or extrinsic, or specific types of events (as in the neutral condition) might stimulate cognitive and emotional processes that could keep people from engaging in low arousal negative states such as rumination. Such cognitive activation could plausibly explain the observed improvements in affect and well-being.

4.2 | The dual nature of goal memories

Perhaps particularly unexpected were the participants' reports of extrinsic goal accomplishments as being relatively more need satisfying (than neutral) and less need frustrating (than intrinsic and neutral) in Study 2. On close inspection of the goals nominated in response to the extrinsic prompt provided, it seems that participants varied on their interpretation of an extrinsic goal accomplishment. Some goals were very clearly extrinsic, such as "... getting employee of the month and getting money for it" (fame and wealth) and "I was picked as a hair model" (image) and "I bought stock and it soared in price" (wealth). While others could feasibly be considered an intrinsic goal memory, for example "I felt accomplished when I was able to retire at 56", retirement obviously requires a certain degree of financial stability but could also be indicative of autonomy and personal growth. Similarly, "I have been recognized as being kind and caring" pertains to recognition from others, but of qualities that arguably serve relationship goals, and "There was a man with cancer who needed some yard

work done I took it upon myself and collected donations and equipment from different resources and went in and cleaned up his yard and planted flowers and made a paved patio. I was awarded an award from the news station for doing this act of kindness", is about receiving an award and recognition but for a community contribution. Clearly, these goal memory examples have the potential to have felt rewarding, thus their recall could also have an enhancing effect. Worth noting, however, is the fact that the possible enhancing effect did not confer additional benefit to participants in the extrinsic group. This arguably reiterates the complexities of extrinsic goal pursuits often being subjectively meaningful yet not actualizing (Bradshaw et al., 2021). Recent evidence indicates that the attainment of extrinsic goals may be a double-edged sword (Ryan, 2023), with positive links to both basic psychological need satisfaction *and* frustration. It is via the frustration pathway we expected to see extrinsic goal memories linked with reduced well-being. Recall of extrinsic accomplishments may result in the "escalation of expectations" (Csikszentmihalyi, 1999, p. 823) in that they are rewarding initially, but over time, more money, fame, or beauty is needed to elicit the same sense of reward, which would arguably be need frustrating, therefore, harming well-being. Of course, we did not find evidence of the double-edged sword in our research, though the effect may be more detectable over a longer time scale.

Our prompt for intrinsic goal memories also attracted diverse memories. Some very obviously intrinsic such as "I have a good relationship with my wife and my child" (relationships), "I helped [a homeless stranger] up and took her to the nearest convenience store to get some things" (community contribution), "helping disabled children at a local park negotiate the obstacles of using the playground" (community and relationships), and "I finished all my assignments" (personal growth). However, many goals in the intrinsic condition conveyed personal growth through challenging circumstances, such as "I discovered cheating and I stayed still in my place, without leaving my family alone. I have accepted myself and focused on my family", "When I stopped drinking and started to go to AA meetings" and "When I was first diagnosed with cancer, I had to go deep within myself to realize that I am stronger than I think I am to beat it". These experiences, while clearly examples of personal growth, could also be emotionally confronting to remember thus attenuating any potential benefit of contemplating them during solitude. These possibilities about the emotional experiences associated with different goal accomplishment memories would be a meaningful addition to follow-up research.

Taken together, these results highlight the fact that goal accomplishments rarely have a single underpinning motivation or outcome. Goals with intrinsic or extrinsic contents can be selected for either intrinsic and extrinsic reasons or a combination and—consistent with the seventh proposition of goal contents theory—to the extent that a goal satisfies basic psychological needs, it has the potential to be beneficial, regardless of content (Bradshaw, 2023).

4.3 | The unexpected role of neutral memories

Unexpectedly, we were unable to distinguish either goal memory condition (i.e., intrinsic or extrinsic) from neutral memories on any of the outcomes. This result is arguably the most discouraging evidence regarding the relevance of goal content to memory and solitude. A possible explanation for the unexpected role of the neutral condition may lie in the nature of the neutral task. We asked people to recall a typical day at work or school. Typical means that these events would be neither traumatic nor sensational. In this condition as in the others, positive affect was generally enhanced. Clearly, across conditions, solitude experiences impact mood.

We also suggest that this study be improved and replicated in future research, because while the results shown in Table 8 were not statistically significant, there was a discernible pattern. The extrinsic group showed the most beneficial estimates, followed by the intrinsic group, and then the neutral group. Being cautious not to overinterpret what are ultimately statistically nonsignificant results, we suggest these may warrant further investigation, particularly considering that statistical significance can be obscured by sample size especially when effect size magnitudes are small. We thus encourage replication with a considerably expanded sample to test these potential effects.

4.4 | Limitations

We did not find support for our hypotheses in this study which may be due to their not being relations where we expected there would be. However, there were some noteworthy limitations of our study that should lend caution to such conclusions. First, our participants joined the experiment online. Although we asked participants repeatedly to report their compliance with experimental instructions, and we compensated them regardless of whether they said they did or did not comply, we still cannot be sure of the extent that participants thoroughly partook in the solitude experience. A replication study would ideally be conducted in person. Such a strategy would allow not only for

better monitoring of the solitude compliance, but also of the goal contents, a trained interviewer could more rigorously assess the intrinsic or extrinsic quality of the memories reported. Our framing of the solitude experience may also have impacted people's reactions, beyond the experience itself. Some evidence has shown that reappraising being alone as beneficial can lead people to experience solitude positively (Rodriguez et al., 2020). While we did not address the benefits of solitude directly, our prompt did contain phrases such as "entertain yourself with your thoughts" which may have positively biased people's experiences. In addition, a longer period of solitude would have likely been more uncomfortable for some participants, thus more acutely necessitating a goal memory skill set (insofar as it is indeed relevant). Most participants reported post-solitude experiential benefits, which might not have been the case if a longer experience of solitude had been required. Further, if we had asked participants to step away from their computer during the solitude exercise participants may have had a purer experience of solitude, which could have differentiated the groups. Finally, the participants were also only recruited from a single country and may not be representative of all groups.

4.5 | Conclusion

The results herein indicated that a brief period of solitude may confer benefits including the facilitation of low arousal positive affect, decreased low and high arousal negative affect, and lower feelings of depletion, regardless of instructional sets regarding memory contents. Our aim was to uncover skills to potentially enhance coping with unavoidable solitude, but our findings suggested a similar pattern of beneficial results across memory conditions. However, the similar pattern of results across memory conditions implies a relative robustness to solitude's benefits. Even if certain memories are more psychologically need satisfying, as we observed for intrinsic and unexpectedly for extrinsic memories, that did not translate to tangible differences in the solitude experience. Our findings highlight the complexities of how goal accomplishment memories can relate to present moment wellness. Further research should continue to study conditions under which solitude is experienced as replenishing versus taxing. But the present studies provide initial evidence that solitude experiences in which people are actively engaged in relatively benign and/or positive memories may have broad value, underscoring the importance of future investigations into how people can creatively enrich time alone. Hopefully these findings point to fruitful areas for additional research on solitude, memory content, and their intersection.

AUTHOR CONTRIBUTIONS

All authors contributed to the manuscript's development and approved its final version for submission. The lead author lead the data analysis, while the second author managed data collection, and all authors contributed to the study design and writing.

ACKNOWLEDGMENTS

We have no acknowledgements to declare. Open access publishing facilitated by Australian Catholic University, as part of the Wiley - Australian Catholic University agreement via the Council of Australian University Librarians.

FUNDING INFORMATION

This study was funded by the Australian Catholic University.

DATA AVAILABILITY STATEMENT

Data resulting from the study underpinning this registered report is available on the Journal of Personality's Special Issue OSF page.

ETHICS STATEMENT

Our study was approved by the Australian Catholic University's Human Research Ethics Committee prior to data collection. We are not reproducing copyrighted material.

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How to cite this article: Bradshaw, E. L., Ferber, K. A., & Ryan, R. M. (2024). Seeking solitude skills: Do memories of intrinsic goals enhance enjoyment of alone time? *Journal of Personality*, *00*, 1–17. https://doi.org/10.1111/jopy.12914