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RUNNING HEAD: Individual differences in Mind wandering and self-consciousness

Individual differences in Self-consciousness and Mind wandering: Further evidence for a
dissociation between Spontaneous and Deliberate Mind wandering

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Abstract

Recent research on individual differences in MW has consistently shown that spontaneous and deliberate MW can be distinguished being differentially associated with a number of psychological traits. The present study aimed to further investigate this distinction by investigating the associations between the two types of MW and two dispositional sub-types of self-consciousness, namely, self-rumination and self-reflection. Specifically, we specified a structural equation model in order to test the hypotheses that (1) self-rumination predicts spontaneous mind-wandering over and above neuroticism, and (2) self-reflection predicts deliberate mind-wandering over and above need for cognition (i.e., the tendency for an individual to engage in and enjoy thinking). Data were collected on 252 online participants. We found that while the spontaneous and deliberate MW were positively associated with each other, spontaneous MW was uniquely positively predicted by self-rumination, over and above neuroticism, whereas deliberate MW was uniquely positively predicted by self-reflection, over and above need for cognition. These results provide further support for the distinction between the two types of MW and suggest specific motivational dispositions for doing spontaneous and deliberate MW.

Key-words: mind wandering, self-consciousness, spontaneous mind wandering, deliberate mind wandering, self-rumination, self-reflection; neuroticism

1. Introduction

At times we can all find our attention drifting away from an ongoing task (e.g. reading a book or attending a lecture) towards self-generated, personal inner thoughts and feelings, unrelated to the ongoing task. We refer to this shift in the focus of attention as 'mind wandering' (MW; Smallwood & Schooler, 2015).

Converging evidence suggests that MW is a ubiquitous and pervasive phenomenon with high intra-individual stability across short and long time periods (e.g. Killingsworth & Gilbert, 2010) and its thematic content is mostly driven, directly or indirectly, by the individual's goal or current life concerns, especially when taking an appropriate action toward the goal is not possible (Klinger, 1971).

Up until recently, MW has been considered as a unitary and homogeneous class of experiences (but see Giambra, 1995, for a different approach). However, during the last few years, an increasing number of studies has demonstrated the utility of the distinction between deliberate and spontaneous experiences of MW (see for a review, Seli, Risko, Smilek, & Schacter, 2016c). In spontaneous MW, task-unrelated thoughts capture attention, triggering an uncontrolled shift from the task at hand to other trains of thoughts, whereas in deliberate MW attention is intentionally shifted from the focal task toward internal thoughts. The difference between the two kinds of MW is in the process underlying the experience of MW, whether it comes to be spontaneously or, somehow, under individual's mental control.

Several studies have shown that trait-level tendencies to mind wander spontaneously and deliberately, although positively correlated, are differentially associated with a number of psychological traits. Specifically, evidence has been reported that high trait-level tendency to spontaneous MW may reflect difficulties in controlled processing: spontaneous but not deliberate MW was found to be associated with attention-deficit/hyperactivity disorder (ADHD) symptomatology (Seli, Smallwood, Cheyne, & Smilek, 2015b), with higher reports of obsessive-

compulsive disorder (OCD) symptoms (Seli, Risko, Purdon, & Smilek, 2016a), and with self-reported fidgeting and self-reported propensity to act mindlessly (without awareness) (Carriere, Seli & Smilek, 2013). Moreover, Seli, Carriere & Smilek (2015a) have shown that spontaneous and deliberate MW had opposing unique associations with some aspects of mindfulness: specifically, rates of deliberate mind wandering uniquely and positively predicted the tendency to be non-reactive to personal inner experiences, whereas spontaneous mind wandering negatively predicted the same dimension. In a very recent study on mind wandering and creativity, Agnoli, Vannucci, Pelagatti & Corazza (in press) showed that deliberate MW positively predicted originality at a divergent thinking task (i.e. Titles task), whereas spontaneous MW was negatively associated with originality.

In the present study, we aimed to go a step further in the investigation of the two kinds of MW, by addressing the question of their association with the dimension of private self-consciousness, namely, the tendency to be aware and attend to one's inner thoughts and feelings (Fenigstein, Scheier, & Buss, 1975).

Trapnell and Campbell (1999) distinguished between the rumination and reflection subtypes of private self-consciousness, based on the motivation underlying self-consciousness. Self-rumination is a kind of maladaptive, persistent, inflexible, and inappropriate self-consciousness that is motivated by neurotic motives, such as perceived threats and losses to the self. Self-reflection is an adaptive kind of inspection of one's own thoughts and feelings motivated by curiosity or epistemic interest in the self.

Several studies have shown that high levels of self-rumination are associated with high levels of neuroticism, psychological distress, depression, unhappiness of memories, and perceived impaired interpersonal skills (Joireman, Parrott & Hammersla, 2002; Takano, Sakamoto & Tanno, 2011; Teasdale & Green, 2004). On the contrary, high levels of self-reflection are associated with high levels of need for cognition, openness to experience, happiness, empathic concern, self-assertiveness, and relationship-maintenance skills (Takano et al., 2011; Trapnell & Campbell,

1999).

Given the relevance of the self in the experience of MW and the motivational role played by the individual's goals and current concerns in stimulating MW, one might argue that individual differences in trait levels of self-consciousness should positively predict the tendency to MW in everyday-life. Specifically, on the basis of the findings reviewed above about spontaneous and deliberate MW and self-rumination and self-reflection, we hypothesise that (1) the two dispositional sub-types of self-consciousness uniquely predict the two kinds of MW, with self-rumination predicting spontaneous MW and self-reflection predicting deliberate MW; (2) the two *specific* dispositions related to self-focused attention are more efficient in predicting individual differences in spontaneous and deliberate MW compared to their related *broader* traits of neuroticism and need for cognition. This result would rule out the hypothesis that the association between spontaneous MW and self-rumination, on the one hand, and between deliberate MW and self-reflection, on the other, is spurious, i.e., due to their being different facets of neuroticism and need for cognition, respectively. Hence, showing that the two specific sub-types of self-consciousness uniquely predict the two forms of MW while controlling for the effect of their two related and broader psychological traits (neuroticism and need for cognition) would suggest for the existence of two motivationally distinct dispositions related to self-focused attention underlying spontaneous and deliberate MW.

These hypotheses were tested using a structural equation model (SEM) specifying self-rumination, self-reflection, neuroticism, and need for cognition as predictors, and spontaneous and deliberate MW as criteria. We expected to find a significant direct effect of self-rumination (but not of neuroticism) on spontaneous MW and of self-reflection (but not of need for cognition) on deliberate MW. However, given the association of neuroticism with self-rumination and of need for cognition with self-reflection, we expect that the indirect effects of these broader traits on spontaneous and deliberate MW, respectively, would be significant.

2. Method

2.1 Participants

Participants were recruited online from the general population using a snowball-like system (for a detailed description of the procedure see Section 1 of the Supplementary Materials [SM]). The final sample comprised 252 participants (Females: 69%, mean age 26.76 ± 8.67 years, range 18-65).

2.2. Measures

Mind Wandering: Spontaneous (MW-S) and *Mind Wandering: Deliberate* (MW-D; (Carriere et al., 2013; Italian version in Chiorri & Vannucci, 2017). The MW-D and the MW-S are 4-item scales that assess individual differences in trait levels of spontaneous and deliberate MW, respectively. Items are scored using 7-point, Likert-type, frequency or intensity scales and participants are asked to select the answer that most accurately reflects their everyday MW. Higher scores reflect a greater tendency to mind wander spontaneously or deliberately. Previous studies reported adequate reliability and discriminant validity of the two scales (Carriere et al., 2013; Chiorri & Vannucci, 2017).

Rumination-Reflection Questionnaire (RRQ, Trapnell & Campbell, 1999). The RRQ is a 24-item measure of self-rumination and self-reflection. The items are equally split across the two scales, with the items scored on a 5-point Likert-type scale, ranging from "strongly disagree" to "strongly agree". Previous studies have shown adequate reliability and convergent validity of the RRQ (Trapnell & Campbell, 1999). Since no validated Italian version of the RRQ was available, we developed one and tested its psychometric properties, which were found to replicate those of the original version (see the Section 2 of the SM).

Neuroticism subscale of the Big Five Inventory (BFI-N; John, Donahue, & Kentle, 1991; Italian version in Ubbiali, Chiorri, Hampton, & Donati, 2013). The BFI-N is an 8-item subscale of the BFI that assesses a range of negative affects, including anxiety, sadness, irritability, and nervous tension. Participants are asked to rate the degree to which each item applies to their personality on a

5-point, Likert-type scale. Previous studies reported adequate reliability and validity of this subscale (John, Naumann, & Soto, 2008; Ubbiali et al., 2013).

Need for Cognition Scale (NfCS; Cacioppo, Petty, & Kao, 1984; Italian version in Chiesi & Primi, 2008). The NfCS is a 18-item scale that assesses an individual's preference for engaging in effortful cognitive and intellectual task and for dealing with situations that require thinking. The responses are scored using a 5-point Likert-type scale ranging from "extremely uncharacteristic" to "extremely characteristic". Previous studies reported good reliability and construct validity (Cacioppo, Petty, & Kao, 1984; Chiesi & Primi, 2008).

3. Results

In order to test whether rumination uniquely predicted spontaneous MW and reflection uniquely predicted deliberate MW while controlling for neuroticism and need for cognition, we specified a structural equation model (SEM) using parcels as manifest indicators for predictor latent variables, while we used the original items as indicators for the criterion variables. We used item parcels for the predictors to reduce the sample size to parameter ratio, as this ratio impacts the standard errors and stability of the estimates (see Section 2 of the SM for a rationale for the use of parceling in SEM). The correlation/covariance matrix of the observed variables is reported in Section 3 of the SM.

The model had an adequate fit ($\chi^2(155) = 278.82, p < .001, CFI = .95, TLI = .93, RMSEA = .06$). Table 1 reports the regression and correlation coefficients for the latent variables. Consistent with the hypotheses, in the structural model only the regression coefficients of MW-D on Reflection and of MW-S on Rumination were statistically significant (Table 1; Figure 1).

Table 1 Standardized regression coefficients (lower triangle) and zero-order correlation coefficients (upper triangle) for the latent variables.

MWDL	MWSL	RUML	REFL	NEUL	NFCL
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MWDL		0.36***	0.00	0.26***	-0.11	0.22**
MWSL	0.40***		0.53***	0.31***	0.31***	0.19*
RUML	0.02	0.54***		0.32***	0.69***	0.02
REFL	0.30**	0.08	0.32***		0.09	0.48***
NEUL	-0.16	-0.05	0.69***	0.09		-0.16*
NFCL	-0.05	0.13	0.03	0.48***	-0.16*	

Note: MWDL: Mind Wandering: Deliberate latent variable; MWSL: Mind Wandering: Spontaneous latent variable; RUML: Rumination latent variable; REFL: Reflection latent variable; NEUL: Neuroticism latent variable; NFCL: Need for Cognition latent variable.
 *: $p < .05$; **: $p < .01$; ***: $p < .001$.

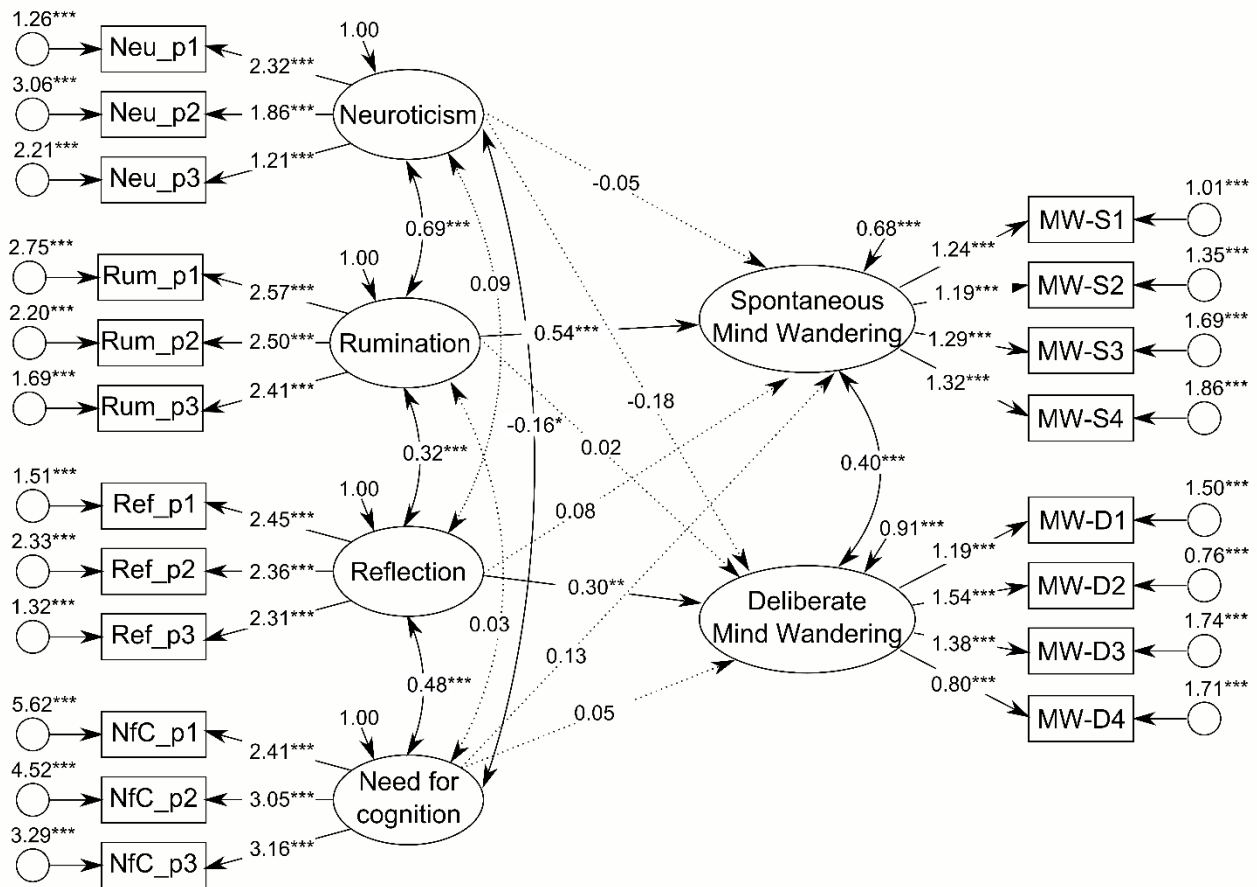


Figure 1. A structural equation model of Self-rumination (Rum), Self-reflection (Ref), neuroticism (Neu), and need for cognition (NfC) predicting spontaneous and deliberate mind wandering (MW-S and MW-D, respectively). Ellipses represent latent factors and rectangles represent manifest indicators. Manifest indicators for the predictor variables are item parcels (hence the p1-p3 notation in indicator labels), while for the criterion variables the actual items were used. Solid lines represent significant paths at $p < .05$ (*: $p < .05$, **: $p < .01$; ***: $p < .001$). Dotted lines represent nonsignificant paths. Details of parameter estimation are reported in Section 3 of the SM.

Since predictors were correlated, we also tested total and indirect effects using the INDIRECT option in MPlus. The total and total indirect effects of Neuroticism on Deliberate MW were not significant (estimate = -0.044, Standard error [SE] = 0.043, $p = .303$; and estimate = 0.049, $SE = 0.060$, $p = 0.409$, respectively). While the total effect of Need for Cognition on Spontaneous MW was significant (estimate = 0.134, $SE = 0.054$, $p = .013$), its total indirect effect was not significant (estimate = 0.073, $SE = 0.038$, $p = .058$). When we inspected specific indirect effects, none of them was statistically significant. These results suggested that Neuroticism and Need for Cognition were not significantly associated to Deliberate and Spontaneous MW, respectively, either directly or indirectly. Conversely, the total and total indirect effects of Neuroticism on Spontaneous MW were significant (estimate = 0.192, $SE = 0.054$, $p < .001$; and estimate = 0.266, $SE = 0.063$, $p < .001$, respectively). The only significant specific indirect effect was the one through Rumination (estimate = 0.214, $SE = 0.061$, $p < .001$). The total effect of Need for Cognition on Deliberate MW was not significant (estimate = 0.053, $SE = 0.049$, $p = .278$), while its total indirect effect was significant (estimate = 0.081, $SE = 0.034$, $p = .015$). The only significant specific indirect effect was the one through Reflection (estimate = 0.078, $SE = 0.032$, $p = .013$). These results suggested that while Neuroticism and Need for Cognition did not directly predict Spontaneous and Deliberate MW, respectively, when the effect of RRQ scales was partialled out, they had an indirect effect on the expected criterion variables through their association with Rumination and Reflection, respectively.

We also tested models that included age and gender as further predictors, but no significant parameter estimate was found for these variables.

4. Discussion

The aim of the present study was to investigate the relationship between spontaneous and deliberate MW and two different subtypes of private self-consciousness, namely, self-rumination and self-reflection. Self-rumination refer to the “private *self*-attentive aspect of neuroticism”

(Trapnell & Campbell, 1999, p.291), whereas self-reflection refers to a “philosophical love of *self-exploration*” (Harrington & Loffredo, 2011, p.41), that is a reflection on oneself out of epistemic curiosity.

In our study we tested the hypotheses that self-rumination uniquely predicted spontaneous MW whereas self-reflection predicted deliberate MW. We also tested the hypotheses that the two *specific* dispositions related to self-focused attention were more efficient predictors of spontaneous and deliberate MW than their related *broader* traits of neuroticism and need for cognition, respectively. Our results fully supported these hypotheses, by showing that self-rumination but not self-reflection significantly predicted spontaneous MW over and above neuroticism, whereas self-reflection but not self-rumination significantly predicted deliberate MW over and above need for cognition.

These findings have important implications for theory and research on MW. Recently, an increasing number of studies has demonstrated the practical and theoretical utility of distinguishing between spontaneous and deliberate MW (see, for a review, Seli et al., 2016b). Globally, studies on the cognitive correlates of individual differences in spontaneous and deliberate MW have demonstrated that, although positively correlated, they reflect unique, dissociable cognitive experiences, being differentially associated with several psychological dimensions (e.g. Agnoli et al., in press; Chiorri & Vannucci, 2017; Seli et al., 2015a, 2015b, 2016a). More recent studies have shown that the two types of mind-wandering are related to their corresponding state-levels when assessed in the laboratory (Seli et al., 2016b), and that they are also distinguishable in terms of their neural associates (Golchert, Smallwood, Jefferies, Seli, Hunttenburg, Liem, & Margulies, 2017).

Our results confirm the importance of distinguishing between the two kinds of MW and they go a step further by showing for the first time that individual differences in spontaneous and deliberate MW are also uniquely predicted by distinct and specific motivational dispositions related to private self-consciousness, namely self-rumination and self-reflection. Moreover, these two

distinct self-focusing tendencies were more effective in predicting the two kinds of MW compared to their broader traits of neuroticism and need for cognition.

This pattern of results clearly show a critical role of the Self and the tendency to be aware and attend to the Self in motivating the experience of MW. These findings are in line with the results of experimental and experience sampling studies in different cultures showing that a large proportion of MW is spent engaged in self-related and self-relevant thoughts (self-referential thought, e.g. Smallwood et al., 2011; Song & Wang, 2012; Vannucci, Pelagatti & Marchetti, 2017) and that MW might contribute to maintaining a sense of self-identity and continuity across time (Suddendorf & Corballis, 2007).

Moreover, at a theoretical level, the present findings are consistent with the *current-concern hypothesis* developed by Klinger (1971; 2013), which suggest that a critical reason for MW is that people are committed to unfulfilled personal goals which extend beyond the perceptual moment, referred to as current concerns. Mental life is attracted to these personal concerns, and, especially when the external world is relatively uninteresting and the circumstances are unfavorable for goal-directed behavior, the mind turns inwards, it starts wandering and the thoughts reflect the goal pursuit or associated contents. Our results suggest that the two motivations underlying self-attention, namely ruminative and reflective might affect the cognitive experience of MW, increasing the likelihood of spontaneous or deliberate MW, respectively.

When interpreting these results, we should consider some limitations of the study as well as future developments. First, our sample was recruited opportunistically from the general population using a snowball system: initially a relatively small group of participants was contacted, and these, in their turn, e-mailed or shared the link to other potential participants, giving the sampling modality a broad reach. Online social networking sites represent a promising new way to recruit participants, particularly young adults, and web-based recruitment methods have been reported previously in health research, including paid advertising and links on websites and online discussion boards (e.g. Gordon, Akers, Severson, Danaher, & Boles, 2006). Recently, Antoun ,

Zhang, Conrad, and Schober (2016) compared online recruitment strategies for convenience samples, and found that while “pull in” methods that recruit online users actively looking for paid work (MTurk workers and Craigslist users) are more cost efficient and recruit participants more committed to the survey task, “push out” methods that recruit online users engaged in other, unrelated online activities (Google AdWords and Facebook) can provide more demographically diverse samples. As shown by the descriptive statistics reported in Section 1 of the SM, we could actually recruit a demographically diverse sample. As with any convenience sample, generalizations to the broader population cannot be made, thus calling for replication studies in order to strengthen these results and make them more compelling.

Second, in the present study the sample comprises people taken from the general population. Future studies should extend this investigation to other populations of special interest for research on MW, such as elderly people and people who exhibit clinical depression. Studies on aging have shown a reduction in MW in healthy older adults compared to young adults (for a discussion, see Maillet & Schacter, 2016), with a similar trend for both spontaneous and deliberate MW (Seli et al., 2017). Future studies should investigate whether and how the patterns of association of spontaneous and deliberate MW with other characteristics, as private self-consciousness, can vary as a function of age.

Within the field of MW research, several studies have reported a positive relationship between the frequency of MW, especially past-oriented MW, and measures of negative mood and dysphoria (e.g. Poerio, Totterdell, & Miles, 2013; Smallwood & O’Connor, 2011). A recent model proposed that, in individuals who stably or transitorily experience negative affect (i.e., negative affectivity or stress), spontaneous MW could function as a precursor of major risk factors for depression (Marchetti, Koster, Klinger, & Alloy, 2016). Hence, an investigation of the association of different kinds of self-consciousness with different types of MW in dysphoric and depressed individuals would help to expand the results of this study.

Finally, in our study we entirely relied on self-report measures, which can be biased by a socially desirable response style, and measured the frequency of spontaneous and deliberate MW in everyday life. Future studies should include performance measures of MW and extend the investigation to the phenomenological aspects of spontaneous and deliberate MW, including the form and the content of the mental contents generated during MW episodes (e.g. temporal focus, affective state, self-relevance).

References

- Agnoli, S., Vannucci, M., Pelagatti, C., & Corazza, G.E. (in press). Exploring the link between mind wandering, mindfulness, and creativity: a multidimensional approach. *Creativity Research Journal*.
- Antoun, C., Zhang, C., Conrad, F.G., & Schober, M.F. (2016), Comparisons of Online Recruitment Strategies for Convenience Samples. *Field Methods*, 28, 231–246.
doi:10.1177/1525822X15603149
- Cacioppo, J. T., Petty, R. E., & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal of Personality Assessment*, 48, 306–307. doi:10.1207/s15327752jpa4803_13
- Carriere, J. S. A., Seli, P., & Smilek, D. (2013). Wandering in both mind and body: Individual differences in mind wandering and inattention predict fidgeting. *Canadian Journal of Experimental Psychology*, 67(1), 19–31. doi:10.1037/a0031438
- Chiesi, F., & Primi, C. (2008). *Le proprietà psicometriche della versione italiana della Need for Cognition Scale-Short Form* [The psychometric properties of the Italian version of the Need for Cognition Scale-Short Form]. Paper presented at the National Congress of the Italian Psychological Association, Padua, 18-20 September.
- Chiorri, C., & Vannucci, M. (2017). Replicability of the psychometric properties of trait-levels measures of spontaneous and deliberate mind wandering. *European Journal of Psychological Assessment*. Advance online publication. doi:10.1027/1015-5759/a000422

- Fenigstein, A., Scheier, M. F., & Buss, A. (1975). Public and private self-consciousness. Assessment and theory. *Journal of Consulting and Clinical Psychology, 43*, 522–527. doi:10.1037/h0076760
- Giambra, L. M. (1995). A laboratory method for investigating influences on switching attention to task-unrelated imagery and thought. *Consciousness and Cognition, 4*(1), 1–21. doi:10.1006/ccog.1995.1001
- Golchert, J., Smallwood, J., Jefferies, E., Seli, P., Huntenburg, J. M., Liem, F., & Margulies, D. S. (2017). Individual variation in intentionality in the mind-wandering state is reflected in the integration of the default-mode, fronto-parietal, and limbic networks. *NeuroImage, 146*, 226–235. doi:10.1016/j.neuroimage.2016.11.025
- Gordon, J. S., Akers, L., Severson, H. H., Danaher, B. G., & Boles, S. M. (2006). Successful participant recruitment strategies for an online smokeless tobacco cessation program. *Nicotine and Tobacco Research, 8*(1), 35–41. doi:10.1080/14622200601039014.
- Harrington, R., & Loffredo, D.A. (2010). Insight, Rumination, and Self-Reflection as Predictors of Well-Being. *The journal of Psychology: Interdisciplinary and Applied, 145*, 39–57. doi:10.1080/00223980.2010.528072
- Killingsworth, M. A., & Gilbert, D. T. (2010). A wandering mind is an unhappy mind. *Science, 330*, 932. doi:10.1126/science.1192439
- Klinger, E. (1971). *Structure and functions of fantasy*. New York, NY: John Wiley.
- Klinger, E. (2013). Goal commitments and the content of thoughts and dreams: Basic principles. *Frontiers in Psychology, 4*, 415. doi:10.3389/fpsyg.2013.00415.
- John, O. P., Donahue, E. M., & Kentle, R. L. (1991). *The Big Five Inventory - Versions 4a and 5*. Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research.
- John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative Big Five trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, &

L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 114–158).
New York, NY: Guilford.

Joireman, J. A., Parrott, L., & Hammersla, J. (2002). Empathy and the self-absorption paradox: Support for the distinction between self-rumination and self-reflection. *Self and Identity*, *1*, 53–65. doi:10.1080/13576500444000038

Maillet, D., & Schacter, D. L. (2016). From mind wandering to involuntary retrieval: Age-related differences in spontaneous cognitive processes. *Neuropsychologia*, *80*, 142–156. doi:10.1016/j.neuropsychologia.2015.11.017

Marchetti, I., Koster, E. H. W., Klinger, E., & Alloy, L. B. (2016). Spontaneous thought and vulnerability to mood disorders: The dark side of the wandering mind. *Clinical Psychological Science*, *4*(5), 835–857. doi:10.1177/2167702615622383

Poerio, G., Totterdell, P., & Miles, E. (2013). Mind-wandering and negative mood: does one thing really lead to another? *Consciousness and Cognition*, *22*, 1412–1421. doi:10.1016/j.concog.2013.09.012.

Seli, P., Carriere, J. S. A., & Smilek D. (2015a). Not all mind wandering is created equal: Dissociating deliberate from spontaneous mind wandering. *Psychological Research*, *79*, 750–758. doi:10.1007/s00426-014-0617-x

Seli, P., Maillet, D., Smilek, D., Oakman, J.M., & Schacter, D.L. (2017). Cognitive aging and the distinction between intentional and unintentional mind wandering. *Psychology and Aging*. Advance online publication. <http://dx.doi.org/10.1037/pag0000172>

Seli, P., Risko, E. F., Purdon, C., & Smilek, D. (2016a). Intrusive thoughts: linking spontaneous mind wandering and OCD symptomatology. *Psychological Research*, *81*, 392–398. doi:10.1007/s00426-016-0756-3

Seli, P., Risko, E.F., & Smilek, D. (2016b). Assessing the associations among trait and state levels of deliberate and spontaneous mind wandering. *Consciousness & Cognition*, *41*, 50–56. doi:10.1016/j.concog.2016.02.002.

- Seli P., Risko E. F., Smilek D., & Schacter, D. L. (2016c). Mind-wandering with and without intention. *Trends in Cognitive Science*, *20*, 605–617. doi:10.1016/j.tics.2016.05.010
- Seli, P., Smallwood, J., Cheyne, J. A., & Smilek, D. (2015b). On the relation of mind wandering and ADHD symptomatology. *Psychonomic Bulletin & Review*, *22*(3), 629–636. doi:10.3758/s13423-014-0793-0
- Smallwood, J., & Schooler, J. W. (2015). The science of mind wandering: Empirically navigating the stream of consciousness. *Annual Review of Psychology*, *66*(1), 487–518. doi:10.1146/annurev-psych-010814-015331
- Smallwood, J., & O'Connor, R. C. (2011). Imprisoned by the past: Unhappy moods lead to a retrospective bias to mind wandering. *Cognition and Emotion*, *25*(8), 1481–1490. doi:10.1080/02699931.2010.545263
- Smallwood, J., Schooler, J.W., Turk, D.J., Cunningham, S.J., Burns, P., & Macrae, C.N. (2011). Self-reflection and the temporal focus of the wandering mind. *Consciousness and Cognition*, *20*, 1120–1126. doi:10.1016/j.concog.2010.12.017
- Song, X., & Wang, X. (2012). Mind wandering in Chinese daily lives – An experience sampling study. *PLoS ONE*, *7*(9), e44423. doi:10.1371/journal.pone.0044423
- Suddendorf, T., & Corballis, M. C. (2007). The evolution of foresight: What is mental time travel and is it unique to humans? *Behavioral and Brain Sciences*, *30*, 299–351. doi:10.1017/S0140525X07001975
- Trapnell, P. D., & Campbell, J. D. (1999). Private self-consciousness and the five-factor model of personality: Distinguishing rumination from reflection. *Journal of Personality and Social Psychology*, *76*(2), 284–304. doi:10.1037/0022-3514.76.2.284
- Takano, K., Sakamoto, S., & Tanno, Y. (2011). Ruminative and reflective forms of self-focus; their relationships with interpersonal skills and emotional reactivity under interpersonal stress. *Personality and Individual Differences*, *51*, 515–520. doi:10.1016/j.paid.2011.05.010
- Teasdale, J. D., & Green, H. A. C. (2004). Ruminative self-focus and autobiographical memory.

Personality and Individual Differences, 36, 1933–1943. doi:10.1016/j.paid.2003.08.022

Ubbiali, A., Chiorri, C., Hampton, P., & Donati, D. (2013). Psychometric properties of the Italian adaptation of the Big Five Inventory (BFI). *Bollettino di Psicologia Applicata*, 266, 37–48.

Vannucci, M., Pelagatti, C., & Marchetti, I. (2017). Manipulating cues in mind wandering: Verbal cues affect the frequency and the temporal focus of mind wandering. *Consciousness and Cognition*, 53, 61–69. doi:10.1016/j.concog.2017.06.004

Supplementary materials for the paper "Individual differences in Self-consciousness and Mind wandering: Further evidence for a dissociation between Spontaneous and Deliberate Mind wandering"

1. Recruitment procedure

Initially, a starter sample of participants was recruited through authors' and their assistants' e-mail and social network contacts. The contacts received an e-mail or message invitation that included a short description of the study, the link to the website (which was created using the Limesurvey platform - www.limesurvey.com), and the request to forward the link to their e-mail and social network contacts. Once the potential participant was connected to the website, she/he found a cover letter that briefly explained that the aim of the study was to investigate individual differences in thoughts and affect; that participation was anonymous and voluntary, that if she/he decided to participate or not to participate there would have been no loss of benefits to which she/he was otherwise entitled; that she/he could skip any question or she/he could decide to stop participating without consequences; that the results would be reported in aggregate form only, that she/he could not be identified individually; and that if she/he decided to continue she/he was implicitly giving his/her consent to participate in the study. After the cover letter, a form asking for basic demographic characteristics (age, gender, educational level) was presented. All the measures described in the manuscript were administered in a random order generated by the software.

A total of 319 contacts with the website were recorded, but 43 potential participants did not answer to any question. Of the remaining 276 participants, we decided to exclude further 24 participants that reported having a background in psychology or were psychology students. Other details about background characteristics of the final group of 252 participants whose data were used in this study are reported in Table 1.1, Table 1.2, and Table 1.3.

Table 1.1 Distribution of educational level of the 252 participants

Category	Frequency	Proportion
Secondary school (8 years)	7	.03
Vocational degree (10 years)	11	.04
High school degree (13 years)	137	.54
2-year bachelor degree (15 years)	6	.02
3-year bachelor degree (16 years)	57	.23
Master degree (18 years)	28	.11
PhD or other post-lauream title (21 years)	6	.02
Total	252	1.00

Table 1.2 Distribution of relationship status of the 252 participants

Category	Frequency	Proportion
Single	105	.42
In a relationship	95	.38
Coliving	33	.13
Married	16	.06
Divorced	3	.01
Total	252	1.00

Table 1.3 Distribution of occupational status of the 252 participants

Category	Frequency	Proportion
Professional	13	.05
Employee	72	.29
Unoccupied	29	.12
Housewife	2	.01
Student	131	.52
Retired	3	.01
Clergy	2	.01
Total	252	1.00

2. A rationale for the use of parceling in structural equation modeling

The specification of a structural equation model (SEM) allows for the estimation and testing of relationships among psychological, latent constructs that are operationalized through manifest indicators such as test/questionnaire items. Compared with other multivariate models such as multivariate regression or path analysis, where constructs may be represented with only one measure and measurement error is not modelled (thus giving rise to issues such as attenuation of correlations), SEM allows for the use of multiple measures to represent constructs and addresses the issue of measure-specific error by including it in the model. Scores on the latent variables are thus more accurate as they are purged from measurement error and, consequently, relationships among them can be more reliably estimated (e.g., MacCallum & Austin, 2000).

However, if we specified the measurement models for all the latent constructs using ordinal items as manifest indicators, we would have a large number of parameters (321) to be estimated with respect to the sample size. One way to address this issue is the use of item parcels, i.e., combinations (sum or average) of two or more items that are used as the manifest indicators of latent constructs. There is an ongoing debate about the adequacy of the use of parcels in SEM (see e.g., Little, Rhemtulla, Gibson, & Schoemann, 2013, and Marsh et al., 2013), and some authors concluded that "no absolute pro or con stance is warranted" (Little et al., 2013, p. 285). Little, Cunningham, Shahar, and Widaman (2002) reported that parceling is inappropriate when the focus of the analysis is to understand the exact relations among the individual items comprising the measured variables, since missing a double loading or correlated residual at the item level would reflect a failure to understand fully the pattern of observed data. This is typically the case of measurement models like the one we tested in Section 4 of these Supplementary Materials. However, when the focus is principally on the relations among latent variables, as it was case of the SEM described in the manuscript, item indicators are merely tools that allow one to build a measurement model for a latent construct, and in such circumstances parceling is more strongly warranted (Little et al., 2002). We thus constructed three parcels per construct using random

assignment of items, except for the MW-D and the MW-S, where we used the raw item scores (the 7-point answer scales offered enough variability to consider the item scores as continuous). Parcels were computed as follows.

Rumination subscale

$$\text{RUM1} = \text{RRQ01} + \text{RRQ03} + \text{RRQ04} + \text{RRQ06}$$

$$\text{RUM2} = \text{RRQ02} + \text{RRQ09} + \text{RRQ11} + \text{RRQ12}$$

$$\text{RUM3} = \text{RRQ05} + \text{RRQ07} + \text{RRQ08} + \text{RRQ10}$$

Reflection subscale:

$$\text{REF1} = \text{RRQ14} + \text{RRQ20} + \text{RRQ22} + \text{RRQ23}$$

$$\text{REF2} = \text{RRQ15} + \text{RRQ19} + \text{RRQ21} + \text{RRQ24}$$

$$\text{REF3} = \text{RRQ13} + \text{RRQ16} + \text{RRQ17} + \text{RRQ18}$$

Neuroticism subscale of the Big Five Inventory:

$$\text{NEU1} = \text{BFIN02} + \text{BFIN04} + \text{BFIN06}$$

$$\text{NEU2} = \text{BFIN01} + \text{BFIN03} + \text{BFIN05}$$

$$\text{NEU3} = \text{BFIN07} + \text{BFIN08}$$

Need for Cognition scale:

$$\text{NFC1} = \text{NFC03} + \text{NFC08} + \text{NFC09} + \text{NFC10} + \text{NFC11} + \text{NFC16}$$

$$\text{NFC2} = \text{NFC02} + \text{NFC05} + \text{NFC13} + \text{NFC14} + \text{NFC15} + \text{NFC17}$$

$$\text{NFC3} = \text{NFC01} + \text{NFC04} + \text{NFC06} + \text{NFC07} + \text{NFC12} + \text{NFC18}$$

3. Details of results

Table 3.1 Variances (main diagonal), covariances (upper triangle), correlations (lower triangle), and mean scores (bottom line) of observed variables in this study ($n = 252$)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. MWD01	2.91	1.90	1.43	0.93	0.77	0.80	0.58	0.54	0.80	0.21	0.07	0.97	1.04	0.74	-0.01	0.07	-0.05	0.55	0.30	0.51
2. MWD02	0.63	3.12	2.15	1.09	0.51	0.66	0.29	0.58	-0.15	-0.30	-0.27	1.01	1.09	0.87	-0.64	-0.37	-0.33	0.24	0.94	0.71
3. MWD03	0.44	0.64	3.63	1.35	0.73	0.79	0.30	0.82	0.28	0.22	0.03	0.28	0.78	0.62	-0.18	-0.09	-0.37	-0.56	0.36	-0.03
4. MWD04	0.36	0.40	0.46	2.35	0.62	0.69	0.64	0.68	0.23	0.38	0.05	0.68	0.92	0.59	-0.01	0.22	0.15	0.22	0.44	0.35
5. MWS01	0.28	0.18	0.24	0.25	2.55	1.38	1.52	1.73	1.92	1.90	1.71	1.22	1.24	1.19	0.82	0.81	0.26	0.27	0.91	1.51
6. MWS02	0.28	0.23	0.25	0.27	0.52	2.76	1.82	1.37	1.54	1.77	1.38	1.10	0.78	0.80	0.46	0.51	0.44	0.00	0.71	1.31
7. MWS03	0.19	0.09	0.09	0.23	0.52	0.60	3.35	1.77	1.35	1.44	1.13	1.08	0.47	0.72	0.59	0.79	0.62	-0.42	0.60	0.92
8. MWS04	0.17	0.17	0.23	0.24	0.57	0.43	0.51	3.62	2.16	2.18	1.76	0.54	0.25	0.61	1.70	1.35	0.84	-1.04	0.11	0.33
9. RUM1	0.15	-0.03	0.05	0.05	0.39	0.30	0.24	0.37	9.37	6.42	6.24	1.96	2.23	2.02	4.11	3.63	1.73	-1.43	-0.30	1.42
10. RUM2	0.04	-0.06	0.04	0.09	0.41	0.37	0.27	0.39	0.72	8.49	6.06	1.53	1.66	1.44	3.96	3.49	2.06	-1.47	-0.65	1.49
11. RUM3	0.02	-0.06	0.01	0.01	0.39	0.30	0.23	0.34	0.74	0.76	7.53	1.88	2.13	1.99	3.71	3.46	1.81	-1.06	-0.84	1.10
12. REF1	0.21	0.21	0.05	0.16	0.28	0.24	0.22	0.10	0.23	0.19	0.25	7.52	5.70	5.70	0.23	0.78	0.20	2.92	3.37	4.48
13. REF2	0.22	0.22	0.15	0.21	0.28	0.17	0.09	0.05	0.26	0.20	0.28	0.74	7.89	5.50	0.34	0.85	-0.04	2.71	2.98	4.13
14. REF3	0.17	0.19	0.13	0.15	0.29	0.19	0.15	0.12	0.26	0.19	0.28	0.81	0.76	6.68	0.43	1.13	0.10	2.15	2.36	3.60
15. NEU1	0.00	-0.14	-0.04	0.00	0.20	0.11	0.13	0.35	0.52	0.53	0.53	0.03	0.05	0.07	6.63	4.27	2.87	-1.73	-2.06	-0.17
16. NEU2	0.02	-0.08	-0.02	0.06	0.20	0.12	0.17	0.28	0.47	0.47	0.50	0.11	0.12	0.17	0.65	6.50	2.07	-1.54	-1.49	-0.25
17. NEU3	-0.02	-0.10	-0.10	0.05	0.08	0.14	0.18	0.23	0.30	0.37	0.34	0.04	-0.01	0.02	0.58	0.42	3.66	-0.76	-1.33	-0.24
18. NFC1	0.10	0.04	-0.09	0.04	0.05	0.00	-0.07	-0.16	-0.14	-0.15	-0.11	0.32	0.29	0.25	-0.20	-0.18	-0.12	11.43	7.47	7.54
19. NFC2	0.05	0.14	0.05	0.08	0.15	0.12	0.09	0.02	-0.03	-0.06	-0.08	0.33	0.29	0.25	-0.22	-0.16	-0.19	0.59	13.83	9.62
20. NFC3	0.08	0.11	-0.01	0.06	0.26	0.22	0.14	0.05	0.13	0.14	0.11	0.45	0.40	0.38	-0.02	-0.03	-0.04	0.61	0.71	13.24
Mean	4.50	4.17	4.45	5.06	4.57	4.82	3.74	4.50	14.34	13.97	15.79	14.63	13.74	14.62	10.36	9.29	6.15	20.83	20.22	22.04

Note: MWD01-MWD04: items from the Mind Wandering: Deliberate scale; MWS01-MWS04: items from the Mind Wandering: Spontaneous scale; RUM1-RUM3: parcels from the Rumination and Reflection Questionnaire (RRQ), Rumination subscale; REF1-REF3: parcels from the Rumination and Reflection Questionnaire (RRQ), Reflection subscale; NEU1-NEU3: parcels from the Neuroticism subscale of the Big Five Inventory; NFC1-NFC3: parcels from the Need for Cognition scale.

Table 3.2 Parameter estimates for the measurement models

Variable	Estimates		RV	R ²	Int
	Raw	Std			
MWDL	1.29***	0.91***		0.09*	
MWD01	1.00	1.19***	1.50***	0.49***	4.50***
MWD02	1.29***	1.54***	0.76***	0.76***	4.17***
MWD03	1.16***	1.38***	1.74***	0.52***	4.46***
MWD04	0.67***	0.80***	1.71***	0.27***	5.06***
MWSL	1.05***	0.68***		0.32***	
MWS01	1.00	1.24***	1.01***	0.60***	4.57***
MWS02	0.96***	1.19***	1.35***	0.51***	4.82***
MWS03	1.04***	1.29***	1.69***	0.50***	3.73***
MWS04	1.06***	1.32***	1.86***	0.48***	4.49***
RUML	6.62***	1.00			
RUM1	1.00	2.57***	2.75***	0.71***	14.32***
RUM2	0.97***	2.50***	2.20***	0.74***	13.96***
RUM3	0.94***	2.41***	1.69***	0.78***	15.78***
REFL	6.00***	1.00			
REF1	1.00	2.45***	1.51***	0.80***	14.64***
REF2	0.96***	2.36***	2.33***	0.71***	13.73***
REF3	0.94***	2.31***	1.32***	0.80***	14.63***
NEUL	5.37***	1.00			
NEU1	1.00	2.32***	1.26***	0.81***	10.36***
NEU2	0.80***	1.86***	3.06***	0.53***	9.29***
NEU3	0.52***	1.21***	2.21***	0.40***	6.15***
NFCL	5.81***	1.00			
NFC1	1.00	2.41***	5.62***	0.51***	20.81***
NFC2	1.27***	3.05***	4.52***	0.67***	20.20***
NFC3	1.31***	3.16***	3.29***	0.75***	22.03***

Note: Bolded values indicate results for latent variables; Values for latent variables in the first two columns are variances; Std: standardized; RV: residual variance; R²: R-square; Int: intercept; MWDL: Mind Wandering: Deliberate latent variable; MWD01-MWD04: items from the Mind Wandering: Deliberate scale; MWSL: Mind Wandering: Spontaneous latent variable; MWS01-MWS04: items from the Mind Wandering: Spontaneous scale; RUML: Rumination latent variable; RUM1-RUM3: parcels from the Rumination and Reflection Questionnaire (RRQ), Rumination subscale; REFL: Reflection latent variable; REF1-REF3: parcels from the Rumination and Reflection Questionnaire (RRQ), Reflection subscale; NEUL: Neuroticism latent variable; NEU1-NEU3: parcels from the Neuroticism subscale of the Big Five Inventory; NFCL: Need for Cognition latent variable; NFC1-NFC3: parcels from the Need for Cognition scale.

*: $p < .05$; **: $p < .01$; ***: $p < .001$;

4. Adaptation of the RRQ in Italian and its psychometric properties

Since no validated Italian version of the RRQ was available, we developed one and tested its psychometric properties, namely, factor structure and internal consistency, test-retest reliability, and construct validity of the scales. Consistent with the seminal study by Trapnell and Campbell (1999), we expected to replicate the two-factor structure of the RRQ, with minimally correlated factors ($r = .22$ in Trapnell & Campbell, 1999, p. 293), and to find high internal consistency of the scales (Cronbach's $\alpha \geq .90$ in Trapnell & Campbell, 1999, p. 294). To the best of our knowledge, no data on the test-retest reliability of the RRQ has been reported in the literature. We thus considered as an adequate level of retest reliability the commonly used .70 threshold (e.g., Nunnally & Bernstein, 1994). Besides, since we used community participants, we did not expect mean scores to change in the 3-week interval between the administrations of the questionnaire. As a test of construct validity of the two scales, we expected that the rumination scale was more strongly associated with measures of worry and neuroticism than the reflection scale, and that the reflection scale was more strongly associated with measures of openness to experience than the rumination subscale (Trapnell & Campbell, 1999, p. 296).

4.1. Translation of the RRQ

The RRQ was first translated into Italian through a forward- and back-translation procedure (Behling & Law 2000). The authors and three PhD students and post-doc in psychology independently translated the English version of the questionnaire into Italian. After consensus among translators was achieved, an Italian-English bilingual speaker, blind to the original version, translated this preliminary version back into English. Discrepancies emerging from this back-translation and other issues about the adaptation into Italian were discussed, taking

into account the meaning of the original English items and the consistency of the translation with the content domain of the constructs to be measured.

After the final version of the items was drafted, the newly developed Italian version was administered to ten naïve individuals in order to check for comprehension and readability of items. These characteristics were scored using a 10-point scale, with higher scores reflecting more positive evaluations. The mean scores were all higher than 9.

4.2. Participants

Two undergraduate psychology students were asked to recruit participants from their relatives, friends, and acquaintances as part of their research-training project. They recruited a total 88 participants (Females: 58%, mean age 31.47 ± 15.00 , range 18-61). All participants had at least a high-school diploma and did not report to have been diagnosed with a psychological disorder and to have undergone a psychotherapy.

4.3. Measures

Participants completed the Rumination-Reflection Questionnaire (as described in the paper), the Penn State Worry Questionnaire, and the Big Five Inventory.

Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990, Italian version in Morani, Pricci, & Sanavio, 1999). The PSWQ is a 16-item inventory designed to assess trait worry, namely, “a chain of thoughts and images, negatively affect-laden and relatively uncontrollable; it represents an attempt to engage in mental problem-solving on an issue whose outcome is uncertain but contains the possibility of one or more negative outcomes” (Borkovec, Robinson, Pruzinsky, & DePree, 1983, p. 10). Items describe the generality, excessiveness, and uncontrollability of worry and participants are asked to rate the extent to which each item is typical of them (from 1 = ‘not at all typical of me’ to 5 =

‘very typical of me’). The scale has shown good psychometric properties, and previous research indicates that the PSWQ can adequately distinguish worry from obsessions (e.g., Burns, Keortge, Formea, & Sternberger, 1996). The Italian version of the PSWQ (Morani et al., 1999) has been shown to have adequate internal consistency ($\alpha = .85$) and construct validity with respect to the Worry Domain Questionnaire (Eysenck, 1984).

Big Five Inventory (BFI; John, Donahue, & Kentle, 1991; Italian version in Ubbiali, Chiorri, Hampton, & Donati, 2013). The BFI is a 44-item measure of the Big Five (Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness). A common stem ("I see myself as someone who...") is used for all items, which are made up of one or two prototypical trait adjectives known to be prototypical markers of neuroticism and used as the item core, with added elaborative, clarifying, or contextual information. Participants are asked to rate the degree to which each item applies to their personality on a 5-point, Likert-type scale. Previous studies reported adequate reliability and validity of this subscale (John, Naumann, & Soto, 2009; Ubbiali et al., 2013).

4.4. Procedure

All participants were tested individually and anonymously at the premises of a psychology department in northwestern Italy. The scales making up the battery were administered in counterbalanced fashion to control for order and sequence effects. Participants took approximately 20-30 minutes to complete the battery. All participants were treated in accordance with the Ethical Principles of Psychologists and Code of Conduct (American Psychological Association, 2010). In order to be included in the study, participants had to report to be at least 18 years old. They did not receive any compensation for their participation. In order to match Time 1 and Time 2 data for the RRQ, they were asked to generate an alphanumeric code.

4.5. Results

4.5.1. Exploratory Factor Analysis and Test-retest reliability of RRQ

The sample size ($n = 88$) was too small to perform a confirmatory factor analysis, but, according to de Winter, Dodou, and Wieringa (2009, Table 2, p. 155), with expected factor loadings in the .60s (as from Trapnell & Campbell, Table 3, p. 293), 2 factors, and 24 items, it was adequate for exploratory factor analysis.

We addressed the issue of determining the number of factors to extract performing dimensionality analyses on the correlation matrix of RRQ items through Scree-plot (Cattell, 1966), Minimum Average Partial Correlation statistic (MAP; Velicer, 1976), and Parallel Analysis (PA, Horn, 1965). On the basis of the recommendations of Buja and Eyuboglu (1992), we performed PA on 1000 random correlation matrices obtained through permutation of the raw data, and following Longman, Cota, Holden, and Fekken (1989) we considered the 95th percentile eigenvalues. In order to take into account the ordinal nature of item scores, these analyses were performed on the polychoric correlation matrix using the R libraries *psych* (Revelle, 2015) and *hornpa* (Huang, 2015).

The Scree-plot suggested that eigenvalues began to level off after two factors (First ten observed eigenvalues: 5.99, 4.14, 1.50, 1.27, 1.11, 1.01, 1.00, 0.84, 0.77, 0.76). PA suggested to extract two factors, as only the first two observed eigenvalues were higher than the corresponding randomly generated ones (First ten random eigenvalues: 2.29, 2.04, 1.87, 1.74, 1.61, 1.51, 1.41, 1.32, 1.23, 1.16). MAP reached its lowest value at two factors (.0457, .0174, .0191, .0208, .0233, .0263, .0298, .0331). Taken together, these results converged to suggest to perform an EFA with the extraction of two factors. This solution explained the 42% of total variance and All the items had their primary loading on the expected factor (Table 1).

Table 1 Results of exploratory factor analysis on the Italian version of the Rumination and Reflection Questionnaire ($n = 88$). Bolded coefficients are expected loadings.

Item	F1	F2
RRQ01	.62	-.36
RRQ02	.43	.04
RRQ03	.55	.08
RRQ04	.81	-.09
RRQ05	.75	-.09
RRQ06	.69	.01
RRQ07	.58	.09
RRQ08	.55	.23
RRQ09	.45	.19
RRQ10	.56	-.04
RRQ11	.65	-.11
RRQ12	.69	-.03
RRQ13	-.09	.67
RRQ14	.12	.59
RRQ15	-.21	.76
RRQ16	.04	.60
RRQ17	.17	.58
RRQ18	.08	.38
RRQ19	-.12	.43
RRQ20	.18	.52
RRQ21	.20	.59
RRQ22	.07	.56
RRQ23	-.12	.48
RRQ24	-.14	.53

The first factor grouped rumination items and the second reflection items. Primary loadings ranged from .43 to .81 (median = .60) in the former factor, and from .38 to .76 (median = .56) in the latter. The only substantial (i.e., larger than $|\lambda_{30}|$) cross-loading was the one of item 1. However, the difference with the primary loading was large enough to rule out the possibility that this item had a factorial complexity substantially larger than 1. The model-estimated factor correlation was .21. The Cronbach's alphas of the two scales are reported in Table 2 and are both well above .80. These results almost perfectly replicated the results reported by Trapnell and Campbell (1999) in their seminal paper on the RRQ, and supported the adequacy of the measurement model of Italian adaptation of the questionnaire.

In order to test the stability of RRQ scores in likely absence of true change, participants completed again the RRQ after 3 weeks. Intraclass correlation coefficients (ICCs, Single measure values, two-way mixed model, absolute agreement, Wong & McGraw, 1996) were computed. The ICC for rumination was .76 (95% confidence interval: .66-.84), while the ICC for reflection was .78 (.69-.85). We also performed paired-samples *t*-tests to investigate the change in mean scores. The difference was not significant in either scale (Rumination: Time 1 41.84±8.85, Time 2: 40.84±7.86, $t(87) = 1.63$, $p = .106$; Reflection: Time 1 42.82±7.63, Time 2: 41.91±7.04, $t(87) = 1.78$, $p = .078$). Summarizing, these results supported the temporal stability of the RRQ scores.

Table 2 Cronbach's alphas, descriptive statistics, correlations of the scores on the Italian version of the Rumination and Reflection Questionnaire with measures of worry and personality, and results of the statistical tests for the comparisons of dependent correlations.

<i>Scale</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>Z</i>
1. RRQ-RUM	<i>.89</i>								-
2. RRQ-REF	<i>.12</i>	<i>.85</i>							-
3. PSWQ	<i>.59***</i>	<i>-.02</i>	<i>.90</i>						<i>4.59***</i>
4. BFI-E	<i>-.29*</i>	<i>.02</i>	<i>-.20</i>	<i>.85</i>					<i>1.99</i>
5. BFI-A	<i>-.35**</i>	<i>.11</i>	<i>-.21</i>	<i>.24</i>	<i>.78</i>				<i>1.77</i>
6. BFIC	<i>-.22</i>	<i>.10</i>	<i>-.04</i>	<i>.20</i>	<i>.11</i>	<i>.83</i>			<i>0.84</i>
7. BFI-N	<i>.49***</i>	<i>-.11</i>	<i>.70***</i>	<i>-.20</i>	<i>-.20</i>	<i>-.20</i>	<i>.81</i>		<i>2.87*</i>
8. BFI-O	<i>-.05</i>	<i>.37**</i>	<i>-.15</i>	<i>.40***</i>	<i>.10</i>	<i>.05</i>	<i>-.06</i>	<i>.86</i>	<i>-2.32*</i>
M	<i>41.84</i>	<i>42.82</i>	<i>49.90</i>	<i>26.35</i>	<i>31.44</i>	<i>31.16</i>	<i>26.34</i>	<i>35.91</i>	
SD	<i>8.85</i>	<i>7.63</i>	<i>12.40</i>	<i>5.92</i>	<i>6.32</i>	<i>6.59</i>	<i>6.14</i>	<i>7.66</i>	

Note. Italicized values on the main diagonal are Cronbach's alphas; *Z*: *Z*-value of the test for dependent correlations; RRQ: Rumination and Reflection Questionnaire; RUM: Rumination; REF: Reflection; PSWQ: Penn State Worry Questionnaire; BFI: Big Five Inventory; E: Extraversion; A: Agreeableness; C: Conscientiousness; N: Neuroticism; O: Openness. ***: $p < .001$; **: $p < .01$; *: $p < .05$. All p -values are corrected for multiple comparisons using the Benjamini and Hochberg's (1995) procedure.

1 4.5.2. *Construct validity of RRQ*

2 Correlations of observed scores of the RRQ with all the other measures used to test its
3 construct validity are reported in Table 2. The two RRQ scores showed the expected pattern
4 of significance of the correlations with the other measures: rumination was significantly
5 correlated with worry and neuroticism, while reflection was significantly associated with
6 openness to experience. In order to formally test whether the correlation of an RRQ scale with
7 a target measure was stronger than that of the other RRQ scale, we used the test for the
8 comparison of dependent correlations (Meng, Rosenthal, & Rubin, 1992; Westen &
9 Rosenthal, 2003). Results are reported in the leftmost column of Table 2 and are consistent
10 with the hypotheses. Taken together, these results seemed to support the discriminant validity
11 of the RRQ scales.

12

13 4.5.3. *Confirmatory factor analyses*

14 Using data from the main study reported in the paper, we also tested through confirmatory
15 factor analysis (CFA) a set of alternative measurement models (the expected two-correlated-
16 factor model and the more parsimonious one-factor and two-independent-factor models).
17 These analyses were performed in Mplus 7.0 (Muthén & Muthén, 1998-2012) using the mean
18 and variance adjusted weighted least squares estimator (WLSMV, Muthén, du Toit, & Spisic,
19 1997) to take into account the ordinal nature of the item scores. The fit of the model was
20 evaluated using the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), and the Root
21 Mean Square Error of Approximation (RMSEA). Following Marsh, Hau, and Wen (2004), we
22 considered values higher than .90 and .95 as indices of acceptable and optimal fit,
23 respectively, for TLI and CFI, and values smaller than .08 and .06 as indices of acceptable
24 and optimal fit, respectively, for RMSEA.

1 The two-correlated-factor model showed an acceptable fit ($\chi^2(251) = 607.49, p < .001,$
2 CFI = .92, TLI = .91, RMSEA = .08), while the one-factor ($\chi^2(252) = 1897.04, p < .001,$ CFI
3 = .62, TLI = .58, RMSEA = .17) and the two-uncorrelated-factor models did not ($\chi^2(252) =$
4 $773.39, p < .001,$ CFI = .88, TLI = .87, RMSEA = .10). The factor correlation estimate was
5 indicative of a significant moderate positive association between the factors ($r = .34, p <$
6 $.001$). These results suggested that the two-correlated-factor model is an adequate and
7 replicable measurement model for the Italian version of the RRQ.

8

9 **5. References**

- 10 American Psychological Association. (2010). *Ethical principles of psychologists and code of*
11 *conduct*. Retrieved from <http://apa.org/ethics/code/index.aspx>
- 12 Behling, O., & Law, K. S. (2000). *Translating questionnaires and other research*
13 *instruments: Problems and solutions*. Thousand Oaks, CA: Sage.
- 14 Benjamini, Y., & Hochberg, Y. (1995). Controlling the false discovery rate: A practical and
15 powerful approach to multiple testing. *Journal of the Royal Statistical Society. Series B.,*
16 *57(1), 289–300.* <https://doi.org/10.2307/2346101>
- 17 Borkovec, T. D., Robinson, E., Pruzinsky, T., & DePree, J. A. (1983). Preliminary
18 exploration of worry: Some characteristics and processes. *Behaviour Research and*
19 *Therapy, 21(1), 9–16.* [https://doi.org/10.1016/0005-7967\(83\)90121-3](https://doi.org/10.1016/0005-7967(83)90121-3)
- 20 Buja, A., & Eyuboglu, N. (1992). Remarks on parallel analysis. *Multivariate Behavioral*
21 *Research, 27(4), 509–540.* https://doi.org/10.1207/s15327906mbr2704_2
- 22 Burns, G. L., Keortge, S. G., Formea, G. M., & Sternberger, L. G. (1996). Revision of the
23 Padua Inventory of obsessive compulsive disorder symptoms: Distinctions between

- 1 worry, obsessions, and compulsions. *Behaviour Research and Therapy*, 34(2), 163–173.
2 [https://doi.org/10.1016/0005-7967\(95\)00035-6](https://doi.org/10.1016/0005-7967(95)00035-6)
- 3 Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral*
4 *Research*, 1(2), 245–276. Retrieved from
5 http://dx.doi.org/10.1207/s15327906mbr0102_10
- 6 de Winter, J. C. F., Dodou, D., & Wieringa, P. A. (2009). Exploratory factor analysis with
7 small sample sizes. *Multivariate Behavioral Research*, 44(2), 147–181.
8 <https://doi.org/10.1080/00273170902794206>
- 9 Eysenck, M. W. (1984). Anxiety and the worry process. *Bulletin of the Psychonomic Society*,
10 22(6), John, O. P., Donahue, E. M., & Kentle, R. L. (1991). *The Big Five Inventory-*
11 *Versions 4a and 54*. Berkeley, CA: University of California, Berkeley, Institute of
12 Personality and Social Research. 545–548. <https://doi.org/10.3758/BF03333903>
- 13 Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis.
14 *Psychometrika*, 30(2), 179–185. <https://doi.org/10.1007/BF02289447>
- 15 Huang, F. (2015). *hornpa: Horn's (1965) Test to Determine the Number of*
16 *Components/Factors. R package version 1.0*. Retrieved from [http://cran.r-](http://cran.r-project.org/package=hornpa)
17 [project.org/package=hornpa](http://cran.r-project.org/package=hornpa)
- 18 John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative big-five
19 trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W.
20 Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 114-
21 158). New York, NY: Guilford Press.
- 22 Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to
23 parcel: exploring the question, weighing the merits. *Structural Equation Modeling*, 9(2),
24 233–255. <http://doi.org/10.1207/S15328007SEM0902>

- 1 Little, T. D., Rhemtulla, M., Gibson, K., & Schoemann, A. M. (2013). Why the items versus
2 parcels controversy needn't be one. *Psychological Methods, 18*(3), 285–300.
3 <http://doi.org/10.1037/a0033266>
- 4 Longman, R. S., Cota, A. A., Holden, R. R., & Fekken, G. C. (1989). A regression equation
5 for the parallel analysis criterion in principal components analysis: Mean and 95th
6 percentile eigenvalues. *Multivariate Behavioral Research, 24*(1), 59–69.
7 https://doi.org/10.1207/s15327906mbr2401_4
- 8 MacCallum, R. C., & Austin, J. T. (2000). Applications of structural equation modeling in
9 psychological research. *Annual Review of Psychology, 51*(1), 201–226.
10 <https://doi.org/10.1146/annurev.psych.51.1.201>
- 11 Marsh, H. W., Hau, K.-T., & Wen, Z. (2004). In search of golden rules: Comment on
12 hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in
13 overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling, 11*(3),
14 320–341. https://doi.org/10.1207/s15328007sem1103_2
- 15 Marsh, H. W., Lüdtke, O., Nagengast, B., Morin, A. J. S., & Von Davier, M. (2013). Why
16 item parcels are (almost) never appropriate: two wrongs do not make a right--
17 camouflaging misspecification with item parcels in CFA models. *Psychological*
18 *Methods, 18*(3), 257–284. <http://doi.org/10.1037/a0032773>
- 19 McGraw, K. O., & Wong, S. P. (1996). Forming inferences about some intraclass correlation
20 coefficients. *Psychological Methods, 1*(1), 30–46. [https://doi.org/10.1037/1082-](https://doi.org/10.1037/1082-989X.1.1.30)
21 [989X.1.1.30](https://doi.org/10.1037/1082-989X.1.1.30)
- 22 Meng, X., Rosenthal, R., & Rubin, D. B. (1992). Comparing correlated correlation
23 coefficients. *Psychological Bulletin, 111*(1), 172–175. [https://doi.org/10.1037/0033-](https://doi.org/10.1037/0033-2909.111.1.172)
24 [2909.111.1.172](https://doi.org/10.1037/0033-2909.111.1.172)

- 1 Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and
2 validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy*,
3 28(6), 487–495. [https://doi.org/10.1016/0005-7967\(90\)90135-6](https://doi.org/10.1016/0005-7967(90)90135-6)
- 4 Morani, S., Pricci, D., & Sanavio, E. (1999). Penn State Worry Questionnaire and Worry
5 Domains Questionnaire: Italian versions and reliability. *Psicoterapia Cognitiva E*
6 *Comportamentale*, 5, 195–209.
- 7 Muthén, B., & Muthén, L. (1998-2012). *Mplus user's guide* (7th ed.). Los Angeles, CA:
8 Muthén & Muthén.
- 9 Muthén, B., du Toit, S. H. C., & Spisic, D. (1997). *Robust inference using weighted least*
10 *squares and quadratic estimating equations in latent variable modeling with categorical*
11 *and continuous outcomes*. Unpublished technical report. Los Angeles, CA: Muthén &
12 Muthén. Retrieved from https://www.statmodel.com/download/Article_075.pdf
- 13 Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York:
14 McGraw-Hill.
- 15 Revelle, W. (2015). *psych: Procedures for Psychological, Psychometric, and Personality*
16 *Research. R package version 1.5.4*. Retrieved from [http://cran.r-](http://cran.r-project.org/package=psych)
17 [project.org/package=psych](http://cran.r-project.org/package=psych)
- 18 Trapnell, P. D., & Campbell, J. D. (1999). Private self-Consciousness and the five-factor
19 model of personality: Distinguishing rumination from reflection. *Journal of Personality*
20 *and Social Psychology*, 76(2), 284–304. <https://doi.org/10.1037/0022-3514.76.2.284>
- 21 Ubbiali, A., Chiorri, C., Hampton, P., & Donati, D. (2013). Psychometric properties of the
22 Italian adaptation of the Big Five Inventory (BFI). *Bollettino Di Psicologia Applicata*,
23 266, 37–48.

- 1 Velicer, W. (1976). Determining the number of components from the matrix of partial
2 correlations. *Psychometrika*, *41*(3), 321–327. <https://doi.org/10.1007/BF02293557>
- 3 Westen, D., & Rosenthal, R. (2003). Quantifying construct validity: Two simple measures.
4 *Journal of Personality and Social Psychology*, *84*(3), 608–618.
5 <https://doi.org/10.1037/0022-3514.84.3.608>

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1 **6. Italian version of the RRQ**

2 Per ognuna delle affermazioni proposte, indica per favore il tuo grado di accordo o disaccordo
 3 cerchiando uno dei numeri a destra di ciascuna affermazione in base alla seguente scala [*For*
 4 *each of the statements located on the next two pages, please indicate your level of agreement*
 5 *or disagreement by circling one of the scale categories to the right of each statement. Use the*
 6 *scale as shown below*]

1	2	3	4	5
Completamente in disaccordo [<i>Strongly disagree</i>]	In disaccordo [<i>Disagree</i>]	Né d'accordo né in disaccordo [<i>Neutral</i>]	D'accordo [<i>Agree</i>]	Completamente d'accordo [<i>Strongly agree</i>]

8

9 **Parte A [Section A]**

- | | | | | | |
|--|---|---|---|---|---|
| 1. La mia attenzione è spesso focalizzata su aspetti di me a cui mi piacerebbe smettere di pensare [<i>My attention is often focused on aspects of myself I wish I'd stop thinking about</i>] | 1 | 2 | 3 | 4 | 5 |
| 2. Mi sembra sempre di ripetere mentalmente le cose che ho detto o fatto recentemente [<i>I always seem to be rehashing in my mind recent things I've said or done</i>] | 1 | 2 | 3 | 4 | 5 |
| 3. A volte mi risulta difficile smettere di riflettere su me stesso [<i>Sometimes it is hard for me to shut off thoughts about myself</i>] | 1 | 2 | 3 | 4 | 5 |
| 4. Anche molto tempo dopo un litigio o una discussione, i miei pensieri continuano a tornare su quanto è accaduto [<i>Long after an argument or disagreement is over with, my thoughts keep going back to what happened</i>] | 1 | 2 | 3 | 4 | 5 |
| 5. Tendo a "ruminare" (rimuginare) o a soffermarmi mentalmente sulle cose per molto tempo dopo che mi sono accadute [<i>I tend to "ruminate" or dwell over things that happen to me for a really long time afterward</i>] | 1 | 2 | 3 | 4 | 5 |
| 6. Evito di perdere tempo a ripensare a cose superate e concluse [<i>I don't waste time rethinking things that are over and done with</i>] | 1 | 2 | 3 | 4 | 5 |
| 7. Spesso rivivo nella mia mente il modo in cui mi sono comportato in situazioni passate [<i>Often I'm playing back over in my mind how I acted in a past situation</i>] | 1 | 2 | 3 | 4 | 5 |
| 8. Spesso mi trovo a riesaminare qualcosa che ho fatto [<i>I often find myself reevaluating something I've done</i>] | 1 | 2 | 3 | 4 | 5 |
| 9. Non rumino mai né mi soffermo molto a lungo a riflettere su me stesso [<i>I never ruminate or dwell on myself for very long</i>] | 1 | 2 | 3 | 4 | 5 |
| 10. Per me è facile tenere lontani dalla mente i pensieri indesiderati [<i>It is easy for me to put unwanted thoughts out of my mind</i>] | 1 | 2 | 3 | 4 | 5 |
| 11. Spesso rifletto su episodi della mia vita di cui non mi dovrei più preoccupare [<i>I often reflect on episodes in my life that I should no longer concern myself with</i>] | 1 | 2 | 3 | 4 | 5 |
| 12. Passo molto tempo a ripensare a momenti per me imbarazzanti o deludenti [<i>I spend a great deal of time thinking back over my embarrassing or disappointing moments</i>] | 1 | 2 | 3 | 4 | 5 |

10

11

1 Parte B [Section B]

13.	Il pensiero filosofico o quello astratto non mi attraggono molto [<i>Philosophical or abstract thinking doesn't appeal to me that much</i>]	1	2	3	4	5
14.	Io non sono proprio un tipo di persona meditativa [<i>I'm not really a meditative type of person</i>]	1	2	3	4	5
15.	Mi piace esplorare la mia "vita interiore" [<i>I love exploring my "inner" self</i>]	1	2	3	4	5
16.	Sono affascinato dai miei atteggiamenti e sentimenti verso le cose. [<i>My attitudes and feelings about things fascinate me</i>]	1	2	3	4	5
17.	Tengo poco a riflettere su me stesso o in modo introspettivo [<i>I don't really care for introspective or self-reflective thinking</i>]	1	2	3	4	5
18.	Mi piace analizzare i motivi per cui faccio le cose [<i>I love analyzing why I do things</i>]	1	2	3	4	5
19.	Gli altri dicono spesso che sono una persona "profonda" e introspettiva [<i>People often say I'm a "deep," introspective type of person</i>]	1	2	3	4	5
20.	Sono poco interessato all'autoanalisi [<i>I don't care much for self-analysis</i>]	1	2	3	4	5
21.	Per natura sono molto curioso di me stesso [<i>I'm very self-inquisitive by nature</i>]	1	2	3	4	5
22.	Mi piace meditare sulla natura e sul significato delle cose [<i>I love to meditate on the nature and meaning of things</i>]	1	2	3	4	5
23.	Spesso amo guardare alla mia vita da una prospettiva filosofica [<i>I often love to look at my life in philosophical ways</i>]	1	2	3	4	5
24.	Riflettere su me stesso non è il mio divertimento ideale [<i>Contemplating myself isn't my idea of fun</i>]	1	2	3	4	5

2

3