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Disentangling the Phenomenology of Mind-Wandering

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Abstract

Objective: In the last decade, the research about mind-wandering (MW) significantly improved and allowed us to depth the phenomenology of thoughts. Prototypically, excessive MW was linked with ADHD symptoms. However, many studies have demonstrated the need to relate the type of mind-wandering with specific phenomenological presentations. **Method:** Participants ($N = 53$; 54.7% male; age range 18–36 years) selfreported the Mind Excessively Wandering Scale (MEWS), and they were investigated for ADHD, impulsivity levels, and anxiety/depressive symptoms. **Results:** The exploratory analysis indicated a meaningful correlation between MEWS and anxiety traits and depressive symptoms. There was no significant relationship with ADHD symptoms. **Conclusion:** These findings based our discussion about MW's phenomenology considering the novel classification model based on the consideration of clinical markers such as thoughts' content. *(J. of Att. Dis. XXXX; XX(X) XX-XX)*

Keywords

ADHD, cognition, cognitive functioning, anxiety, depression

Introduction

The number of studies addressing Mind Wandering (MW) increased significantly in the last 5 years, contributing to deepening knowledge on cognition's phenomenology. MW is a universal human experience, defined as periods when attention switches from the task at hand to intrinsically generated thoughts (Smallwood & Schooler, 2014). Those episodes can be expected in 30%–50% of the adult waking time (Killingsworth & Gilbert, 2010). MW has an important adaptative function, promoting future planning and prospection, decision-making, problem-solving, and reconsideration of past facts (Klinger et al., 2018). Similar to other mental processes, its excess is associated with adverse outcomes: excessive MW can be costly in educational and learning activities, and ruminative ideas connected with negative mood, for example (Poerio et al., 2013; Risko et al., 2012). Overall, the MW's conceptual model is based on two dimensions: the one regarding stimulus dependency and another one differentiating intentional and unintentional MW (Seli et al., 2016; Stawarczyk et al., 2011).

Unintentional or *spontaneous* MW refers to task-unrelated thoughts capturing one's focus, generally to process low order of information. Unintentional MW has been closely related to ADHD (Seli et al., 2016). *Deliberate* MW intentionally captures one's focus in order to process high-order information such as self-reflection (Carriere et al., 2013). Higher deliberated MW levels were associated with worse mood, higher stress, and lower self-esteem (Mrazek et al., 2013).

Research data have highlighted the correlation between MW and adverse outcomes in some psychiatric conditions, such as affective symptoms, schizophrenia, and Alzheimer's disease (El Haj et al., 2020; Figueiredo et al., 2020; Iglesias-Parro et al., 2020). This huge spectrum of conditions to which the MW may be related raises questions about this construct's different facets. For example, regarding the relationship with affective symptoms, excessive MW has been pointed out as a contributor to mood changes and as a product of high levels of anxiety (Franklin et al., 2013).

Initially, ADHD was described as a prototypical condition related to MW. In ADHD, the MW definition can traduce the default mode network (DMN) (Kucyi & Davis, 2014). Deficient deactivation of DMN activity during cognitive tasks has been associated with ADHD, leading to excessive MW that leads to the inattentive symptoms of ADHD (Bozhilova et al., 2018; Christakou et al., 2013). Although the close relationship between inattentive symptoms and

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MW has been extensively explored, the heterogeneity of conditions related to this outcome indicates that this construct can be useful to explain also low cognitive performance in other psychiatric disorders.

This study explores the relationship between MW and other symptoms above ADHD core symptoms to understand cognitive functioning's phenomenology. We have recently published a study investigating the relationship between ADHD and MW (Figueiredo et al., 2018). Our findings indicated a significant role for depressive and anxiety symptoms in excessively self-reported MW. Here, we aim to explore the relationship between ADHD symptoms, anxiety, depressive symptoms, and impulsivity levels in adult samples to extend our previous findings.

Material and Method

Participants and Procedures

Fifty-three adults participated in this study. They were recruited through the outpatient unit for neuropsychological assessment at the D'Or Institute for Research and Education (IDOR), Rio de Janeiro, Brazil. The participants were referred because of either learning or behavioral problems. The collection of data was initiated in January 2019 and occurred until January 2020. The collection of data was included in a systematic sequential order of the participants' assessment, which included psychiatric, neuropsychological, and language assessments. The MW assessment occurred during a psychiatric evaluation. The Institute D'Or for Research and Education (IDOR) Ethics Committee approved this study. All participants and respective parents provided written informed consent.

Exclusion criteria were (a) cognitive impairment defined as an IQ < 80; b) presence of autism spectrum disorders or autistic traits; (c) existence of communication disorder (language development disorder); (d) Psychosis; (e) Substance Use Disorders; (f) Neurologic conditions and genetic disorders. All interviews were conducted by a board-certified psychiatrist using DSM-5 criteria (American Psychiatry Association [APA], 2013).

All patients received a unique identification code to maintain data anonymity. Participants were not given monetary rewards for their involvement.

Assessment Tools

Mind excessively wandering assessment. All participants rated the Brazilian version of MEWS to assess MW (Figueiredo et al., 2018). It is a 12-item self-report measure, where the participant rates items on a Likert-scale from 0 (rarely) to 3 (nearly all the time). We used the cutoff point suggested in the recommendations proposed by the original version, which suggests considering excessive MW above 15 points. The MEWS has previously shown excellent psychometric properties and construct validity, with an excellent internal consistency ($\alpha > .9$) and high sensitivity (0.9) for the ADHD diagnosis. Eigenvalues indicated a unidimensional structure of the MEWS.

ADHD symptoms. All subjects participated in a detailed, clinical interview using DSM-5 criteria for ADHD (APA, 2013) (Caye et al., 2017); they also completed the ASRS (Adult Self Report Scale), which helped guide the interview. ADHD diagnosis was made by considering the number of positive symptoms reported in ASRS-IV and confirmed through clinical interviews with the specialists. The consultant involved collecting self-reports and collateral reports about the onset, course, and profile of symptoms impairment.

Anxiety and depressive symptoms. Anxiety symptoms were assessed using the State-Trait Anxiety Inventory (STAI), validated in Brazil (Biaggio et al., 1977; Spielberger et al., 1970). STAI consists of two subscales that measure situational anxiety and general anxiety levels (trait anxiety).

Depressive symptoms were assessed with Beck's Depression Scale (Beck et al., 1961). It evaluates the severity of emotional, somatic, cognitive, and motivational symptoms frequent in depressive episodes.

Impulsivity levels. The Impulsive Behavior Scale (UPPS) scale was used to measure impulsivity levels (Whiteside & Lynam, 2001). The UPPS assesses the five dimensions of impulsivity constructs (negative-urgency, positive-urgency, lack of premeditation, lack of perseverance, and sensation seeking). The five subscores were considered for the analysis with the MW scores.

IQ scores. Intelligence level (IQ) was assessed with the Weschler Abbreviated Scale of Intelligence (WISC-IV) (Wagner et al., 2014).

Sample size determination. Sample size estimation was based on the primary endpoint (difference between the two groups according to the MEWS' cutoff point). An effect size of $d = 0.5$ was considered as relevant (d denotes the difference in the difference of the score between the two groups in standard deviation units). The study was designed to detect this difference with a power of 80% at a significance level of 5%.

Data analysis. All computations were performed using IBM SPSS Statistics (Version 27.0, IBM Corporation, Amonk, NY, USA). We checked the normality of data for all variables using the Smirnov-Kolmogorov test. The statistical analysis was made in the following steps:

a) The total MEWS scores were compared between the ADHD group and clinical controls using a *t*-test.

Table 1. Sociodemographic Characteristics of the Participants.

	ADHD group ($N = 17$)	Clinical control group ($N = 36$)	Significance (p value)
Age	24.0 ($SD = 7.9$), range = 18–33	26.5 ($SD = 9.2$), range = 18–36	$p = .34$
Gender			–
Male	11	18	
Female	6	18	
MEWS total score	20.53 ($SD = 9.7$)	22.25 ($SD = 8.0$)	$p = .50$
STAI-T	43.86 ($SD = 13.0$)	50.8 ($SD = 13.2$)	$p = .11$
STAI-S	45.93 ($SD = 45.9$)	46.87 ($SD = 11.1$)	$p = .81$
BECK	12.43 ($SD = 9.5$)	18.68 ($SD = 11.3$)	$p = .08$
UPPS	116.86 ($SD = 18.6$)	103.68 ($SD = 17.3$)	$p = .09$
IQ scores	97.59 ($SD = 9.8$)	103.89 ($SD = 12.9$)	$p = .08$

b) Correlations of MEWS, anxiety trait and state, depression, impulsive symptoms, and IQ scores were explored in the entire sample using Pearson's correlation.
c) Regression analysis was based on step (b) results in order to investigate the contribution of anxiety, depressive, and impulsive symptoms for MW levels. Multicollinearity was assessed according to previously suggested criteria (Myers, 1990). Also, the assumption of homogeneity of variance (homoskedasticity) was attained.

Results

Descriptive Analysis of the Sample

Our sample comprised 53 subjects from both genders (27 males, 50.9%), aged 18–36 years (mean = 24.5). Participants belonged to middle-high socioeconomic status according to the occupation and education level of parents. Seventeen subjects (10 males, 58.8%) fulfilled the criteria for ADHD diagnosis according to DSM-5 criteria, and 36 were included as clinical controls. The comparison group includes participants with depressive disorders ($N = 14$), anxiety disorders ($N = 20$), and learning disabilities ($N = 18$).

ADHD and clinical controls did not differ in their intelligence level, anxiety, depression, and impulsivity measures. MEWS total score was not statistically significant ($t[51] = -.679$, $p = .5$) between groups (Table 1).

We obtained an irrelevant number of missing data. Only one of the participants did not provide a complete UPSS response. We conducted a complete case analysis and single imputation of data.

Symptoms Correlation with MEWS

The was a significant correlation between MEWS and STAI-T scores ($p = .578$, $p < .001$). There was also a significant correlation between MEWS and UPPS scores ($p = .415$, $p = .01$). The correlation between depressive symptoms (rs = .469, $p = .001$) and anxiety state ($rs = .313$, $p = .03$) was significant, as expected.

Specific Associations with MEWS

Individual linear regression analysis was performed to test for specific associations between MEWS and variables with a significant correlation. Due to the sample size, each cluster of symptoms was modeled in a separate model.

Anxiety trait had a significant association with MEWS ($F = 21.09$, $df = 1$, adjusted $R^2 = .33$, $p < .001$). Depressive symptoms also were a predictor for MEWS ($F = 12.75$, $df = 1$, adjusted $R^2 = .211$, $p < .001$). The results are shown in Table 2.

Discussion

This study aimed to investigate the intricate relationship between MW and ADHD symptoms, taking into consideration anxiety, depression, and impulsivity levels in an adult sample. This exploratory analysis might contribute to understand the phenomenology of MW better. Although excessively MW has been strongly linked with ADHD, MW scores were similar in ADHD and control group. However, we found a significant role of anxiety and depressive symptoms in predict MW.

Our findings regarding the relationship between MW and anxiety and depressive symptoms are similar to our previous results with adolescents (Figueiredo et al., 2020). Those from Kruger et al., 2020 highlighted the important role of depressive and anxiety symptoms for excessive MW.

A critical analysis of the standard instrument used to assess the MEWS is pivotal in discussing our findings. Mowlem et al. (2019) developed the original version MEWS scale used in our study, which captures unintentional and uncontrollable mind-wandering. Although MEWS provides information regarding unintentional thoughts; it does not distinguish their *content*. Questions such as "I have difficulty controlling my thoughts," "My thoughts are on the go all the time," and "I experience ceaseless mental activity" are not sensitive to distinguish from the two facets of MW. We suggest that more in-depth insight into the content of the thoughts could bring light to our findings.

Table 2. Regression Analysis Modeled in a Separate Model of Symptoms Correlated with Mind-Wandering.

	Symptoms modeled in separate model					
	β	*SE*	*p*-Value	*F* statistic	*df*	Adjusted R^2
Inattentive symptoms	.366	0.425	.007	7.87	1	.134
Hyperactivity	.388	0.413	.04	9.03	1	.134
STAI-T	.578	0.085	.000*	21.09	1	.318
STAI-S	.392	0.106	.008	7.64	1	.134
BECK	.478	0.108	.001*	12.75	1	.211
UPPS	.415	0.083	.018	6.24	1	.145

*$p < .005$.

Subjects diagnosed with ADHD frequently experience anxious and depressive symptoms. In our study, the comparison group (a clinical control group) comprises individuals with high levels of anxiety and depressive symptoms, similar to those seen in ADHD. Our findings indicate that anxiety and depression are strongly related to MW, independent of ADHD symptoms. Mason et al. (2007), Seli et al. (2019), and Arch et al. (2020) already demonstrated the relationship of anxiety and depressive symptoms with MW. Those authors suggest that ADHD symptoms are probably a significant predictor only of *spontaneous* MW. In contrast, anxiety and depressive symptoms are a predictor of both *deliberated* and *spontaneous* MW.

Ruby et al. (2013) and Stawarczyk and cols. in a laboratory setting, demonstrated that most MW content is related to the self (Stawarczyk et al., 2013; Stawarczyk et al., 2011). These findings reflect the effects that are possibly caused by high levels of anxiety and depression. In both conditions, cognitive distortions are expected to lead to increased concerns and ruminative thoughts. This effect contributes to the increase in deliberate MW, which traduce thoughts with high energy load.

We believe that the content analysis could be an essential contributor to disentangling the MW construct during its assessment. Jayasinghe (2020) published a preliminary exploration of MW using a novel systematic approach. We recognize the vital role of continuous update of theoretical models regarding cognition constructs due to the implementation of new findings. Based on this, we reinforce the importance of phenomenological characteristics in results analysis and treatment approaches.

Attention-deficit demands are vast and frequent in clinical practice. MW constitutes an intersection point between different conditions with similar adverse functional outcomes, mainly in adulthood. The scientific knowledge regarding MW can guide the treatment framework and help avoid stimulant prescription mistakes.

Our study has many limitations. First, as critically analyzed, the instrument used for MW assessment, although well established as a consistent tool, cannot be comprehensive enough to classify the MW. The absence of information about thought content and related feelings could contribute to mixed results about risk factors. Also, our ADHD sample size and participant's psychiatric profile can be contributing to the low scores in MW. We prospect to consider the cognitive profile obtained in neuropsychological evaluation to reinforce the contributors for excessive MW. Finally, the depressive and anxiety symptoms are qualified as reaching a threshold for DSM-5 diagnostic criteria, and this needs to be considered to prevent erroneous extrapolation of the results.

Our finding constitutes an essential factor in discuss this phenomenon. The clinical phenomena of excessive MW can be present in individuals with mental health problems, with several and specific associations. Whether a deliberated or spontaneous process, task-unrelated thoughts characteristics are probably key to classifying the MW.

Declaration of Conflicting Interests

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