Consciousness and Cognition 39 (2016) 77–91

Contents lists available at ScienceDirect

Consciousness and Cognition

journal homepage: www.elsevier.com/locate/concog

Development and validation of the Maladaptive Daydreaming Scale (MDS)

Eli Somer [a,*], Jonathan Lehrfeld [b], Jayne Bigelsen [c], Daniela S. Jopp [d,1]

[a] School of Social Work, University of Haifa, Israel
[b] Fordham University, New York, NY, USA
[c] Anti-Human Trafficking Initiatives, Covenant House International, New York, NY, USA
[d] University of Lausanne, Switzerland

ARTICLE INFO

Article history:
Received 31 July 2015
Accepted 4 December 2015

Keywords:
Maladaptive daydreaming
Fantasy proneness
Mind-wandering

ABSTRACT

This study describes the development of the Maladaptive Daydreaming Scale (MDS), a 14-item self-report instrument designed to gauge abnormal fantasizing. Our sample consisted of 447 English-speaking individuals from 45 different countries. A 3-correlated-factors model best presented the underlying dimensions Yearning, Kinesthesia and Impairment, capturing related rewarding experiences as well as psychological impairment of maladaptive daydreaming. MDS scores were associated with obsessive–compulsive behavior and thoughts, dissociative absorption, attention deficit, and high sense of presence during daydreaming, but less with psychotic symptoms. The MDS and its subscale demonstrated good validity, sound internal consistency and temporal stability and discriminated well between self-identified individuals with and without maladaptive daydreaming. Considering the instrument's high sensitivity and specificity levels, it seems an excellent measure for future investigation of MD that will, hopefully, shed light on the etiology and psycho-biological mechanisms involved in this mental condition, as well as on the development of effective MD treatment methods.

1. Introduction

Maladaptive daydreaming (MD) is defined as "extensive fantasy activity that replaces human interaction and/or interferes with academic, interpersonal or vocational functioning" (Somer, 2002, p. 199). Individuals with MD spend hours completely absorbed in highly structured and very fanciful daydreams, often accompanied by stereotypical movements, hindering functioning and participation in everyday life. Despite the large and growing number of online international forums and websites[2] on which these individuals profess to have been secretly suffering from maladaptive daydreaming for years (Somer, 2013), only very limited scientific research has addressed this phenomenon. The purpose of the current study was to develop a statistically sound measure of MD that facilitates the scientific study of this under-researched construct. Moreover, it

* Corresponding author at: University of Haifa, School of Social Work, 199 Aba Khoushy Avenue, Haifa 3498838, Israel.
E-mail addresses: somer@research.haifa.ac.il (E. Somer), Daniela.jopp@unil.ch (D.S. Jopp).
[1] Alternative contact: University of Lausanne, Institute of Psychology, Geopolis, 1015 Lausanne, Switzerland.
[2] E.g., Maladaptive Daydreamers forum on Yahoo Groups had 3256 members on December 9, 2015; see https://groups.yahoo.com/neo/groups/maladaptivedaydreamers/info.

http://dx.doi.org/10.1016/j.concog.2015.12.001
1053-8100/

is further our hope that more research will lead to increased awareness and, in the long-run, the professional recognition of this clinical phenomenon.

Maladaptive daydreaming is part of the larger cognitive phenomenon of daydreaming, which constitutes a highly prevalent, normal mental activity experienced by 96% of all Americans (Singer, 1966). This mental process is claimed to encompass almost half of all human thought (Killingsworth & Gilbert, 2010), and the average person seems to activate hundreds of daydreaming episodes per day (Klinger, 2009). Most research today addresses the underlying cognitive activities by studying default mode network activation patterns (the brain regions that are active when the individual is not focused on the outside world) and mind-wandering (Raichle et al., 2001); eye movement and pupil dimensions during mind-wandering (Smallwood et al., 2011); decoupling of attention from perceptual input (e.g., Smallwood et al., 2012); as well as cognitive control failure and its deleterious effects on academic performance and mood (McVay & Kane, 2010).

Before daydreams were studied as a neuropsychological phenomenon, daydreaming was recognized for its clinical implications. Historically, daydreams were understood as attempts to cope with deprivation states and latent conflicts (Freud, 1908, 1962). Supporting the idea of daydreaming being adaptive in nature (e.g., Hartman, 1958) a recently study demonstrated that daydreams about significant others were related to increased happiness and feelings of connectedness, but only for individuals lacking these feelings prior to daydreaming (Poerio, Totterdell, Emerson, & Miles, 2015). In an earlier study, Singer and his colleagues (e.g., Zhiyan & Singer, 1997) found positive constructive daydreaming which was correlated with curiosity and openness to experience, but also identified two additional dysfunctional daydreaming styles: guilty-dysphoric (associated with neuroticism), and poor attentional control (linked with lower levels of conscientiousness). Unfortunately, these latter more compulsive forms of daydreaming have received less research attention. Very recently, this type of under-regulated daydreaming has become a topic of interest in the context of clinical research. Robinson, Woods, Cardona, Baglioni, and Hedderly (2014) published a study on stereotypic movements associated with intense imagery in children, whose behavior and thoughts seem very similar to MD adults. Commenting on the study, Freeman (2014) highlighted the importance to further assess this behavior given its clinical relevance, to better understand the phenomenon and to guide the development of these children. Yet, there is no systematic research on what constitutes excessive, highly sensory, scene-driven and affect-laden maladaptive daydreaming, and no tool to measure this construct.

Somer (2002) presented a first qualitative research report on maladaptive daydreaming describing six outpatients. The respondents were mostly withdrawn socially and struggled with academic and professional functioning because of their time-consuming daydreaming behavior. On the basis of these interviews Somer (2002) identified several central MD themes. These included, for example, disengagement from the experience of pain by mood enhancing and fantasizing about an idealized self. Scenarios included furthermore motifs of companionship, intimacy and romance, but also compensatory scripts involving power, rescue and escape. All interviewees except one reported employing physical movement (e.g., tossing an object in the air or pacing) to induce and maintain MD. Given that several of the interviewed patients associated the inception of MD with aversive childhood experiences, including maltreatment and loneliness, Somer (2002) theorized that MD may represent a coping strategy developed by imaginative children in response to aversive early life experiences.

In 2009, Schupak and Rosenthal presented another paper on maladaptive daydreaming, describing a case study of an otherwise well-adjusted woman distressed by her excessive need to daydream. The patient reported that from age four through ten she spent periods of free time, sometimes several hours, walking around in circles shaking a string, while imagining creative stories in which she was the central focus, i.e., "just like playing school with other kids, but in my head." (p. 290). This case study also provided some clues regarding potential treatment options: The patient was treated with Fluvoxamine, commonly used to treat obsessive compulsive disorders, which helped to control her daydreaming.

More recently, Bigelsen and Schupak (2011) published the first study with a larger MD sample, using data from 90 self-identified maladaptive daydreamers recruited from designated Internet support forums. The study reported that respondents tended to experience utmost pleasure while immersed in their inner worlds, but were also distressed by the quantity and uncontrollability of their inventive highly-structured daydreaming and its consequences. Thus, Bigelsen and Schupak's (2011) findings suggested that MD may represent an abnormal form of fantasizing indicative of a yet unidentified clinical syndrome. Below is an illustrative description of what we wish to examine, provided by one of the individuals we have talked to preparing the present study, highlighting the distinction between common and maladaptive daydreaming:

N is a 23-year-old student who struggles with her school work because of severe concentration problems. She prefers to be alone in her room, where she engages in vivid fantasies regarding her friendship with a celebrity rock star while pacing back and forth. She experiences her fantasies as sensorily and emotionally lucid, providing her with a powerful sense of presence. She reports that since age five, her default waking mode when alone is to script and imagine elaborate, emotionally laden interpersonal scenarios. She spends up to seven hours every day in such a state, which she finds enormously gratifying. Yet the discrepancies between her fantasized self, her actual loneliness and her difficulties in stopping the daydreaming and meeting her academic obligations have been causing her considerable distress. Over the past three years, two therapists reassured her that daydreaming was normal and suggested to focus on other issues in therapy. She felt she was not being helped, dropped out of therapy and never sought professional assistance again. *N* belongs to an online forum on maladaptive daydreaming where she feels she gets support from many others who feel similarly impaired and unaided.

Unfortunately, to date, there is no assessment tool available to capture what we consider as maladaptive daydreaming, namely its characteristic time-consuming thoughts and behaviors, as well as the dysfunction and distress caused by it. Although several measures of the propensity to mind-wander or fantasize have been developed, none focuses on pathological daydreaming or could adequately gauge the sensory-affective qualities of highly-structured daydreaming. So far, there

are measures that address psychological absorption and openness to mystical and consciousness-altering experiences (Tellegen Absorption Scale; Tellegen & Atkinson, 1974), as well as the tendency for daydreaming (Daydreaming Frequency Scale of the Imaginal Process Inventory; Singer & Antrobus, 1963), however, they do not assess the lack of control, mental distress, social, academic or vocational dysfunction associated with it which seems to be characteristic of MD. Most Dissociative Experiences Scale (DES, Bernstein & Putnam, 1986) items measure amnesia and depersonalization/derealization and do not focus on fantasizing behavior. DES items that are most closely related to daydreaming are the absorption items but except for one item, they mostly describe activities such as watching television or a movie rather than excessive fantasizing. Furthermore, there are measures assessing aspects of daydreaming content, mental style and inner experience but not excessiveness and maladaptation (Short Imaginal Processes Inventory; Huba, Singer, Aneshensel, & Antrobus, 1982). Another questionnaire gauges trait levels of task-unrelated thought representing an attention and distractibility construct but not the compulsive, time-consuming, impairment dimension of the powerful sensory-affective scene-driven process of interest here (Mind-Wandering Questionnaire; Mrazek, Phillips, Franklin, Broadway, & Schooler, 2013). Wilson and Barber developed the Inventory of Childhood memories and Imaginings (ICMI, 1981) to measure fantasy proneness, but their measure investigates childhood and adolescent experiences rather than current mental activities and offers limited supporting psychometric evidence (Lynn & Rhue, 1988; Myers, 1983). Similar to the ICMI, the Creative Experiences Questionnaire (Merckelbach, Horselenberg, & Muris, 2001) focused mostly on childhood experiences and paranormal and absorption constructs rather than on extensive current mental activity, and was therefore unsuitable as a measure of pathological daydreaming behavior.

Given that MD appears to be a special, maybe abnormal form of excessive, compulsive and distressing fantasizing behavior that hinders the life of thousands of individuals seeking help in curbing this disturbing behavior, and given the limited scientific research on this phenomenon to date, we developed a self-report measure of MD, the Maladaptive Daydreaming Scale (MDS), in order to provide a tool to assess MD related symptoms in larger groups of individuals. The purpose of the article is to describe the development and validation of this measure, which we designed to capture the unique features of pathological fantasizing among self-identified maladaptive daydreamers and to accurately differentiate this group from a non-MD sample.

2. Method

2.1. Participants

Participants were recruited (1) by posting an online enrollment flyer explaining study details in Internet chat rooms devoted to discussions on excessive daydreaming; (2) through Internet chat rooms devoted to psychology and mental health issues; (3) by word of mouth, particularly through researchers who asked, students, interns and research assistants to participate and encourage the participation of their peers by forwarding the recruitment notice to their social networks. This latter group served mostly for recruitment of individuals without MD issues. Participants were asked if they considered themselves to be a maladaptive or compulsive daydreamer, as per the definition provided earlier in this paper (hereafter referred to as an MDer). Five participants skipped this question and were thus dropped from subsequent analyses. A total of 447 participants were included in the study (96 male, 347 female, 2 transgender, 2 omitted). Age range (as per IRB approval) was 13–78 ($M = 30.08$, $SD = 13.94$). Nationalities represented included 45 countries in North America, South America, Europe, Asia, Africa, and Oceania, though participants were primarily from the United States (46%), the United Kingdom (14%), and Australia (12%). We decided not to analyze statistically any differences between national or continental occurrences of MD because we believe the figures presented in Table 1 reflect proficiency in English and access to the Internet more than an actual epidemiological reality. We asked respondents whether they would consider themselves as daydreaming normally, as much as most people do, or if they see themselves as daydreaming excessively, or suffering from maladaptive daydreaming. Seventy-six percent of our sample identified themselves as struggling with MD (MDers). The remaining 24% identified themselves as daydreaming normally, and serve as the comparison group (non-MDers) in this study. Chi-square tests revealed no significant gender differences in self-identified MD status. However, there were several demographic differences between our research groups (possibly attributable, at least in part, to the different recruitment procedures): MDers were more likely than non-MDers to be students, $\chi^2(1, N = 442) = 9.58$, $p < .01$, $\phi = .15$, and, as such, MDers ($M = 14.57$, $SD = 3.27$) had significantly fewer years of education than non-MDers ($M = 17.42$, $SD = 3.01$), $t(422) = 7.90$, $p < .001$, Cohen's $d = .89$. MDers ($M = 26.51$, $SD = 11.13$) were also substantially younger than non-MDers ($M = 41.27$, $SD = 15.86$), $t(138.73) = 8.93$, $p < .001$, $d = 1.190$.

To determine test–retest reliability, we contacted approximately 300 participants, all of whom indicated they were willing to be contacted for future studies, and we asked them to fill out the MDS a second time. Of those we contacted, $n = 66$ filled out the MDS a second time and thus comprise our test–retest group. The average time between the first and the measurement occasions was 21.17 weeks ($SD = 5.62$ weeks). Among the retest subjects, there were 52 females and 13 males, and the age range was 15–66 ($M = 30.83$, $SD = 14.01$).

2.2. Measures

Participants provided general demographic information and completed five questionnaires that assessed a variety of mental health disorders and one additional questionnaire specifically about daydreaming that is the focus of the current study.

Table 1
Demographic information.

		N (%)	Age *M* (*SD*)	Female *N* (%)	Years of education *M* (*SD*)	Ever married *N* (%)
North America[a]	MDer	172 (78)	28.20 (12.50)	133 (78)	14.62 (3.55)	33 (19)
	Non-MDer	49 (22)	42.20 (17.71)	39 (81)	17.06 (3.47)	29 (59)
	Total	221 (100)	31.32 (14.97)	172 (79)	15.20 (3.69)	62 (28)
Europe[b]	MDer	97 (90)	25.31 (9.50)	77 (79)	14.42 (2.82)	15 (16)
	Non-MDer	11 (10)	38.45 (11.50)	8 (73)	18.00 (1.83)	5 (46)
	Total	108 (100)	26.65 (10.45)	85 (79)	14.85 (2.98)	20 (19)
Oceania[c]	MDer	27 (47)	23.30 (7.14)	23 (85)	14.52 (2.97)	4 (15)
	Non-MDer	30 (53)	38.87 (16.15)	25 (83)	17.10 (2.76)	15 (50)
	Total	57 (100)	31.49 (14.84)	48 (84)	15.90 (3.14)	19 (33)
Asia[d]	MDer	27 (87)	22.70 (8.10)	17 (63)	14.04 (3.22)	5 (19)
	Non-MDer	4 (13)	43.25 (12.92)	4 (100)	18.00 (0.82)	2 (50)
	Total	31 (100)	25.35 (11.07)	21 (68)	14.61 (3.30)	7 (23)
Africa[e]	MDer	8 (42)	33.13 (15.42)	5 (63)	16.75 (3.01)	3 (38)
	Non-MDer	11 (58)	45.91 (11.84)	9 (82)	18.82 (2.48)	8 (73)
	Total	19 (100)	40.53 (14.58)	14 (74)	17.95 (2.84)	11 (58)
South America[f]	MDer	5 (100)	23.20 (7.60)	2 (40)	15.40 (3.05)	1 (20)
	Non-MDer	0 (0)	n/a	n/a	n/a	n/a
	Total	5 (100)	23.20 (7.60)	2 (40)	15.40 (3.05)	1 (20)
Total sample	MDer	341 (76)	26.51 (11.13)	261 (77)	14.57 (3.27)	61 (18)
	Non-MDer	106 (24)	41.27 (15.86)	86 (82)	17.42 (3.01)	59 (56)
	Total	447 (100)	30.08 (13.94)	347 (78)	15.30 (3.45)	120 (27)

Note. *N* = count; *M* = mean; *SD* = standard deviation; MDer = self-identified maladaptive daydreamer.
[a] USA, Canada, and Mexico.
[b] e.g., UK, The Netherlands, Germany, etc.
[c] Australia and New Zealand.
[d] e.g., India, Singapore, etc.
[e] South Africa and Morocco.
[f] Brazil, Argentina, and Colombia.

2.2.1. Demographic and basic clinical information

Participants were asked for basic demographic data. In addition, they were also asked if they had ever been diagnosed with a mental health disorder and if they had ever been in therapy for any mental health issue.

2.2.2. Self-identified MD status and related functional impairment

In the absence of a preexisting MD diagnostic tool, we used two questions by which participants could indicate whether they considered themselves to be maladaptive daydreamers ("Are you an excessive daydreamer?": *yes* or *no*) and whether they thought they daydreamed in an enhanced way ("Relative to other people, is your daydreaming enhanced with respect to content, sense of presence, emotional intensity or time?": *no*, *yes but it does not bother me*, or *yes and it bothers me*). In addition, we assess the functional implications of MD with three single item questions. Specifically, participants were asked to indicated the extent to which they daydream on a weekly basis ("What percent of your waking hours do you daydream in an average or typical week?"), the extent to which their daydreaming interfered with their social functioning ("How much does daydreaming interfere with your relationships with friends, family, co-workers and others?"), and with their health, using sleep as a proxy ("On average, how much does your daydreaming interfere with your ability to sleep?"). These three latter questions were answered on a scale of 0–100% in increments of 10%.

2.2.3. Maladaptive Daydreaming Scale (MDS)

The MDS was designed as a 14-item rating scale to identify potential MD. Questionnaire items were developed after extensive review of the original descriptions of individuals reporting MD from data collected by Bigelsen and Schupak (2011), Somer (2002) and Somer, Somer and Jopp (submitted for publication). These data provided information on MD content, extent and distress. We also reviewed several websites dedicated to excessive daydreaming (e.g., on Yahoo health, India parenting and Wild Minds Network) to further determine commonalities across those who self-report having MD. On the basis of this extensive review, the co-authors of the current study, among them two researchers who have gained experience working with individuals with MD (e.g., in clinical practice), identified five symptom dimensions on which MD differs from normative daydreaming and developed a set of self-report items to capture these dimensions. The identified set of MD experiences and related items were discussed with a prominent scholar in the field of daydreaming whose feedback resulted in a further refined scale. We then administered this preliminary scale to 10 MDers and asked for their detailed feedback. We changed the wording of some items based on that feedback. The final instrument included 14 items assessing five key characteristics of MD: MD Content/Quality (2 items), MD Compulsion/Control (4 items), MD Distress (3 items), Perceived Benefits of Daydreaming (2 items) and Interference with Life Functioning (3 items; see Appendix A for questionnaire). Respondents

were asked to answer the items on a scale ranging from 0% to 100%, with 10% intervals (0% = *Never/None of the time*; 100% = *All of the time/Extreme amounts*), in parallel with the widely used Dissociative Experiences Scale (described below).

2.2.4. Creative Experiences Questionnaire (CEQ)

The CEQ (Merckelbach et al., 2001) is a 25-item self-report measure with good internal consistency and test–retest stability derived from Wilson and Barber's (1981) description of fantasy proneness characteristics. Items assess profound involvement in fantasy, developmental antecedents of fantasy proneness and the consequences of fantasizing. Participants indicate yes or no to statements such as: "As a child, I thought that the dolls, teddy bears, and stuffed animals that I played with were living creatures." A higher sum score indicates higher levels of fantasy proneness.

2.2.5. World Health Organization adult ADHD self-report scale version 1.1 (ASRS v 1.1)

The ASRS v 1.1 (Kessler et al., 2005) is a six-item standardized measure based on ADHD criteria described in the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013). An example item is: "How often do you have trouble wrapping up the final details of a project, once the challenging parts have been done?" The answering format is a 5-point Likert scale ranging from *Never* (0) *to Very often* (4). The ASRS V.11 has demonstrated adequate reliability (Kessler et al., 2007) and good sensitivity, specificity and total classification accuracy (Kessler et al., 2005).

2.2.6. Obsessive–Compulsive Inventory-Revised (OCI-R)

The OCI-R (Foa et al., 2002) is an 18-item self-report measure to assess symptoms of obsessive–compulsive disorder with good psychometric properties. It captures six subscales: washing, checking, ordering, obsessing, hoarding and neutralizing. A sample item is: "I get upset if objects are not arranged properly". The answering format ranges from *Not at all* (0) to *Extremely* (4).

2.2.7. Dissociative Experiences Scale (DES)

The DES is the most widely used self-report measure of dissociative experiences (Bernstein & Putnam, 1986; Somer, Dolgin, & Saadon, 2001), with excellent reliability and validity (Ross, Norton, & Anderson, 1988; Van Ijzendoorn & Schuengel, 1996). The scale includes 28 items (e.g., "Some people have the experience of finding themselves in a place and have no idea how they got there. Circle a number to show what percentage of the time this happens to you"; 0% = *Never*, 100% = *All the time*, in increments of 10%). The DES overall score (ranging from 0 to 100) is obtained by averaging all responses.

2.2.8. Psychosis Screener

The Psychosis Screener (Degenhardt, Hall, Korten, & Jablensky, 2005) evaluates the presence of psychotic symptoms and is comprised of elements of the Composite International Diagnostic Interview (CIDI; Robins, Wing, & Wittchen, 1988). The measure includes seven items to be answered with *yes* or *no.* The first six items cover the features of psychotic disorders including: delusions of control, thought interference and passivity delusions of reference or persecution, and grandiose delusions. The last item records whether a participant reports ever receiving a diagnosis of schizophrenia. Affirmative responses are summed, and a score of 1 or more indicates a case of psychosis. Degenhardt et al. found that the screener is well able to discriminate between cases and non-cases of psychosis.

2.2.9. Sense of Presence in Daydreaming (SPD)

Seven questions were derived from tools designed to measure the sense of presence in virtual reality worlds (Slater, Steed, McCarthy, & Maringelli, 1998; Witmer & Singer, 1994). In the present study, we asked participants to think back to the last two weeks and choose their longest and most vivid daydream and answer questions regarding their sense of "being there" in the daydream and involvement of their senses on a scale ranging from *Not at all* (1) to *Totally involved* (7). The three immersion questions were selected from Witmer and Singer's Immersive Tendency Questionnaire (1994).

2.3. Procedure

After seeing recruitment notices on MD websites (to recruit MDers) or email listservs and Facebook (to recruit non-MDers), and giving informed consent, participants anonymously completed an online survey. The study was approved by two institutional review boards.

3. Statistical analyses

We used SPSS (Versions 18 and 22) and R (R Core Team, 2013) to obtain descriptive statistics, conduct significance tests, and estimate effect sizes. All modeling was done in M*plus* version 7 (Muthén & Muthén, 1998–2011).

We developed our MDS model by performing a series of exploratory factor analyses on half of the data set (the "model-fitting group," $n = 227$). We used the geomin rotation method, which is the default rotation method in M*plus* and which aids in the interpretation of the factors by searching for a solution wherein each item has at least one loading parameter equal to

zero (Browne, 2001). We used the MLR estimator (Muthén & Muthén, 1998–2011, p. 603) to fit all our models. The MLR estimation method uses maximum likelihood but corrects for non-normality of item responses in calculating the model-fit χ^2 test statistic. Furthermore, this method uses a sandwich estimator to produce standard errors that are also corrected for the above-mentioned non-normality of item responses. We fit a common factor model, as well as 2-, 3-, 4-, and 5-correlated-factor models. The latter two models did not converge. We chose between the rest of the models using both adequacy of fit indices and interpretability of factors and factor loadings. To indicate a good model fit, the following values were chosen, in line with prior recommendations: Root Mean Square Error of Approximation (RMSEA; Steiger & Lind, 1980) < .05, Comparative Fit Index (CFI; Bentler, 1990, 1995) > .90, Tucker–Lewis Index (TLI; Tucker & Lewis, 1973) > .90, and Standardized Root Mean Square Residual (SRMR; Bentler, 1995) < .05. For the RMSEA, a 90% confidence interval (CI) was also reported. We considered these fit indices in addition to the model-fit chi-square statistic, the log-likelihood value under the null hypothesis that the model was the correct model, and the Akaike Information Criterion (AIC; Akaike, 1974), the Bayesian Information Criterion (BIC; Schwarz, 1978), and the Sample Size-Adjusted BIC (SABIC; Sclove, 1987).

The final exploratory factor model which had been developed on the basis of the "model-fitting sample" was then validated by fitting a confirmatory factor model to the "validation sample". Specifically, this confirmatory model used the same number of factors as the final exploratory model and factor loading patterns specified by the highest loading for each item in the exploratory model. All factors were allowed to correlate, as the exploratory factor model inter-factor correlations were all very high. We judged the fit of our confirmatory factor model using the same fit indices used for the exploratory factor models, and also by examining the statistical significance of the individual factor loadings and the suggestions provided by the modification indices. Based on these considerations, we decided to allow two items to have correlated residual variances due to similarity in item content above and beyond the similarity shared by all the items loading on that factor. Including this one extra parameter caused the fit indices to improve and did not seriously affect the parsimony of the model. We also tried including age as a covariate in our models since we noted the statistically significant difference between MDers and non-MDers on this demographic variable; however, we found that the model fit statistics were virtually unchanged when age was included and, more importantly, we found that the corresponding parameters were statistically non-significant and therefore had no substantive importance.

This study aims to develop a measure for behavior that may be linked to a clinical phenomenon that has not yet been described. We therefore could not derive an inclusion criterion from any preexisting diagnostic measures. In order to develop a scoring model for our questionnaire, we used the self-reported MD status as a starting point.

Convergent and divergent validity of the MDS was then examined by comparing individuals scoring positive on the MDS criterion relative to those not meeting the MDS criterion. Mean level differences as well as correlations were used. This section was meant to further illustrate the phenomenon of MD in the context of other clinical syndromes. Finally, in order to illustrate the burden associated with this under-acknowledged clinical condition, we provide more information on the extent of dysfunction MDers experience as a consequence of their excessive mental activity.

We followed up with all participants who agreed to be contacted to ask that they take the MDS a second time. Out of 358 individuals, 66 (15%) provided a second round of MDS data. The average time in between the two administrations was 21.17 weeks (*SD* = 5.62 weeks).

4. Results

4.1. Factor model

4.1.1. Exploratory model

Descriptive information on the individual items, split by MDers and non-MDers, are presented in Table 2. The full sample was used to determine the factor structure of the MDS. As a preliminary measure, we generated a scree plot from our item response data for the MDS. Fig. A1 (Appendix A) shows that the first two principal components (labeled "1" and "2" on the *x*-axis) have eigenvalues (*y*-axis values) greater than 1, while the third principal component has an eigenvalue just below 1. Using the Kaiser Rule, namely the number of principal components with eigenvalues greater than one (Zwick & Velicer, 1986), to determine the optimal number of factors in this exploratory solution suggested a two-factor solution. Instead when using the "elbow criterion", the shape of the scree plot suggested a one-factor solution. The "rules of thumb" in this case do not suggest using the same number of factors, so we chose to fit exploratory models with between one and five factors, and to examine each resulting fit for statistical fit and interpretability (i.e., theoretical fit).

The common factor model had a poor fit according to all fit indices we inspected. Although the proportion of variance accounted for by the first factor was much greater than the proportion of variance accounted for by each subsequent factor (which is responsible for the shape of the scree plot), no fit indices supported the use of a common factor model. The two-factor model was a definite improvement over the common factor solution. It had an adequate fit according to the CFI (.95), the TLI (.93), and the SRMR (.03), although the 90% CI for the RMSEA still excluded .05. The two factors were not entirely uninterpretable, but were not as straightforward as we had hoped. The three-factor model had a better model-fit: the CFI (.97), TLI (.95), and SRMR (.02) were all very good, and the 90% CI for the RMSEA included .05 (RMSEA was .07 and 90% CI was [.05, .09]; see Table 3). This factor solution was easily interpretable as (1) yearning for daydreaming, (2) kinesthesia, and (3) impairment, and represented theoretically important characteristics of MD. These three factors all had strong

Table 2
*M*s and *SD*s of MDS item responses for self-identified MDers ($n = 341$) and non-MDers ($n = 106$).

Item	Short text	MDers		Non-MDers	
		M	*SD*	*M*	*SD*
Qual1	Physical activity	57.63	39.09	6.42	16.51
Qual2	Noises and facial expressions	65.74	32.64	10.75	21.28
Ctrl1	Maintain control	66.98	30.23	6.70	17.82
Ctrl2	Resume after interruption	67.56	31.06	15.09	25.42
Ctrl3	Urge after waking up	63.24	34.80	10.48	21.92
Ctrl4	Complete goals without daydreaming	64.36	32.09	13.51	21.56
Dis1	Annoyed at being interrupted	53.16	32.18	10.80	19.83
Dis2	Distressed about quantity of time daydreaming	63.41	32.44	3.79	12.62
Dis3	Distressed about inability to find time to daydream	50.94	35.26	7.66	17.55
Ben1	Rather daydream than be social or pursue hobbies	59.60	31.06	9.56	20.16
Ben2	Daydreaming is comforting or enjoyable	79.99	26.32	40.59	33.55
Func1	Interferes with basic chores	58.44	31.90	8.33	16.59
Func2	Interferes with academic/occupational success	62.38	35.75	8.52	16.20
Func3	Interferes with achieving overall life goals	63.98	34.88	4.56	12.36

Note. MDer = self-identified maladaptive daydreamer; *M* = mean; *SD* = standard deviation. *M*s and *SD*s calculated from original response scale of 0–100%.

Table 3
Exploratory factor model using data from the model-fitting group ($n = 227$).

	F1	F2	F3
Geomin-rotated factor loadings			
Qual1	0.00	0.88*	−0.05
Qual2	0.17	0.66*	0.04
Ctrl1	0.25*	−0.02	0.71*
Ctrl2	0.71*	0.01	0.19
Ctrl3	0.58*	−0.13	0.41*
Ctrl4	0.12	0.12	0.66*
Dis1	0.79*	0.08	−0.05
Dis2	0.01	0.05	0.81*
Dis3	0.71*	0.12	−0.01
Ben1	0.69*	0.02	0.18
Ben2	0.43*	0.23*	0.09
Func1	0.03	0.01	0.83*
Func2	−0.12	0.01	0.99*
Func3	−0.12	0.01	1.01*
Fit indices			
Log-likelihood		−14687.49	
Model-fit χ^2 (*df*), *p*-value		111.56 (52), $p < .001$	
RMSEA [90% CI]		.07 [.05, .09]	
CFI		.97	
TLI		.95	
SRMR		.02	

Note. *df* = degrees of freedom, CI = confidence interval, RMSEA = Root Mean Square Error of Approximation, CFI = Comparative Fit Index, TLI = Tucker–Lewis Index, SRMR = Standardized Root Square Mean Residual.
* $p < .05$.

correlations. The four-factor and five-factor models had improved model fit, but we found that the factors they yielded were less interpretable than in the three-factor solution, and we thus considered them to be weaker models (results are available from the authors).

Given our theoretical interest in the three-factor solution, as well as its good statistical fit, we chose to test this model for the subsequent round of confirmatory factor model validation.

4.1.2. Confirmatory model

Table 4 provides the factor loadings, inter-factor correlation matrix, and fit indices for the confirmatory three-correlated-factor model. Not shown in the table is the modeled residual variance correlation between Ben1 and Ben2, which had a standardized value of .45. All model parameters were significant different from 0 (all *p*s < .001). Table 5 provides the same information, now for the model is fitted to the entire sample (also Fig. 1). Again omitted from the table is the modeled residual variance correlation for Ben1 and Ben2 (standardized value was .30). Similar to the case where the model was fit to the validation sample only, all parameters of this model were significantly different from 0 (all *p*s < .001). All subsequent model interpretation will reference the fit to the entire sample.

Table 4
Confirmatory factor model using data from the validation group (n = 220).

Item	Yearning	Kinesthesia	Impairment
Standardized factor loadings			
Ctrl2	0.84		
Ctrl3	0.74		
Dis1	0.85		
Dis3	0.81		
Ben1	0.81		
Ben2	0.54		
Qual1		0.78	
Qual2		0.86	
Ctrl1			0.87
Ctrl4			0.74
Dis2			0.84
Func1			0.85
Func2			0.85
Func3			0.90

	Yearning	Kinesthesia	
Inter-factor correlations			
Kinesthesia	.89		
Impairment	.84	.76	
Fit indices			
Log-likelihood	−14361.23	χ^2 (df)	191.72 (73)
AIC	28814.46	RMSEA	.09 [.07, .10]
BIC	28970.57	CFI	.94
SABIC	28824.80	TLI	.92
		SRMR	.05

Note. df = degrees of freedom, AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, SABIC = Sample Size-Adjusted BIC, RMSEA = Root Mean Square Error of Approximation, CFI = Comparative Fit Index, TLI = Tucker–Lewis Index, SRMR = Standardized Root Mean Square Residual. Model-fit χ^2 statistic significant (p < .001).
* p < .05.

Table 5
Confirmatory factor model using data from the complete sample (n = 447).

Item	Yearning	Kinesthesia	Impairment
Standardized factor loadings			
Ctrl2	0.84		
Ctrl3	0.77		
Dis1	0.81		
Dis3	0.79		
Ben1	0.82		
Ben2	0.58		
Qual1		0.78	
Qual1		0.86	
Ctrl1			0.86
Ctrl4			0.78
Dis2			0.85
Func1			0.85
Func2			0.88
Func3			0.92

	Yearning	Kinesthesia	
Inter-factor correlations			
Kinesthesia	.82		
Impairment	.78	.71	
Fit indices			
Log-likelihood	−29138.14	χ^2 (df)	307.93 (73)
AIC	58368.27	RMSEA	.09 [.08, .10]
BIC	58556.99	CFI	.94
SABIC	58411.01	TLI	.92
		SRMR	.04

Note. df = degrees of freedom, AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion, SABIC = Sample Size-Adjusted BIC, RMSEA = Root Mean Square Error of Approximation, CFI = Comparative Fit Index, TLI = Tucker–Lewis Index, SRMR = Standardized Root Mean Square Residual. Model-fit χ^2 statistic significant (p < .001).
* p < .05.

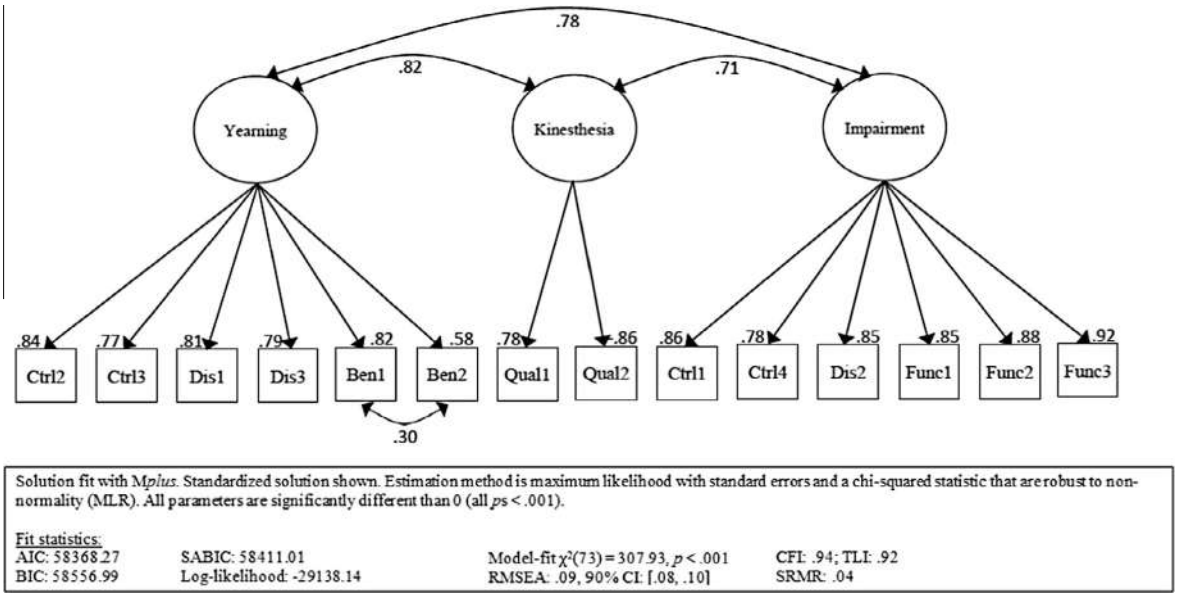

Fig. 1. Final measurement model for MDS.

We labeled the first factor (F1 in the exploratory model) "Yearning" as its items reflected the appeal of daydreaming and the intense craving to engage in this activity. We labeled the second factor (F2 in the exploratory model) "Kinesthesia", as it contained items describing physical movements that accompany MD. We labeled the third factor (F3 in the exploratory model) "Impairment", because its items portray the dysfunction and suffering associated with MD. Cronbach's Alpha for Yearning (α = .90) and Impairment (α = .94) both reflect very good reliability. The Alpha for Kinesthesia (α = .80) represented a good internal consistency. The Alpha for the total MDS item set was α = .95.

4.2. MDS scoring

Table 6 shows the MDS overall mean scores as well as those of the subscales (Yearning, Kinesthesia, and Impairment) for self-identified MDers and non-MDers. Self-identified MDers (M = 62.67, SD = 20.53) scored higher on the MDS than did non-MDers (M = 11.20, SD = 13.88), $t(259.30) = 29.46$, $p < .001$, Cohen's $d = 2.69$), suggesting that simply accounting for overall mean endorsement level could be sufficient to distinguish between MDers and non-MDers. Also, with a Cronbach's α of .95, the internal consistency of the total set of MDS items was very strong. Thus, we feel comfortable recommending that the identification of a person as positive for MD can be based on overall mean score.

Given the rationale outlined earlier with regard to the inclusion criterion in this pioneering study, we used the self-identified MD status as the best available proxy for a correct identification of MD. We then compared the classifications derived from the MDS using cut-off scores ranging from 5 to 100 in increments of 5 points. That is, for each cut score, we computed a two-way contingency table so we could examine self-identified MD status vs. MD status as determined by MDS score. For instance, using the cut score 30, the contingency table would show the number of self-identified MDers who were classified as MDers by our measure (by scoring 30 or higher) and the number of "false negatives" (i.e., self-identified MDers who were classified as non-MDers by scoring lower than 30). A similar breakdown for the self-identified non-MDers group showed correct classification for non-MDers as well as "false positives." Sensitivity at each cut score

Table 6
Scores of self-identified MDers (n = 341) and non-MDers (n = 106) on the MDS.

Scale	MDer		Non-MDer		Independent-samples t-tests			
	M	SD	M	SD	t	df	p	d
Overall mean score	62.67	20.53	11.20	13.88	29.46	259.30	<.001	2.69
Yearning	62.42	22.97	15.70	17.79	21.95	223.53	<.001	2.14
Kinesthesia	61.68	31.09	8.58	17.62	22.12	315.47	<.001	1.86
Impairment	63.26	26.32	7.57	13.60	28.66	346.81	<.001	2.33

Note. MDS = Maladaptive Daydreaming Scale, MDer = self-identified maladaptive daydreamer, non-MDer = self-identified non-MDer. M = mean, SD = standard deviation, t = independent-samples t-statistic, df = degrees of freedom, p = p-value, d = Cohen's d. Non-integer df were due to the use of the Welch–Satterthwaite (Satterthwaite, 1946; Welch, 1947) equation for df when the assumption of homogeneity of variances was violated.

was computed by determining the proportion of self-reported MDers who were classified as MDers at each cut score, and likewise with sensitivity. This numerical procedure is akin to using ROC curve, however, this approach allowed us to identify with greater ease the exact proportions of false positives and false negatives (as well as correct classifications) at each threshold. Using 30 as the cut-off for inclusion in the MD category (i.e., identifying anyone with at least an overall mean score of 30 as an MDer) led to sensitivity and specificity above 90%. However, we chose a cut-off score of 25 for a positive identification of MD in order to boost the sensitivity further, albeit at the expense of specificity. This led to a sensitivity of 95% and a specificity of 89%.

4.3. Test–retest reliability

The Pearson product–moment correlation between the MDS overall mean scores at the two time points was $r = .92$, indicating very high test–retest reliability. Subscale temporal stability was also high ($r = .89$ for Yearning, $r = .87$ for Kinesthesia, and $r = .88$ for Impairment).

4.4. Do we psychopathologize a common mental behavior? Functional impairment related to MD

In order to determine if MD is part of a regular mental activity or if it may have clinical relevance we investigated the extent to which MDers are hindered by their symptoms in everyday functioning. In order to examine MD-related functional impairment, we chose three items: one capturing the amount of time spent daydreaming, one assessing health-related issues and one measuring social issues caused by MD behaviors. Using the cutoff MDS score of 25 we found that individuals scoring positive for MD experienced much higher levels of functional impairment. Specifically, these individuals reported spending on average 58% of a typical week daydreaming ($SD = 24\%$), compared to an average of 13% of a week ($SD = 15\%$) for individuals scoring negative for MD (MDS score <25), $t(318.54) = 23.59$, $p < .001$, $d = 2.02$. Individuals scoring positive for MD reported much higher levels of health-related dysfunction ($M = 49.58$, $SD = 33.45$) compared to individuals scoring negative for MD ($M = 7.57$, $SD = 14.27$), $t(418.77) = 18.49$, $p < .001$, $d = 1.41$. Finally, individuals scoring positive for MD reported much higher levels of dysfunction related to social relations ($M = 55.18$, $SD = 33.78$) compared to individuals scoring negative for MD ($M = 5.10$, $SD = 12.33$), $t(441.16) = 22.94$, $p < .001$, $d = 1.67$. These findings provide evidence for the interference of MD with daily functioning and related illness burden, thus suggesting some psychopathological properties. Indirectly, results also underscore the dissimilarity between maladaptive and normal daydreaming, as individuals not suffering from MD report very little interference, despite reporting some daydreaming activities.

4.5. Convergent and discriminant validity

We used the above-reported cut-off score of 25 to distinguish between MDers and non-MDers and compared their scores on the other clinical scales to determine the convergent and discriminant validity of the MDS (see Table 7 for mean level

Table 7
Scale scores of diagnosed MDers ($n = 336$) and non-MDers ($n = 111$) on other clinical measures.

Scale	MDer		Non-MDer		Independent-samples *t*-tests			
	M	*SD*	*M*	*SD*	*t*	*df*	*p*	*d*
CEQ	13.75	4.01	7.60	4.36	13.70	445	<.001	1.28
ASRS total	3.71	1.49	1.83	1.52	11.48	445	<.001	1.15
Inattention	2.84	1.18	1.48	1.28	9.94	176.11	<.001	1.04
Impulsivity	0.87	0.75	0.35	0.58	7.50	238.96	<.001	0.68
OCI-R total	20.76	13.21	8.64	7.70	11.82	326.49	<.001	0.83
Washing	1.69	2.69	0.66	1.20	5.57	407.66	<.001	0.32
Checking	3.32	3.12	1.09	1.46	10.16	396.72	<.001	0.61
Ordering	3.66	3.35	2.01	2.00	6.26	318.43	<.001	0.44
Hoarding	4.04	3.22	2.49	2.48	5.29	242.57	<.001	0.44
Obsessing	6.31	3.72	1.88	2.47	14.28	284.51	<.001	1.09
Neutralizing	1.76	2.50	0.51	1.10	7.23	411.01	<.001	0.50
DES total	29.79	17.09	9.77	10.59	14.58	302.76	<.001	0.93
Absorption	45.67	21.63	15.29	14.55	16.69	276.74	<.001	1.18
Amnesia	9.69	13.71	2.70	7.17	6.89	358.89	<.001	0.26
Depersonalization	19.79	22.45	4.11	10.57	9.89	391.20	<.001	0.55
Psychosis screener	1.34	1.54	0.44	0.80	4.42	100.73	<.001	0.29
SPD	3.73	1.09	1.66	0.99	17.73	445	<.001	1.94

Note. MDer = diagnosed maladaptive daydreamer (Maladaptive Daydreaming Scale grand mean $\geqslant 25$), non-MDer = diagnosed non-MDer. *M* = mean, *SD* = standard deviation, *t* = independent-samples *t*-statistic, *df* = degrees of freedom, *p* = *p*-value, *d* = Cohen's *d*. ASRS = ADHD (Attention Deficit/Hyperactivity Disorder) Self-Report Scale; OCI-R = Obsessive–Compulsive Inventory-Revised; DES = Dissociative Experiences Scale; CEQ = Creative Experiences Questionnaire, SPD = Sense of Presence in Daydreaming. Non-integer *df* were due to the use of the Welch–Satterthwaite (Satterthwaite, 1946; Welch, 1947) equation for *df* when the assumption of homogeneity of variances was violated.

comparisons between both groups, and Table 8 for correlations). Individuals diagnosed with MD based on their MDS score had higher scores on all clinical measures compared to individuals without MD (Table 7), which may suggest that MDers experience higher levels of psychological distress. When examining the relationship of the MDS with Wilson and Barber's (1981) original description of fantasy proneness as measured by the CEQ, the MDS was substantially, but not perfectly, associated with the CEQ ($r = .58$, $p < .01$; Table 8), indicating that both constructs are related yet distinct.

Convergent and divergent validity of the MDS was suggested by the correlations between the MDS and ASRS scores. Although self-reported attention deficit and hyperactivity symptoms (ASRS total score) were significantly associated with MDS ($r = .58$, $p < .01$), an examination of Cohen's *d* (last column of Table 7) and the correlations in Table 8 revealed that daydreaming activity was more strongly related to attention/concentration problems ($r = .52$, $p < .01$) than to the behavioral component of hyperactivity ($r = .37$, $p < .01$). This finding is in line with difficulties in controlling the mental activity associated with daydreaming, as reported by MDers. A major cognitive impact of uncontrollable fantasizing is the intense demand exerted on cognitive resources, as reflected in elevated inattention to external demands.

We further found theory-conform associations between MDS and obsessive–compulsive behavior and thoughts assessed by the OCI-R. There was a significant correlation for MDS with the total OCR-R ($r = .49$, $p < .01$), which is in line with the idea that MD reflects an all-consuming, repetitive and under-controlled mental activity, as well as accompanying persistent behaviors (kinesthesia). Further inspection of the Cohen's *d*s and correlations showed that the OCI-R subscales representing mental repetitions (obsessing, $r = .57$, $p < .01$, and checking, $r = .35$, $p < .01$ subscales) were more strongly correlated with the MDS than the subscales representing the behavioral (compulsive) components of OCD (i.e., ordering, hoarding, and neutralizing, *r*s = .26–.30, *p*s < .01). This finding highlights the possibility that MD has some similarities with OCD regarding the urge to engage in daydreaming, but that the behaviors typical for MD such as walking or pacing are distinct from those seen in OCD. That the strongest association was found between the Obsessing subscale and MDS, with a particular strong correlation between Obsessing and MDS Impairment, suggests that one of the possible pathways leading to MD involves neurochemical irregularities associated with intense obsessive urges that can interfere with normal functioning. This thought is in line with Schupak and Rosenthal's description of the successful treatment with fluvoxamine therapy of in a woman suffering from MD who presented no history of childhood adversity or concurrent psychopathology (2009).

Measuring absorption, amnesia and depersonalization experiences, the DES scale showed various links to the MDS. The significant correlation between the DES total score and MDS ($r = .55$, $p < .01$) suggested that maladaptive daydreaming activity was akin to the more general phenomenon of dissociation, but a more careful examination of the subscale scores presented in Table 7 showed, as expected, that the absorption items of the DES were more responsible for this relationship ($r = .63$, $p < .01$) than amnesia ($r = .24$, $p < .01$) or depersonalization items ($r = .39$, $p < .01$). This pattern of associations corresponds with our understanding of MD being foremost a process of full absorption in one's inner world. Our data also reflect, to a lesser extent, a concomitant distancing among MDers from external events and ones' bodies as well as memory deficits associated with the interfering mental processes. For example, prior data showed that many MDers reported not remembering if things were actually done or only fantasized while others reported not feeling their hunger or need to go the bathroom while daydreaming (Bigelsen & Schupak, 2011; Somer et al., submitted for publication). In other words, MD seems to have strong dissociative properties characterized primarily by a propensity of absorption.

The relationship between MDS and its subscales and the psychotic screener showed lowest effect sizes, compared to the other clinical measures utilized in this study. We noted that psychotic screener scores were slightly higher for MDers. However, we believe that many individuals struggling with MD may have interpreted the psychotic screener items referring to thought insertion, being noticed by others and having special powers in the sense of having an unusual psychological experience rather than in the sense of schizophrenia spectrum symptoms. Finally, the highest effect size among our independent variables was demonstrated by our respondents' sense of presence during daydreaming (SPD). The more real the experience of daydreaming had been, the higher was our respondents' likelihood to classify themselves as maladaptive daydreamers (see Table 7). Indeed, SPD was the variable that showed the highest correlation with the MDS, demonstrating that an essential feature of this excessive mental activity and the yearning to engage in it was the unique ability to create the illusion of full immersion and presence in the fantasized scene (see Table 8).

In sum, convergent validity of the MDS is demonstrated by its intense association with the cognitive processes and dysfunctions represented in fantasy proneness, sense of presence in daydreaming, absorption, obsessing, and inattention. MDs discriminant validity is demonstrated by its lower relationships to hyperactivity, compulsive behaviors and pathological dissociative symptoms such as amnesia and depersonalization.

5. Discussion

This study describes the development and validation of the Maladaptive Daydreaming Scale, an instrument designed to gauge pathological fantasizing, characterized by time-consuming thoughts and behaviors, as well as related dysfunction and distress, which possibly represents an unrecognized clinical syndrome. The present research demonstrates that the MDS is a useful measure with good psychometric properties and is ready to be adopted for further clinical research. Our prior, mostly qualitative work on MD (Bigelsen & Schupak, 2011; Somer, 2002; Somer et al., submitted for publication) illustrated that MD themes typically include highly complex fantasies of social attractiveness, power, fame and love, as well as other fanciful plots, accompanied by acted out behaviors. Besides it being extremely gratifying, MD is characterized by a sense of

Table 8
Correlations between the MDS and the other clinical scales.

Scales	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MDS Overall	1.00																				
MDS Yearning	.92	1.00																			
MDS Kinesthesia	.80	.69	1.00																		
MDS Impairment	.92	.72	.64	1.00																	
CEQ	.58	.60	.51	.45	1.00																
ASRS Overall	.60	.49	.50	.60	.46	1.00															
ASRS Inattention	.52	.41	.39	.55	.36	.83	1.00														
ASRS Hyperactivity	.37	.32	.39	.33	.35	.61	.27	1.00													
OCI-R Overall	.49	.47	.42	.42	.49	.46	.33	.38	1.00												
OCI-R Washing	.26	.28	.27	.18	.30	.22	.12	.26	.65	1.00											
OCI-R Checking	.35	.34	.32	.30	.37	.27	.20	.22	.77	.44	1.00										
OCI-R Ordering	.30	.31	.28	.23	.34	.23	.14	.29	.78	.52	.56	1.00									
OCI-R Hoarding	.30	.31	.23	.26	.32	.39	.33	.25	.70	.27	.47	.42	1.00								
OCI-R Obsessing	.56	.49	.45	.55	.47	.52	.39	.36	.76	.35	.46	.44	.47	1.00							
OCI-R Neutralizing	.26	.25	.21	.22	.30	.30	.21	.29	.70	.43	.47	.52	.37	.43	1.00						
DES Overall	.55	.56	.48	.45	.63	.53	.39	.42	.58	.37	.45	.40	.36	.57	.36	1.00					
DES Absorption	.63	.62	.55	.52	.69	.57	.43	.44	.57	.33	.43	.38	.37	.58	.32	.95	1.00				
DES Amnesia	.24	.26	.21	.19	.34	.32	.26	.24	.37	.30	.31	.30	.18	.29	.27	.70	.56	1.00			
DES Depersonalization	.39	.41	.31	.31	.42	.35	.23	.31	.50	.32	.37	.31	.32	.48	.37	.81	.67	.49	1.00		
Psychosis Screener	.44	.39	.35	.42	.50	.38	.27	.35	.50	.29	.44	.30	.35	.45	.35	.58	.57	.35	.50	1.00	
SPD	.70	.72	.57	.57	.66	.42	.36	.30	.41	.26	.29	.30	.25	.44	.23	.59	.64	.30	.43	.40	1.00

Note. MDS = Maladaptive Daydreaming Scale, CEQ = Creative Experiences Questionnaire, ASRS = ADHD (Attention Deficit/Hyperactivity Disorder) Self-Report Scale, OCI-R = Obsessive–Compulsive Inventory-Revised, DES = Dissociative Experiences Scale, SPD = Sense of Presence in Daydreaming. Correlation between ASRS Hyperactivity and Psychosis Screener is not statistically significant; correlations between ASRS Inattention and Psychosis Screener, and between ASRS Inattention and OCI-R Washing, are statistically significant at $p < .05$; all other correlations are statistically significant at $p < .01$.

compulsion associated with distress and impaired functioning. Reflecting these characteristics, the newly developed MDS was devised using items capturing these identified characteristics (quality, control, distress, benefits, and functioning). Analysis provided strong support for a three-factor structure with factors representing affective, behavioral and functioning properties of the phenomenon. A confirmatory three-correlated-factor model showed a very good overall statistical fit with all model parameters significantly different from 0. Thus, MD seems to represent a phenomenon that is particularly well expressed by three meaningful specific factors that were in line both with our clinical observations and with our theoretical expectations: Items describing intense craving of daydreaming and the pleasure experienced by engaging in this mental activity were clustered in the factor Yearning. The factor labeled Kinesthesia represented items describing compulsive behavioral patterns associated with this mental activity. The distress and dysfunction related to excessive, uncontrollable daydreaming was gauged by items belonging to the factor Impairment.

Findings illustrate that the MDS is a highly reliable measure. The total scale and its subscales had very good internal consistency, suggesting that the items loading on these factors are thematically and substantively related to each other. Additionally, the test–retest correlations were high, indicating that the MDS is also highly reliable over time. The fact that these correlations were high not only for the overall score, but also for the three specific factors, suggests that the experience of MD is very stable over time. This is in line with expectations about MD as a clinical phenomenon, as we would, for example, not expect to see someone scoring high on impairment items at Time 1 but then score low on those same items at Time 2.

Further results confirmed the MDS as a valid measure of maladaptive daydreaming. Given that its items were actually formulated based on prior qualitative data the daydreaming experiences provided by individuals seeking support for MD as well as input from daydreaming experts, its face validity is high. Feedback from study participants gathered during our pilot administration of the MDS and later, from spontaneous feedback we received from many respondents also showed that MDers felt that their experience was captured appropriately and taken seriously, which in turn increased their compliance when completing the questionnaire. Criterion-related evidence was demonstrated by the high correlation of the MDS with the most closely associated criterion measure: Wilson and Barber's (1981) CEQ, the original description of "fantasy proneness." Evidence for discriminant validity was further obtained from the differential effect sizes of the relationships between MDS and subscales of other instruments used in this study. For instance, MD was associated with diminished concentration, but although individuals engaging in MD tend to move while fantasizing (Bigelsen & Schupak, 2011; Somer, 2002), their very active mental state was more strongly related to ASRS indices measuring depletion of attention resources than to those indices measuring restlessness. That the MDS captured the ruminative-addictive nature of MD well was demonstrated through the strong association with the OCI-R measuring obsessive–compulsive thoughts and behaviors. This link also indicates that the repetitive mental activity of maladaptive daydreaming is more similar to the mental repetitions characterizing OCD than to compulsions (or rituals) associated with the behavioral facet of OCD. Further indication of the discriminant validity of the MDS was obtained by examination of its relationship to dissociative experiences. As expected, MD was more similar to intense absorption than to the DES factors of amnesia or depersonalization/derealization which represent dissociative experiences that are more strongly related to pathological dissociation. In sum, investigation of convergent and divergent validity demonstrated that the MDS successfully measures a special, probably pathological form of obsessive fantasizing characterized by intense inner absorption compromising concentration on external tasks. The MDS presents in addition a good reflection of our clinical observations as well as the qualitative descriptions of MD available from our prior work. The patterns of associations further illustrated MD in the context of well-established clinical phenomena, highlighting similarities in characteristics but also important differences. Moreover, we provided some evidence suggesting that MD represents a mental condition that deserves further scientific and clinical attention due to the extent to which individuals with MD are hindered in their daily functioning. The amount of time consumed by daydreaming, negative health consequences, such as disturbed sleep, and compromised social relations are all outcomes suggesting that MD is worth further clinical examination, which may solidify the evidence for considering MD as a mental disorder on its own. Consequently, individuals suffering from MD would not only be able to receive a diagnosis capturing their experience but also specialized professional care.

The present study offers strong evidence in favor of the use of a single composite score for the MDS. Using a cut-off score of 25 (out of a maximum of 100) proved useful in our sample because it discriminated well between MDers and non-MDers. This mean score served as a reliable cut-off mark for the correct identification of maladaptive daydreaming given its superb sensitivity (95%) and high specificity (89%). That this threshold is fairly low also provides further evidence for the soundness of the instrument, demonstrating its potentially high predictive validity and suggesting that the selected items are pathognomonic to maladaptive daydreaming. Thus, even a relatively low item endorsement level may be indicative of this abnormal mental activity. We expect individuals with MD to present with a variety of etiologies and symptom combinations, representing unique profiles of yearning, movement and dysfunction. As more knowledge about MD accrues we expect that specific treatment plans could be offered, for example, depending on the differential origins of MD and the specific presentation of symptoms. While we do not currently advocate the use of subscale scores for purposes of diagnosis (research into MD is still in an early stage), we nevertheless feel that important symptom-related information can be gained by examining subscale mean scores.

Because of the pioneering nature of the present study it was impossible to use a pre-existing clinical diagnosis for validation purpose, as MD presents no formal disorder in any of the diagnostic manuals. We, therefore, resorted to the self-identification of MDers as our external criterion. Moreover, we recognize that certain forms of (immoderate) daydreaming may not be experienced as maladaptive because they do not cause distress or dysfunction. However, "normal daydreamers"

are unlikely to be included among our self-identified MDers because this group was mostly sampled from forums offering peer-support for excessive fantasizers in distress. The latter assumption was supported by significantly higher rates of health- and socially-related dysfunctions reported by MDers relative to our comparison group. Future research should determine the existence of non-maladaptive excessive daydreamers that presents with high scores on the yearning factor along low scores on the impairment factor.

5.1. Limitations

Despite several strengths of the present study, including the introduction of an under-researched clinical phenomenon and the presentation of a new, psychometrically sound measure capturing it, several limitations should be mentioned. Although our sample was large, international and diverse (respondents came from all continents except Antarctica), study participants were primarily recruited via online MD communities. This means that MD respondents were, by definition, self-identified and seeking peer support for distress associated with their excessive daydreaming. Our final sample comprised of a large proportion of females. Although females could be over-represented among MDers, future research should strive to include more males. As this sampling approach resulted in few non-MD respondents for comparison, we recruited more non-MDers social media (e.g., Facebook) and via word-of-mouth asking MDers to recommend our study to their families, which could be responsible for the older age of the non-MDers. Our sampling method also resulted in geographically unmatched samples, a condition that could, theoretically, contribute to the variance between the groups. Differences between continents as presented in Table 1 are difficult to interpret, as awareness of and access to the online forums and interest groups may vary between countries. Still, these differences do not limit the reliability and validity of the MDS, but rather call for future work to investigate population-based samples in different countries using identical sampling methods. Furthermore, it would be ideal to translate the MDS into other languages so that investigation of MD is not limited to English-speaking responders to facilitate examination of this phenomenon across cultures. Finally, while respondents' command of English could be assumed (because of their activity in English language Internet forums and since most were from English speaking countries), some form of assessment of participants proficiency in English should be attempted in future research.

5.2. Conclusions

The MDS represents a highly reliable and valid new measure that we believe is ready for use in applied research. Our clinical experience, backed up by the content posted in numerous Internet forums, websites and support groups run by and for thousands of individuals who seek information and advice on how to cope with MD, has convinced us of the need to design the MDS. This assessment tool enables further investigation of the phenomenon, which will clarify whether MD is a pathology by its own, or a subfacet of another clinical disorder. We are confident that our study offers a good foundation for further research on this psychological phenomenon, which may lead, in the long-run, to list MD as a unique mental disorder. We also hope that this study will help raise awareness of MD among clinicians and that our findings will encourage the development of treatment protocols for individuals suffering from this condition.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.concog.2015.12.001.

References

Akaike, H. (1974). A new look at the statistical model identification. *IEEE Transactions on Automatic Control, 19*(6), 716–723.
American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.
Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238–246.
Bentler, P. M. (1995). *EQS structural equations program manual*. Encino, CA: Multivariate Software.
Bernstein, E. M., & Putnam, F. W. (1986). Development, reliability, and validity of a dissociation scale. *Journal of Nervous and Mental Disease, 174*(12), 727–735.
Bigelsen, J., & Schupak, C. (2011). Compulsive fantasy: Proposed evidence of an under-reported syndrome through a systematic study of 90 self-identified non-normative fantasizers. *Consciousness and Cognition: An International Journal, 20*(4), 1634–1648.
Browne, M. W. (2001). An overview of analytic rotation in exploratory factor analysis. *Multivariate Behavioral Research, 36*(1), 111–150.
Degenhardt, L., Hall, W., Korten, A., & Jablensky, A. (2005). *Use of brief screening instrument for psychosis: Results of a ROC analysis*. Technical Report No. 210. Sydney: National Drug and Alcohol Research Centre.
Foa, E. B., Huppert, J. D., Leiberg, S., Langner, R., Kichic, R., Hajcak, G., et al (2002). The Obsessive-Compulsive Inventory: Development and validation of a short version. *Psychological Assessment, 14*(4), 485–496.
Freeman, R. (2014). Stereotypic movement disorder: A case for Procrustes? *Developmental Medicine & Child Neurology, 65*(12), 1139–1140.
Freud, S. (1908, 1962). Creative writers and daydreaming. In J. Strachey (Ed.), *The standard edition of the complete psychological works of Sigmund Freud* (Vol. IX, pp. 143–153). London: Hogarth.
Hartman, H. (1958). *Ego psychology and the problem of adaptation*. New York: International Universities Press.
Huba, G., Singer, J., Aneshensel, C., & Antrobus, J. (1982). *Short imaginal processes inventory*. Port Huron, MI: Research Psychologists Press.
Kessler, R. C., Adler, L., Ames, M., Demler, O., Faraone, S., Hiripi, E., et al (2005). The World Health Organization adult ADHD self-report scale (ASRS): A short screening scale for use in the general population. *Psychological Medicine, 35*(2), 245–256.

Kessler, R. C., Adler, L. A., Gruber, M. J., Sarawate, C. A., Spencer, T., & Van Brunt, D. L. (2007). Validity of the World Health Organization Adult ADHD self-report scale (ASRS) screener in a representative sample of health plan members. *International Journal of Methods in Psychiatric Research, 16*(2), 52–65.
Killingsworth, M. A., & Gilbert, D. T. (2010). A wandering mind is an unhappy mind. *Science, 330*(6006), 932.
Klinger, E. (2009). *Daydreaming and fantasizing: Thought flow and motivation. Handbook of imagination and mental simulation* (pp. 225–239). New York, NY, US: Psychology Press.
Lynn, S. J., & Rhue, J. W. (1988). Fantasy proneness: Hypnosis, developmental antecedents, and psychopathology. *American Psychologist, 43*(1), 35–44.
McVay, J. C., & Kane, M. J. (2010). Does mind wandering reflect executive function or executive failure? Comment on Smallwood and Schooler (2006) and Watkins (2008). *Psychological Bulletin, 136*, 188–189.
Merckelbach, H., Horselenberg, R., & Muris, P. (2001). The creative experiences questionnaire (CEQ): A brief self-report measure of fantasy proneness. *Personality and Individual Differences, 31*, 987–995.
Mrazek, M. D., Phillips, D. T., Franklin, M. S., Broadway, J. M., & Schooler, J. W. (2013). Young and restless: Validation of the Mind-Wandering Questionnaire (MWQ) reveals disruptive impact of mind-wandering for youth. *Frontiers in Psychology, 4*, 560.
Muthén, L. K., & Muthén, B. O. (1998–2011). *Mplus user's guide* (6th ed.). Los Angeles, CA: Muthén & Muthén.
Myers, S. A. (1983). The Wilson–Barber Inventory of Childhood Memories and Imaginings: Children's form and norms for 1337 children and adolescents. *Journal of Mental Imagery, 7*, 83–94.
Poerio, G. L., Totterdell, P., Emerson, L.-M., & Miles, E. (2015). Love is the triumph of imagination: Daydreams about significant others are associated with increased happiness, love and connection. *Consciousness and Cognition, 33*, 135–144.
R Core Team (2013). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. <http://www.R-project.org>.
Raichle, M. E., MacLeod, A. M., Snyder, A. Z., Powers, W. J., Gusnard, D. A., & Shulman, G. L. (2001). A default mode of brain function. *Proceedings of the National Academy of Sciences United States of America, 98*, 676–682.
Robins, L. N., Wing, J., Wittchen, H. U., et al (1988). The composite international diagnostic interview. An epidemiologic instrument suitable for use in conjunction with different diagnostic systems and in different cultures. *Archives of general psychiatry, 45*, 1069–1077.
Robinson, S., Woods, M., Cardona, F., Baglioni, V., & Hedderly, T. (2014). Intense imagery movements: A common and distinct paediatric subgroup of motor stereotypies. *Developmental Medicine & Child Neurology, 65*(12), 1212–1218.
Ross, C. A., Norton, G. R., & Anderson, G. (1988). The Dissociative Experiences Scale: A replication study. *Dissociation: Progress in the Dissociative Disorders, 1*(3), 21–22.
Satterthwaite, F. E. (1946). An approximate distribution of estimates of variance components. *Biometrics Bulletin, 2*(6), 110–114.
Schupak, C., & Rosenthal, J. (2009). Excessive daydreaming: A case history and discussion of mind wandering and high fantasy proneness. *Consciousness and Cognition, 18*, 290–292.
Schwarz, G. (1978). Estimating the dimension of a model. *Annals of Statistics, 6*(2), 461–464.
Sclove, L. S. (1987). Application of model-selection criteria to some problems in multivariate analysis. *Psychometrika, 52*(3), 333–343.
Singer, J. L. (1966). *Daydreaming*. New York: Random House.
Singer, J. L., & Antrobus, J. S. (1963). A factor-analytic study of daydreaming and conceptually-related cognitive and personality variables. *Perceptual and Motor Skills, 17*, 187–209.
Slater, M., Steed, A., McCarthy, J., & Maringelli, F. (1998). The influence of body movement on presence in virtual environments. *Human Factors: The Journal of the Human Factors and Ergo- nomics Society, 40*(3), 469–477.
Smallwood, J., Brown, K. S., Tipper, C., Giesbrecht, B., Franklin, M. S., Mrazek, M. D., et al (2011). Pupillometric evidence for the decoupling of attention from perceptual input during offline thought. *PLoS ONE, 6*, e18298.
Smallwood, J., Tipper, C., Brown, K., Baird, B., Engen, H., Michaels, J. R., et al (2012). Escaping the here and now: Evidence for a role of the default mode network in perceptually decoupled thought. *Neuroimage, 69*, 120–125.
Somer, E. (2002). Maladaptive daydreaming: A qualitative inquiry. *Journal of Contemporary Psychotherapy, 32*(2), 197–212.
Somer, E. (2013). From adaptive fantasy to dissociative psychopathology: On forms of daydreaming. *Clinical Corner, ISSTSD News, 31*(2), 3–4.
Somer, E., Somer, L., & Jopp, D. (2015). Parallel lives: A phenomenological study of people struggling with maladaptive daydreaming (submitted for publication).
Somer, E., Dolgin, M., & Saadon, M. (2001). Validation of the Hebrew version of the Dissociative Experiences Scale (H-DES) in Israel. *Journal of Trauma and Dissociation, 2*(2), 53–66.
Steiger, H. H., & Lind, J. M. (1980, June). Statistically based tests for the number of common factors. *Paper presented at the annual meeting of the Psychometric Society, Iowa City, IA*.
Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences ("absorption"), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology, 83*, 268–277.
Tucker, L. R., & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika, 38*(1), 1–10.
Van Ijzendoorn, M. H., & Schuengel, C. (1996). The measurement of dissociation in normal and clinical populations: Meta-analytic validation of the Dissociative Experiences Scale (DES). *Clinical Psychology Review, 16*(5), 365–382.
Welch, B. L. (1947). The generalization of "Student's" problem when several different population variances are involved. *Biometrika, 34*(1–2), 28–35.
Wilson, S. C., & Barber, T. X. (1981). Vivid fantasy and hallucinatory abilities in the life histories of excellent hypnotic subjects ("somnambules"): Preliminary report with female subjects. In E. Klinger (Ed.). *Imagery: Concepts, results, and applications* (Vol. 2, pp. 133–149). New York: Plenum Press.
Witmer, B. G., & Singer, M. J. (1994). *Measuring immersion in virtual environments*. (ARI Technical Report 1014). Alexandria, VA: U. S. Army Research Institute for the Behavioral and Social Sciences.
Zhiyan, T., & Singer, J. L. (1997). Daydreaming styles, emotionality, and the big five personality dimensions. *Imagination, Cognition and Personality, 16*, 399–414.
Zwick, W. R., & Velicer, W. F. (1986). Comparison of five rules for determining the number of components to retain. *Psychological Bulletin, 99*(3), 432–442.