By Choice or By Chance? Intentional Reverie is Real but Rare

Erin C. Westgate
Charlottesville, Virginia

A Thesis presented to the Graduate Faculty of the University of Virginia in Candidacy for the Degree of Master of Arts

Department of Psychology

University of Virginia
November, 2014

Abstract

Up to half our lives consists of private internally-focused thought, yet little research has focused on the content and consequences of such thought. The ability to occupy oneself solely by thinking could even reduce stress and increase well-being. However, lab studies suggest that many people do not enjoy intentional thinking and may prefer even negative external stimulation to being alone with their thoughts. Do people deliberately entertain themselves with their thoughts in everyday life and if so, do they enjoy it? Or do people prefer it when such thoughts occur spontaneously? In an experience sampling study, 170 undergraduates responded to texts four times a day for one week, reporting on their thoughts. Overall, people were focused almost equally on the external world around them (48.8% of the time) and on their own inner thoughts (49.3%). On average people chose to entertain themselves with their thoughts approximately 18.48% of the time and reported positive moods while doing so. However, people were in even better moods when desired thoughts occurred spontaneously rather than intentionally. Although people do intentionally engage in enjoyable thinking in everyday life, such thought may make up only a minority of conscious mental activity, and be less enjoyable than spontaneous desired thoughts.

Introduction

"…be a Columbus to whole new continents and worlds within you, opening new channels, not of trade, but of thought" - Henry David Thoreau, *Walden*

Conscious thinking is quintessentially human. Humans are the species best able to project ourselves into the future or even into alternate realities using only the mind. Religious leaders and philosophers have called on people to spend time in reflection and thought for centuries, and the ability to occupy oneself solely by thinking could potentially reduce stress and increase well-being. However, today it is more common to see people entranced by their cell phones than it is to see them sitting quietly, pleasantly lost in their own thoughts. Do people deliberately occupy themselves with their thoughts in everyday life and if so, do they enjoy it? Or do people enjoy themselves more when such desired thoughts occur spontaneously? The present investigation was designed to answer these questions using an experience sampling methodology in which people reported and rated their naturally-occurring thoughts.

Do people like to think? Certainly, most people find themselves pleasantly lost in thought or contemplation some of the time. Henry David Thoreau famously retreated to the solitude of the woods for two years of reflection and contemplation (Thoreau, 2006). There are prisoners of war who survived by building imaginary houses in their head nail by nail (Philpott, 2001). However, many of these examples involve unique individuals or cases in which people were engaged in the external world while thinking. Indeed, research suggests that "the tendency for an individual to engage in and enjoy thinking" differs from person to person and that some people enjoy it more than others (Cacioppo & Petty, 1982, p. 116). How much people in general enjoy thinking in the absence of external stimulation is unclear.

In any case, it does not appear that they do very much of it. Examples like Thoreau's *Walden* stand out precisely because they are highly unusual. The American Time Use survey, which attempts to catalog people's daily activities, does not even include a separate category for thinking (American Time Use Survey, 2012). Only 17% of people reported that they spent any time in the previous 24 hours engaged in the closest category - "relaxing or thinking." In mainstream media, complaints about cell phone use and preoccupation with technology are on the rise, with increasing concern about their ramifications on people's inner mental lives. As of 2014, 90% of Americans own cell phones and 44% even admit to having slept with their phone in or near their bed to avoid missing any news during the night (Pew Research Center, 2014).

Recent experimental research also supports the idea that people may not enjoy being alone with their thoughts. In a series of studies, Wilson et al. (2014) found that many people did not enjoy intentionally occupying themselves with their own thoughts in an empty room for 6-12 minutes. Instead, people reported that the experience was difficult even when they were allowed to do it at home and to prepare topics ahead of time. People assigned to engage in a pleasant external activity instead, such as reading or listening to music, enjoyed the external activity much more those assigned just to think. In fact, when given the chance to administer a painful electric shock, many people chose to shock themselves instead of just thinking, preferring even negative external stimulation over their own thoughts. These findings call into doubt whether people actually enjoy occupying themselves with their own thoughts in the absence of external stimulation. Engaging in intentional reverie, or voluntarily choosing to turn one's thoughts inwards and enjoy those thoughts, may not be as easy as it seems. These studies raise the question - do people engage in intentional reverie in their everyday lives, when no one is telling

them to do it and, if so, do they enjoy it? In everyday life, are people more likely to enjoy their thoughts when they drift inwards spontaneously instead?

Internal Thought

At its most basic level, thought can be broken down into two attentional focuses: external (or "out") thought and internal (or "in") thought. People can choose to focus on the external world around them or they can choose to block out the external world and focus on their own internal thoughts, but they cannot do both simultaneously (Duval & Wicklund, 1972, 1973). Internal and external thought compete for limited attentional resources; therefore, maintaining internally guided thought often requires tamping down attention to the external world. Intentional reverie, or intentionally occupying oneself with one's own thoughts in the absence of external stimuli, belongs to this second category of internal thought, but is only a subset of it.

Internally guided thought appears to result from the spontaneous generation of content by the default mode network, which is then controlled and sustained by top-down processes This "default mode network" consists of brain regions that paradoxically show *increased* activity during states of rest and appears to operate in conjunction with top-down processes in the brain to make internally guided thought possible (Grecius, Krasnow, Reiss, & Menon, 2003; Smallwood, Brown, Baird, & Schooler, 2012). fMRI research has shown that even when the mind appears to be at rest, it is full of activity. Estimates of the incidence of internal thought in everyday life differ, but range from 30% to 50% (Smallwood & Schooler, 2006; note that this includes all kinds of internal thought, not just intentional reverie).

Indeed, most of the research on internally-generated thought has focused on just two types: mind-wandering (or task-unrelated thought) and daydreaming. Mind wandering refers to instances where people are trying to engage in an external task, but find that their minds have

spontaneously wandered away from what they are doing and drifted to some other topic instead. Daydreaming refers to cases in which people are idly playing out mental fantasies, even when they are not engaged in an external task.

Mind-wandering is particularly common when engaged in repetitive or boring tasks. In a review of the literature, Smallwood and Schooler (2006) estimated the prevalence of mind-wandering at 15-50%. In a large-scale experience sampling study, Killingsworth and Gilbert (2010) found that people reported mind-wandering 46.9% of the time. Although most research on mind-wandering has assumed that it occurs spontaneously, Giambra (1995) has also found support for volitional mind-wandering, which occurs when people voluntarily choose to focus their attention on something other than the task at hand. In all cases, mind-wandering involves both internal thought and an external task.

Unlike mind-wandering, daydreaming explicitly includes elements of fantasy, task-unrelated thought, and spontaneous and effortless mental activity. Daydreaming refers to cases in which people are idly playing out mental fantasies, even when they are not engaged in an external task. Klinger (2009, p. 112) defined it as "nonworking thought that is either spontaneous or fanciful." Researchers have estimated the prevalence of daydreaming at 10-50% of all thoughts (Klinger, 2009). Even under the most demanding circumstances, people may engage in daydreaming at least 10% of the time (Singer, 1966). Note, however, that researchers do not typically distinguish between cases in which people daydream while engaged in an external task (commonly called task-unrelated thought) and cases in which people voluntarily withdraw from the external world and elect to daydream. Most research has looked at the former type of daydreaming; indeed, McMillan, Kaufman, and Singer (2013) note that there have been very few investigations of "volitional daydreaming."

Just Thinking: Intentional vs Spontaneous Reverie

Intentional reverie, defined as voluntarily turning one's attention inward and trying to enjoy one's own thoughts, is a distinct form of internal thought that differs from the above types in important ways. Its inward focus is perhaps its most important aspect. Intentional reverie occurs in the absence of external stimulation - either because such stimulation is unavailable or because the thinker has made a deliberate attempt to close off the external world and focus inward. In this respect, it differs considerably from mind-wandering and other forms of task-unrelated thought, which by definition require an external task that one's attention has inadvertently drifted away from.

In addition, intentional reverie is the result of a voluntary and deliberate decision to turn one's thoughts inward, which differs from daydreaming and other forms of spontaneous mental fantasies. Daydreaming, mind-wandering and undirected thought are explicitly the product of spontaneous mental processes, not controlled deliberate ones. Unlike such thoughts, intentional reverie is the deliberate volitional choice to withdraw from the external world and engage in thinking.

Intentional reverie can thus be constrasted with spontaneous reverie, or unintentionally turning one's attention inwards to one's own thoughts. While some kinds of daydreaming may be deliberate and thus qualify as instances of intentional reverie, daydreaming often consists of thoughts which arise spontaneously and unintentionally (Klinger, 2009). Although such daydreams may be pleasant, they are usually a happy accident rather than the product of an intentional decision to occupy oneself with one's thoughts in enjoyable ways. When such daydreaming is internally focused and consists of spontaneously occurring desired thoughts, it

may be characterized as spontaneous reverie (in contrast to intentional reverie). No one has looked at how often people engage in intentional reverie compared to spontaneous reverie, and whether they enjoy these types of internal thought.

Research on mind-wandering and daydreaming does not fully answer how common these forms of reverie are in daily life and how happy people are when their thoughts are directed internally vs externally. Although Killingsworth and Gilbert (2010) found that people are happier when they are engaged in an external task than when their minds have wandered away from that task, they did not address the question of how much people enjoy their own thoughts when they have freely chosen to focus their attention inwards and are not trying to do something else. Thus a key focus of the present study is distinguishing between intentional and spontaneous forms of reverie and contrasting them with other types of thought in both prevalence and enjoyability.

Thought Sampling

Our main interest was in the frequency of intentional reverie versus spontaneous reverie and whether people are in a better mood when they are engaged in these types of thought. Given the difficulty of engaging in intentional reverie in the lab, do people do it in everyday life? Is it possible that people simply prefer – and enjoy - spontaneous reverie more? We were also interested in how frequently people engaged in many other types of thought and how much they enjoyed doing so.

To answer these questions, we used an experience sampling procedure to sample people's thoughts throughout the day. People self-categorized the type of the thought they were experiencing, as well as rating their thought on various dimensions, such as intentionality and

desirability. Doing so allowed us to identify not only intentional versus spontaneous reverie, but a variety of distinct thought types.

There have been dozens of thought sampling studies and it is important to illustrate how ours differs from previous ones. Many studies have examined only one specific type of thought, such as rumination or flow. Relatively few studies have attempted to deliberately sample and categorize a broad representation of people's thoughts in their natural environments. Among those that have, most focused primarily on categorizing thought content rather than categorizing the nature of the thought processes. For instance, Csikszentmihalyi and Figurski (1982) classified thought into 15 different categories, consisting of "thoughts about food", "thoughts about work", thoughts about the "self", etc. However, such classifications say little or nothing about the type of thought (as opposed to its content) or how people experienced it. A thought about key lime pie, for example, could be an instance of daydreaming, recalling the past, planning the future, or even rumination, in the case of a person with an eating disorder. In short, the literature on internal thought is characterized by a narrow focus on specific types of thought, prevalence rates, and mood/valence. Broader approaches have focused overwhelmingly on classifying thought contents rather than thought types.

The Current Study

We investigated the frequency and valence of intentional and spontaneous reverie using an experience sampling method to assess on-line thought in an everyday setting. Participants received texts on their smartphones four times a day for one week. When they received a text, participants were asked to categorize the thought they had just had into one of several categories and to rate the thought on several dimensions, such as how much they were paying attention to the outside world. In sum, the main purpose of this study was to examine the frequency of

intentional versus spontaneous reverie, and to see how much people enjoyed these types of internal thought. In addition, several secondary questions of interest can be addressed, such as how frequently people engage in many other types of though, how much they enjoy doing so, and how intentionality and desirability interact with internal thought.

Method

Participants

Participants consisted of 171 undergraduates (119 women, 50 men, 2 declined to answer) between the ages of 18 and 22 (M = 18.83, SD = 1.09) at a large university on the East Coast of the US. Fifty-five percent of students identified as White/Caucasian, 25% as Asian, 9% as Black/African American, 7% as Hispanic, and 4.7% as either Pacific Islander or other.

Procedure

Procedures were approved by the university's Institutional Review Board. Participants were recruited from the departmental Participant Pool and summer Paid Participant Pool. Laptop and smartphone ownership were required for participation. The study took place in two parts: 1) an instructional briefing session in the lab followed by 2) a week-long thought sampling conducted on participants' smartphones.

In Part 1, participants were invited into the laboratory in groups of up to 50 at a time for a training and information session. In all, the training session lasted an hour and participants were compensated with either course credit or $10 payment. After administering informed consent forms, the experimenter explained the thought inventory that would be used in the second half of the study, including explanations of the various thought categories as well as the rating scales.

The experimenter then invited all participants to participate in a brief verbal quiz that tested their understanding of the thought categories and guided participants through a brief practice session on their smart phones. For the latter, participants were asked to sit quietly for 5 minutes. During that time, the experimenter sent a notification text that alerted them to access and complete the Thought Inventory questionnaire on their phone. Following successful completion of the practice exercise, the participants spent the remainder of the session completing individual difference measures on their laptops, the results of which are beyond the scope of the present paper.

Part 2 of the study consisted of an experience sampling procedure that took place during the week after the lab session. The study was administered via participants' cell phones, using text message notifications and an online questionnaire (Qualtrics, Provo, UT) optimized for a smartphone browser. Participants were alerted via text messages to stop and report on their thoughts for a total of four times a day between the hours for 10am and 10pm for seven days, for a total of 28 time points. Notification times were determined randomly, with one notification sent within each three-hour segment (10am-1pm, 1-4pm, 4-7pm, 7-10pm). Participants were asked to respond immediately to the notification, reporting on whatever thought was in their mind at the time they became aware of the text message. We emphasized that they should not respond while driving or engaging in other activities in which it would be dangerous to use their phones. Participants who could not fill out the survey immediately were asked to take note of their thoughts and respond to the survey as soon as possible.

Upon receipt of a text message notification, participants responded by clicking on a link that took them to an online questionnaire on their smartphone. On that questionnaire, they were asked to categorize their thoughts into one (or more) of 15 distinct categories or to ones labeled "not conscious" or "other" and then to answer six questions about their thoughts, detailed below.

Participants received additional course credit or $5 payment if they responded to at least one text during the thought sampling portion of the study.

Measures

Thought Inventory: Categories. Participants were asked to select one or more of 17 categories from a drop-down menu that best characterized their thought (see Appendix). Participants then rated the thought on these dimensions:

Attention to external stimulus. The extent to which they were trying to pay attention to an external stimulus on a 7-point Likert scale ranging from 1 = *not at all, a great deal of internal thought* to 7 = *fully absorbed, no internal thought*, with a midpoint of 4 = *half-and-half; paying attention but also thinking my own thoughts*.

Thought valence. The valence of the thought on a 7-point Likert scale ranging from −3 = *Very negative* to 3 = *Very positive,* with a midpoint of 4 = *Neutral*.

Control. How much they were trying to control the content and direction of the thought on a 7-point Likert scale ranging from 1 = *Not at all* to 7 = *Trying very hard*.

Desirability. How much they wanted to be thinking that way versus thinking about something else on a 7-point Likert scale ranging from 1 = *Very much wish I was thinking about something else* to 7 = *Very much want to be doing this*, with a midpoint of 4 = *Neutral*.

Intentionality. How much they intended to begin having that thought on a 7-point Likert scale ranging from 1 = *Not at all; don't know why I started thinking about this* to 7 = *Intentionally decided to start thinking about this*.

Importance. How personally important the content of the thought was on a 7-point Likert scale ranging from 1 = *Trivial or unimportant to me* to 7 = *Very important/matters a lot to me*.

Temporal orientation. Whether their thoughts were about the Past, Present, or Future on a 7-point Likert scale ranging from −3 = *Past* to 0 = *Present* to 3 = *Future*.

Mood. Participants were also asked to rate their current mood on a 7-point Likert scale ranging from −3 = *Very negative* to 3 = *Very positive*.

Lastly, participants were asked to briefly describe what they were doing when they had the thought.

Results

Descriptive Statistics and Preliminary Analyses

Descriptive statistics for the sample are shown in Table 1. On average, participants provided responses for 18 of the 28 possible time-points (M = 17.88, SD = 9.44). Participants who provided data on fewer than five time-points were subsequently excluded from analysis, leaving a final sample of 145 participants. Results were similar when all participants were included in analyses. Among participants who provided data for five or more time-points, the average response rate was 20 out of 28 possible time-points (M = 19.74, SD = 8.16).

Prior to data analysis, thoughts reported in the "Other" category were independently recoded by two research assistants as belonging to one of the fifteen thought categories listed on the inventory (74% agreement). These categories were used as a check on participants' ratings. When research assistants could not agree on a category, I acted as a tie-breaker. A total of 50 out of 3044 responses required recoding in this fashion, or 1.64% of all responses. Following recoding, the most common thought category was paying attention to an external stimuli (44.1%), followed by external problem solving (16.1%), conversation (13.9%), daydreaming (8%), future-oriented thought (7.3%), internal problem solving (7.1%), musing (6.2%), flow (5.8%), rumination (4.2%), not thinking (2.8%), recalling memories (2.7%), imagined

conversations (2.5%), bored/tired (1.6%), thought suppression (1.3%), and meditation/prayer (.5%). Note that we disregarded instances in which participants checked "not conscious" (7% of cases), the vast majority of which occurred because participants were sleeping when they received the text.

Desire and Intentionality: Variants of Internal and External Thought

For the purposes of this predissertation, I will focus on participants' ratings of their thoughts, specifically their ratings of external vs internal attention, thought intentionality, and thought desirability[1]. (Comparing these ratings to participants' categorizations of their thoughts is underway, but is beyond the scope of this paper). We coded thoughts as external if they were rated higher than the midpoint on "paying attention to something external"; we coded thoughts as internal if they were rated at the midpoint or lower. We coded thoughts as intentional if they were rated at the midpoint or higher on intentionality; we coded thoughts as spontaneous (unintentional) if they were rated below the midpoint. We coded thoughts as desired if they were rated at the midpoint or higher than the midpoint on "want to be having these thoughts"; we coded thoughts as undesired if they were rated below the midpoint. Using these codings, we ended up with four kinds of internal thought and four types of external thought. Internal thought consisted of intentional reverie (desired and intended), spontaneous reverie (desired and spontaneous), self-examination (intended and undesired), and thought intrusions (spontaneous and undesired). External thought consisted of intentional engagement (desired and intended),

[1] Although we also included measures of controllability, ratings of controllability were highly correlated with intentionality. When intentionality and controllability were both included in the model, controllability did not significantly contribute to predicting outcomes such as mood and thought valence. In addition, effort to control one's thoughts also measured aspects of mental control as well as actual thought valence (because participants tried to control negative thoughts more than positive thoughts), creating a possible confound. For both these reasons, controllability was not retained in the final analyses.

spontaneous engagement (desired and spontaneous), forced attention (intended and undesired), and external intrusions (spontaneous and undesired). Please see Table 2 for a summarized break-down and prevalence of the eight thought types.

Using these criteria, intentional reverie was the most common type of internal thought (18.38% of all thoughts), followed by spontaneous reverie (14.1%), self-examination (11.5%), and thought intrusions (5.3%). In all, consistent with some previous findings, internal thought made up 49.3% of all thoughts (Killingsworth & Gilbert, 2010). Of the external thought types, intentional engagement was most common (28.7%), followed by forced attendance (11.1%), spontaneous engagement (6.3%), and external intrusions (2.2%). Altogether, external thought made up 48.4% of all thoughts.

The main question I addressed was the extent to which these eight types of thought predicted participants' ratings of mood, the valence of their thoughts, the personal importance of their thoughts, and the temporal orientation of their thoughts. In order to address these questions I conducted mixed effects models comparing the relative effect of the three independent variables (intentionality, desirability, and direction of attention) on each of the dependent measures (e.g., mood). Note that these analyses treat the three independent variables as continuous measures, in contrast to the median splits displayed in Table 2.

Mood and Thought Valence. We first examined the relationships of thought type to mood. As seen in Table 3, there were significant main effects of externality, desirability, and intentionality, as well as significant or nearly-significant two-way interactions. All of these effects, however, were qualified by a significant three-way interaction between externality, desirability, and intentionality. Figure 1 illustrates these interactions. For external thought, there was no interaction between thought intentionality and desirability; instead, there was a positive

main effect of both . That is, external thoughts were associated with more positive moods when the thought was desired and/or intentional. For internal thought, there was an interaction between desirability and intentionality. When internal thoughts were undesired, then people were in a better mood when they intended to have these thoughts than when they occurred spontaneously--which was the same pattern found with external thoughts. When internal thoughts were desired, however, people were in a better mood when they occurred spontaneously than when they intended to have these thoughts (see Figure 1). These results provide preliminary evidence that people are in better moods when they engage in spontaneous reverie (spontaneous, desired, internal thoughts) than when they engage in deliberative reverie (intentional, desired, internal thoughts).

Follow-up analyses to break down the three-way interaction within internal and external thought confirmed the presence of these interactions. When only external thoughts were analyzed, we found no significant interaction between intentionality and desirability. In contrast, within internal thought, the two-way interaction between intentionality and desirability remained significant, $B = -.04$, $SE = .01$, $p < .01$.

Next, we looked at thought valence, or participants' ratings of how negative or positive the thought itself was. As seen in Table 4, there were again significant main effects of externality, desirability, and intentionality, as well as significant or nearly-significant two-way interactions. All of these effects, however, were again qualified by a significant three-way interaction between externality, desirability, and intentionality. Figure 2 illustrates these interactions. For both internal and external thought, there was an interaction between intentionality and desirability such that spontaneous thought was more positive when the thought was desired, but intentional thought was more positive when the thought was undesired.

However, this effect was stronger for internal thought than for external thoughts. Follow-up analyses to break down the three-way interaction within internal and external thought confirmed the presence of these interactions. When only external thoughts were analyzed, we again found a significant interaction between intentionality and desirability, $B = -.02$, $SE = .01$, $p < .01$, *Cohen's d* = .15. Within internal thought, we found that the same two-way interaction between intentionality and desirability was both significant and much larger, $B = -.06$, $SE = .01$, $p < .001$, *Cohen's d* = .33.

Once again, these results are consistent with the idea that spontaneous reverie (spontaneous, desired, internal thought) is experienced more positively than intentional reverie (intentional, desired, internal thoughts).

Personal Importance Ratings. As seen in Table 5, there were significant main effects of externality and desirability on ratings of the importance of the thought,, as well as significant two-way interactions between all three predictors. The three-way interaction was not significant. Internal thoughts and undesired thoughts were considered more personally important, while external thoughts and desired thoughts were less personally important. There was no main effect of intentionality. In addition to the main effects of external thought and desirability, there were also significant 2-way interactions between 1) external thought and desirability, 2) external thought and intentionality, and 3) intentionality and desirability. When thoughts were internal, desirability and intentionality did not affect personal importance. However, when thoughts were external, desired thoughts were judged to be more personally important than undesired thoughts, and intentional thoughts were considered more personally important than spontaneous thoughts. Finally, spontaneous thoughts were not affected by desirability, but intentional thoughts were

judged to be more personally important when they were desired than when they were undesired. Figure 3 illustrates these interactions.

Temporal Ratings

Participants rated the time orientation of their thought on a scale that went from -3 (past) to +3 (future), with the zero midpoint labeled "present." Interestingly, as seen in Table 6, there were no significant effects of any of the independent variables on these ratings.

Discussion

We found that thoughts can be meaningfully broken down into eight types on the basis of externality, intentionality, and desirability (see Table 2), and that these types of thought predicted people's mood and thought valence. We found that thinking is split roughly in half between external thought (focused outward on the world) and internal thought (focused inward). This is consistent with past research on mind-wandering and other forms of internal thought (Smallwood & Schooler, 2006). On the surface, the fact that about 50% of thoughts were internally focused may seem to be astonishingly high. People may be physically present but mentally elsewhere up to half of all waking moments. The most common thought categories endorsed by participants were focused on a task at hand in the external world (External Attention & External Problem Solving). Some of the rarest thought categories were thought suppression, rumination, and not thinking. These results are roughly consistent with previous research, which confirm that these kinds of negative internal thought occur relatively infrequently in non-clinical populations. Also consistent with prior research, participants enjoyed external thoughts slightly more than internal thoughts, but the difference may have been due mostly to the overwhelming negativity of ruminative thoughts (those that were internal, spontaneous, and undesired).. Most thoughts were neutral to mildly positive, which is consistent with previous research (Andrews-Hanna, 2013).

The main purpose of the study was to examine the frequency and valence of spontaneous versus intentional reverie, defined as thoughts that were internal, spontaneous, and desired (spontaneous reverie) and thoughts that were internal, intentional, and desired (intentional reverie). We wanted to know whether people choose to occupy themselves with their own thoughts and if so, whether they enjoy it. Intentional reverie made up approximately 18% of all thought, consisted of positive thought content, and was associated with mildly positive moods. Interestingly, spontaneous reverie was slightly less common, making up 14% of all thoughts, but significantly more enjoyable than intentional reverie.

If spontaneous reverie is more pleasant, it may explain why participants in Wilson et al. (2014) had difficulty enjoying reverie when asked to occupy themselves with their thoughts as part of experimental procedures. That is, in most of those studies participants were asked to "entertain themselves with their thoughts," which probably led to intentional attempts to generate positive thoughts. This finding also aligns neatly with theories of the default network that suggest that self-generated thought originates as spontaneous thoughts generated by the default network that are then taken up and maintained by top-down regulatory processes. Spontaneous reverie, like mind-wandering, may be a process that is initiated without executive control, intent, or even awareness (Schooler & Smallwood, 2006).

Characteristics of Conscious Thought

In addition to whether people's attention was focused externally on the world around them or internally on of their own thoughts , other factors also affected people's mood - such as whether a person wanted to be having those thoughts and what he or she was thinking about. Not surprisingly, people tend to be happier when they choose their thoughts, when they think about positive topics, and when they want to be thinking about that topic--with the above-noted

exception that people are happier when they engage in spontaneous rather than intentional reverie.

Another interesting finding was the importance of people's ratings of the intentionality and desirability of their thoughts, which has not been assessed in prior research. People spent around 69.7% of their time engaged in intentional thought, especially intentional desired thoughts. People are generally happy and indeed, intentional desired thought (both external and internal) was associated with mildly positive moods. People spent much less time in spontaneous thought, particularly spontaneous undesired thought. Unsurprisingly, spontaneous undesired thoughts were associated with the most unpleasant moods. Desired thoughts were also quite common, making up about 67.5% of thoughts when collapsed across categories.

In general, intentionality and desirability influence mood most heavily when people are focused internally. This may be because intentionality and desirability are more salient to maintaining internal lines of thought than to maintaining external thoughts, which may be influenced more by environmental features.

Other results were in line with previous thought research. For instance, we found that thought generally centered on the present or near future, consistent with Klinger and Cox's (1987) estimate that 67% of thoughts are focused on the present and Andrews-Hanna and colleagues' (2013) finding that most autobiographical thoughts pertain to the near future. We found that thoughts were also largely personally important, consistent with Andrews Hanna and colleagues' (2013) finding that most thoughts are highly self-relevant and of moderate importance.

Origins of External Thought

Why are thoughts so rooted in the external world? Our enchantment with the world around us has a long history. The brain consumes a huge amount of resources and every mental capacity must "pay" for itself. People are capable of thought because devoting resources to it "paid off" at some point for our ancestors. Evolving humans had to make a choice: should they pay attention to the external world around them or let themselves be drawn inward into the internal world of their own thoughts? Paying attention to the world may have boosted immediate survival by allowing people to focus on the necessities: procuring food, staying alert to danger, and, fundamentally for humans, establishing and nourishing our relationships with other people. However, internal thought allowed us the luxury of escaping from the present so that we could learn from the past, plan for the future, and do both better by understanding ourselves and the world around us. Although every animal must pay attention to the world to survive, not every animal has the higher order thinking capacity of humans. This suggests that while conscious thought may be a defining characteristic of humanity, it may also be one of our newest characteristics. Evolutionarily speaking, conscious thought is recent and it is young (Reber, 1992). It is undoubtedly our ability to think that has propelled humans into every corner of the globe, living in nearly every imaginable environment and under almost unimaginable conditions.

But why, if people enjoy spending time with their thoughts, do people not do it more often? Intentional reverie was reported a relatively small percentage of the time, and a third of our participants never reported doing it at all. The mind, unlike outside distractions, is always at hand and available. For comparison, the average American spends 2.8 hours per day watching television. Why would people go to the effort to seek out external entertainment if internal entertainment is so much easier to access and just as pleasant?

The answer, we argue is that intentional enjoyable thought is real but rare, because it requires a particular set of circumstances. Exerting conscious mental control to direct thoughts and fantasies is taxing and rapidly drains available cognitive resources. Distraction in the environment may add to this burden by taxing mental resources even more heavily, in the effort to tune out the outside world and focus inward. Altogether, there may be only a limited set of circumstances when people have both the time, inclination, and resources at hand to be able to choose to focus inwards and successfully enjoy it. Intentional reverie may be rare then, not because it's unpleasant, but because it's difficult. In a busy world, people may feel that their limited mental resources are best spent on other activities. Over time, as people take the time to pause and think less, intentional reverie may become even more difficult and aversive, initiating a vicious cycle.

Limitations

There are limitations to the current study. All participants consisted of college undergraduates and the study required ownership of a smartphone. It is possible and even likely that thought composition varies across people in ways that may have been difficult to pick up in a sample of highly educated young adults. It is reassuring to note that estimates of thought types in this study do replicate previous research on prevalence rates, but future studies should expand the present research to a general population. In addition, all data collection took place over a relatively small time period of a single week. Particularly rare forms of thought, such as negative internal thought, may have been under-sampled due to the limited timeframe.

The problem of under-sampling is not confined to rare thoughts. Theoretically, some thought types are presumably easier to capture than others. Klinger (1978) estimated that thought segments last between 5-14 seconds and that the average person may experience around 4,000

thoughts each day. Not all of these thoughts are equally likely to be reported. Intentional thoughts are likely to be reported more often than spontaneous thoughts, both due to desire for self-efficacy and retroactive response bias ("Sure, I meant to be thinking about that") and because spontaneous thoughts may be more fleeting. If spontaneous thoughts are frequent but especially brief in nature, these procedures may have underestimated their prevalence. In addition, some thought types may be underreported due to self-presentation concerns (such as rumination). For these types of thought, our estimates are likely to be conservative underestimates of their true prevalence.

People enjoy thinking, at least some of the time. Intentional reverie, it would seem, is real but rare and is characterized by intentional desired internal thought divorced from the world around us. Spontaneous reverie, although less frequent than intentional reverie, may be even more enjoyable. Although we spend much of our time focused on the world around us, up to half our lives is spent in the inner world of our own minds. It's reassuring to know it's at least sometimes a pleasant place to be.

References

American Time Use Survey (2012). Bureau of Labor Statistics, U.S. Department of Labor: www.bls.gov/tus/home.htm#data

Andrews-Hanna, J.R. et al. (2013). A penny for your thoughts: dimensions of self-generated thought content and relationships with individual differences in emotional wellbeing. *Frontiers in Psychology*, 4, 1–13 .

Christoff, K., Gordon, A.M., Smallwood, J., Smith, R., & Schooler, J.W. (2009). Experience sampling during fMRI reveals default network and executive system contributions to

mind wandering. Proceedings of the National Academy of Sciences, 106.

Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal of Personality and Social Psychology*, *42*, 116-131.

Csikszentmihalyi, M., & Figurski, T.J. (1982). Self-awareness and aversive experience in everyday life. *Journal of Personality, 50,* 15-28.

Csikszentmihalyi, M., & Larson, R. (1987). Validity and reliability of the experience sampling method: Mental disorders in their natural settings. *Journal of Nervous and Mental Disease, 175*, 526 –536.

Diaz, B. A., Van Der Sluis, S., Moens, S., Benjamins, J. S., Migliorati, F., Stoffers, D., ... & Linkenkaer-Hansen, K. (2013). The Amsterdam Resting-State Questionnaire reveals multiple phenotypes of resting-state cognition. *Frontiers in Human Neuroscience*, *7*, 1-15.

Diaz, B. A., Van Der Sluis, S., Benjamins, J. S., Stoffers, D., Hardstone, R., Mansvelder, H. D., ... & Linkenkaer-Hansen, K. (2014). The ARSQ 2.0 reveals age and personality effects on mind-wandering experiences. *Frontiers in Psychology*, *5*.

Duval, S., & Wicklund, R. A. (1973). Effects of objective self-awareness on attribution of causality. *Journal of Experimental Social Psychology*, *9*, 17-31.

Field, N. P., Joudy, R., & Hart, D. (2010). The moderating effect of self-concept valence on the relationship between self-focused attention and mood: An experience sampling study. *Journal of Research in Personality*, *44*, 70-77.

Giambra, L.M. (1995). A laboratory based method for investigating influences on switching attention to task unrelated imagery and thought. *Consciousness and Cognition, 4,* 1-21.

Greicius, M. D., Krasnow, B., Reiss, A. L., & Menon, V. (2003). Functional connectivity in the

resting brain: a network analysis of the default mode hypothesis. *Proceedings of the National Academy of Sciences*, *100*, 253-258.

Grodsky, A., & Giambra, L. (1990). The consistency across vigilance and reading tasks of individual differences in the occurrence of task unrelated and task related images and words. *Imagination, Cognition, and Personality, 10,* 39-52.

Hurlburt, R. T. (1979). Random sampling of cognitions and behavior. *Journal of Research in Personality, 13,* 103-111.

Hurlburt, R. T (1990). *Sampling normal and schizophrenic inner experience.* New York: Plenum Press.

Hurlburt, R.T. (1997). Randomly sampling thinking in the natural environment. *Journal of Consulting and Clinical Psychology, 65,* 941-944.

Kane, M.J., Brow, L.H., McVay, J.C., Sylvia, P.J., Myin-Germeys, I., & Kwapil, T.R. (2007). For whom the mind wanders, and when. *Psychological Science, 18*, 614–621.

Klinger, E. (1978). Dimensions of thought and imagery in normal waking states. *Journal of Altered States of Consciousness*.

Klinger, E.C. (1999). Thought flow: Properties and mechanisms underlying shifts in content. In J.A. Singer and P. Salovey (Eds.), At Play in the fields of consciousness: Essays in the honor of Jerome L. Singer (pp. 29-50). Mahwah, NJ: Erlbaum.

Klinger, E. (2009). Daydreaming and fantasizing: Thought flow and motivation. In Markman, K.D., Klein, W. M. P. & Suhr, J.A. (Eds) Handbook of imagination and mental simulation. New York, NY, US: Psychology Press.

Klinger, E. C., & Cox, W. M. (1987). Dimensions of thought flow in everyday life. *Imagination, Cognition and Personality,* 7, 105–128.

Klinger, E. C., Barta, S. G., & Maxeiner, M. E. (1980). Motivational correlates of thought, content, frequency and commitment. *Journal of Personality and Social Psychology, 39,* 1222–1237.

Killingsworth, M.A. & Gilbert, D.T. A wandering mind is an unhappy mind. *Science,* 330, 932.

Mason, M.F.,Norton, M.I., Van Horn, J.D.,Wegner,D.M., Grafton, S.T., & Macrae, C.N. (2007).Wandering minds: the default network and stimulus-independent thought. *Science, 315,* 393–395.

McVay, J. C., Kane, M. J., & Kwapil, T. R. (2009). Tracking the train of thought from the laboratory into everyday life: an experience-sampling study of mind wandering across controlled and ecological contexts. *Psychonomic Bulletin & Review*, *16*, 857-863.

Pew Research (2014). Mobile Technology Fact Sheet. Pew Research Center, Washington, D.C. Retrieved from http://www.pewinternet.org/fact-sheets/mobile-technology-fact-sheet/

Philpott, T. (2001). Glory Denied: The Sage of Jim Thompson, America's Longest-Held Prisoner of War. New York: W.W. Norton & Company.

Reber, A. S. (1992). The cognitive unconscious: An evolutionary perspective. Consciousness and Cognition, 1, 93-133.

Reise, S.P., & Hurlburt, R.T. (1988). The Relations Between Dimensions of Thought Reported in Two Thought-Sampling Studies. *Imagination*, *Cognition and Personality, 7*, 315-321.

Rozin, P., & Royzman, E. B. (2001). Negativity bias, negativity dominance, and contagion. *Personality and social psychology review*, *5*, 296-320.

Ruby, F.J.M., Smallwood, J., Engen, H., & Singer, T. (2013). How self-generated thought shapes mood—the relation between mind-wandering and mood depends on the

socio-temporal content of thoughts. *PLoS One* 8, e77554.

Singer, J.L., & McCraven, V. (1961). Some characteristics of adult daydreaming. *The Journal of Psychology,* 51, 151.

Singer, J.L. (1966). Daydreaming**:** An Introduction to the Experimental Study of Inner Experience. New York: Random House.

Smallwood, J., & Schooler, J.W. (2006). The restless mind. *Psychological Bulletin, 132*, 946–958.

Smallwood, J., Nind, L., & O'Connor, R.C. (2009). When is your head at? An exploration of the factors associated with the temporal focus of the wandering mind. *Consciousness and Cognition, 18,* 118–125.

Song, X. & Wang, X. (2012). Mind wandering in Chinese daily lives--an experience sampling study. *PLoS One* 7, e44423.

Stawarczyk, D., Cassol, H., & D'Argembeau, A, Phenomenology of future-oriented mind-wandering episodes. *Frontiers in Psychology,* 4, 1–12.

Stawarczyk, D., Majerus, S., Maj, M., Van der Linden, M., & D'Argembeau, A. (2011). Mind-wandering: phenomenology and function as assessed with a novel experience sampling method. *Acta Pscyhologica*, 136, 370.

Thoreau, H. D. (2006). *Walden*. Yale University Press.

Tusche, A., Smallwood, J., Bernhardt, B.C., & Singer, T. Classifying the wandering mind: Revealing the affective content of thoughts during task-free rest periods. *Neuroimage*. 97, 107–16.

Wilson, T.D., Reinhard, D., Westgate, E.C., Gilbert, D., Ellerbeck, N., Hahn, C., Brown, C., & Shaked, A. (2014). Just Think: The Challenges of the Mind at Play. *Science, 345,* 75-77.

Tables

Table 1

Descriptive statistics for thought characteristics

Rating Attribute	*M (SD)*
Intentionality	4.35 (1.92)
Desirability	4.07 (1.48)
Valence	4.26 (1.21)
Control	3.77 (1.89)
Attention to external stimulus	4.38 (1.75)
Temporal orientation	-.07 (1.13)
Mood	-.05 (1.51)

Table 2

Categorization of thoughts into 8 types based on the thought attributes of intentionality, desirability, and paying attention to external stimuli.

Internal Thought

	Intentional	**Spontaneous**
Desired	Intentional Reverie (18.4%)	Spontaneous Reverie (14.1%)
Undesired	Self-examination (11.5%)	Thought Intrusions (5.3%)

External Thought

	Intentional	**Spontaneous**
Desired	Intentional Engagement (28.7%)	Spontaneous Engagement (6.3%)
Undesired	Forced Attention (11.1%)	External Intrusions (2.2%)

Table 3

Mixed effects model of the fixed effects of external, desired, and intended thought attributes predicting current mood.

	Current Mood				
	B	*SE*	*t*	*df*	*p*
External	.27	.10	2.84	2602.93	.004**
Desired	.72	.10	7.19	2607.85	<.001***
Intended	.22	.09	2.47	2606.03	.014*
External x Desired	-.06	.02	-2.57	2604.63	.01*
External x Intended	-.03	.02	-1.66	2606.74	.098
Intended x Desired	-.06	.02	-2.88	2603.97	.004**
External x Intended x Desired	.01	.00	2.00	2605.43	.046*

Table 4

Mixed effects model of the fixed effects of external, desired, and intended thought attributes predicting thought valence.

	Thought Valence				
	B	*SE*	*t*	*df*	*p*
External	.20	.07	2.82	2654.19	.005**
Desired	.91	.08	12.10	2662.88	<.001***
Intended	.23	.07	3.35	2659.76	.001**
External x Desired	-.05	.02	-3.08	2655.36	.002**
External x Intended	-.02	.01	-1.08	2660.25	.279
Intended x Desired	-.07	.02	-4.72	2657.64	<.001***
External x Intended x Desired	.01	.00	2.33	2658.52	.02*

Table 5

Mixed effects model of the fixed effects of external, desired, and intended thought attributes predicting personal importance.

	Personal Importance				
	B	*SE*	*t*	*df*	*p*
External	-.48	.12	-4.09	2602.93	<.001***
Desired	-.53	.12	-4.29	2607.85	<.001***
Intended	.02	.11	.22	2606.03	.823
External x Desired	.08	.03	3.08	2604.63	.002**
External x Intended	.05	.02	2.10	2606.74	.036*
Intended x Desired	.08	.03	3.24	2603.97	.001**
External x Intended x Desired	.00	.01	-1.64	2605.43	.102

Table 6

Mixed effects model of the fixed effects of external, desired, and intended thought attributes predicting temporal orientation.

	Temporal Orientation				
	B	*SE*	*t*	*df*	*p*
External	-.08	.08	-.06	2628.74	.368
Desired	.03	.09	-.90	2636.90	.754
Intended	-.05	.08	.31	2634.67	.541
External x Desired	.00	.02	-.61	2631.07	.895
External x Intended	.02	.02	.13	2635.39	.266
Intended x Desired	.01	.02	1.11	2631.96	.684
External x Intended x Desired	.00	.00	-.43	2633.29	.666

Figure 1

Three-way interaction between internal vs external thought, intentionality, and desired thought attributes on current mood

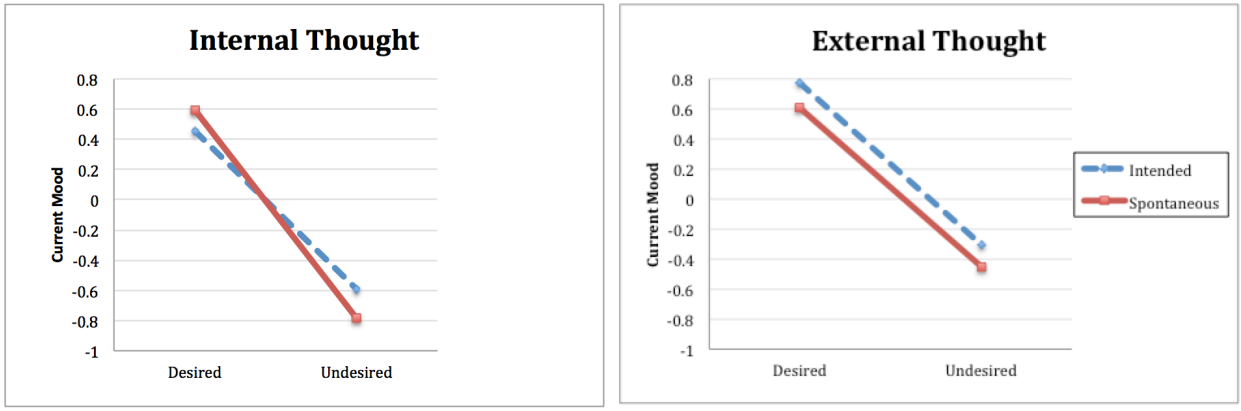


Figure 2

Three-way interaction between internal vs external thought, intentionality, and desired thought attributes on thought valence.

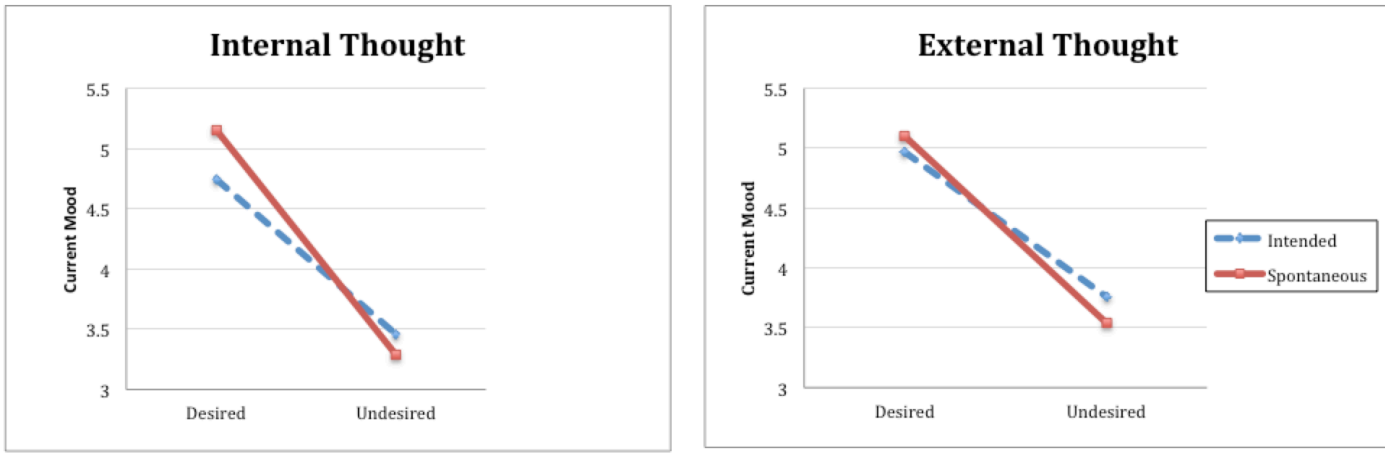
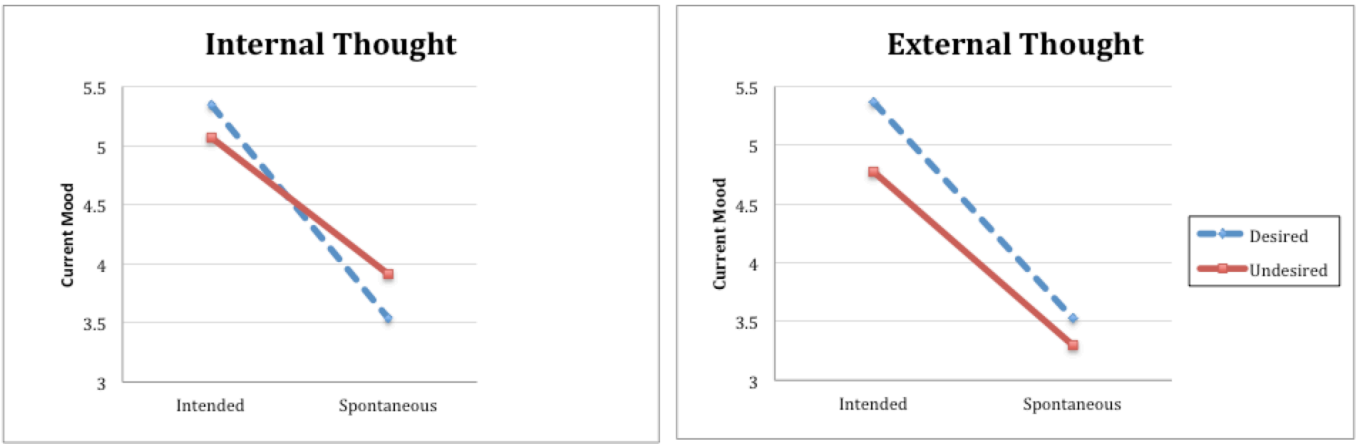


Figure 3

Interactions between internal vs external thought, intentionality, and desired thought attributes on personal importance.



Appendix A

Table 1
Categories used in the thought inventory.

Thought Inventory Categories
Paying attention to something external (e.g., reading, watching television, listening to someone)
Problem solving - external (working on something external, such as doing something at work, fixing something, solving a pu[missing letters]le
Problem solving - internal (thinking about how to achieve a goal/solve something other than what you are doing now)
Flow (making progress toward goal, "lost" in a rewarding activity)
Rumination (negative repetitive thoughts about something)
Daydreaming, fantasying about something specific (including imagining how a future event will go)
Thinking about what you want to do in the future
Recalling memories of the past
Imagining a conversation with someone else
Musing (thoughts move from topic to topic with no attempt to direct them)
Bored/Tired; difficulty in concentrating on anything
Not thinking about anything
Engaged in meditation
Conversation with someone
Thought Supression
Not conscious (e.g., sleeping)
Other (describe)