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Relationship between Impulsivity and Meta-Cognition with Cognitive Failures

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Abstract

Introduction: Inadvertent mistakes are often major problems in daily life. Cognitive failure is the nomenclature attributed to these defects and cognitive failures questionnaire measures the self-reported frequency of these mistakes. It is hypothesized that impulsivity and meta-cognition have underlying associations with cognitive failures. The present study aimed to explore the relationship between impulsivity and meta-cognition with cognitive failures.
Method: A randomly selected sample of 125 university students (age range: 18-22) administered the Cognitive Failures Questionnaire (CFQ), UPPS Impulsive Behavior Scale Questionnaire, and Meta-Cognition Questionnaire (MCQ). Data were analyzed using regression.
Results: The results indicated that the component of meta-cognition, cognitive confidence had a positive significant relationship with cognitive failures ($r=0.51$, $p<0.01$). Furthermore, amongst components of impulsivity, urgency had a significant negative relationship with cognitive failures ($r=-0.44$, $p<0.01$). A regression analysis revealed that cognitive confidence and urgency could predict cognitive failure variance. According to Beta coefficients, relative potion of cognitive confidence to predict CF was 51% at first step and 40% in the second. Relative potion of urgency in the second step was 27%.
Conclusion: The effect of little urgency and inefficient cognitive confidence is noticeable in distraction, memory problems, blunders and lack of names remembering.

Keywords: Impulsivity, Meta-cognition, Cognitive Failures

Introduction

Cognitive failures are usually taken as mistakes made by a person while doing tasks that they are naturally capable of carrying out. To put it another way, it is a multi-dimensional construct entailing errors in shaping targets, errors in activation of schemas, and errors in triggering actions [1]. Cognitive failures in everyday life have a gamut from a lapse without any pertinent consequences to an adversity with huge consequences, depending on the context in which they occur [2]. Mistakes may also be transformed into accidents and even the cause of mutilating injuries or deaths [3,4]. Frequency of self-reported cognitive failures has been noted to be more in women compared to men. Further, the self-reported cognitive failures scores decrease as age increases, but objective-test data have different results [5,6,7].

Impulsiveness is defined as a predisposition toward rapid, unplanned reactions to internal or external stimuli regardless of potential negative results of these reactions [8]. It has been suggested that there may be a consequential distinction between state impulsiveness and

trait impulsiveness [9]. Thus, it would be propitious to delineate it from the latter perspective here. Whiteside et al. [10] offered four different psychological processes that lead to impulsive behaviors: urgency (tendency to experience severe impulsivities), lack of premeditation (lack of attention to and pondering about detailed points before any action and behavior), lack of perseverance (inability to concentrate and persevere especially about uninteresting activities), and sensation seeking (pursuing and enjoying exciting activities and seeking new experiences). Claes et al. [11] applied impulsivity to describe behaviors done without prior thinking and suddenly without considering their consequences. According to Claes, these behaviors are by nature adventurous and often result in damaging consequences. Executive functions are intentional intricate processes of the prefrontal cortex (PFC) that regulate goal-oriented behavior and thought [12]. It seems that, impulsivity resists some executive functions including attention control, learning rules, planning and response organization, flexibility in responses, and inhibition from inappropriate responses [13]. However, inversely, impulsivity has also been offered as a useful construct that might help to make fast decisions in a short time and this feature is cardinal in cases where fast decision-making is critical. Researchers such as Kaufman et al. [14] and Kipper et al. [15] reported that impulsivity along with lack of concentration and attention to main issues and accessing latent problem-solving potentials could result in creative solutions. These researchers, in essence, advocate the positive relationship between impulsivity and creativity.

Metacognition refers to the psychological structures, knowledge, events and processes that are involved in the control, modification and interpretation of thinking itself [16,17]. Metacognition is taken as equivalent to self-regulatory executive functions that regulate cognitive processing [18,19,20]. Specifically, the Self-Regulatory Executive Function [16,17,21] model provides a detailed conceptualization of metacognitive factors as parts of information processing involved in the development and persistence of psychological unrest [22]. The relationship between metacognition and cognitive failures are typically considered as a procedure pertinent to metacognition processing [5]. Metacognition is a multi-cognition concept entailing metacognitive knowledge and metacognitive regulation that contribute to evaluation, monitoring, and control [23]. Metacognition involves beliefs that individuals have about their own capabilities or in capabilities. The study by Souchay and Isingrini [24] indicated that as the participants' age increases, positive metacognitive beliefs decrease and objective cognitive failures increase. Additionally, Mecacci and Righi [5] in a study with 165 subjects aged between 18 and 85 reported that positive metacognitive beliefs decrease in individuals suffering from cognitive failures.

In theories related to metacognition, if metacognitive strategies are maladaptive, deficient, or negative, they cannot control and monitor the cognitive processing that finally turns negative emotions into anxiety [16]. Cartwright-Hatton and wells [25] conducted a study on 104 university students aged from 18 to 25 and concluded that negative metacognitive beliefs positively and positive metacognitive beliefs negatively and significantly correlate with anxiety. In the study by Matthews et al. [26], a significant positive relationship was reported between negative metacognition and exam stress, tension, relevant physical signals and cognitive processing. Davis and Valentiner [27] also reported higher scores for negative metacognitive beliefs. Therefore, it might be possible that negative metacognition might lead to cognitive failures because of anxiety. Reflecting upon the aforementioned inklings, the present exploratory study aims to look into the relationship between impulsivity and metacognition with cognitive failures.

Method

University students volunteered to participate for course credits. A sample of 125 participants (98 females and 27 males; age range: 18-22 years, M = 21.93 and SD = 2.37) administered the CFQ, UPPS, and MCQ with a 15 minute respite to prevent ennui. Regarding their education level, this ''total'' sample was homogeneous: students of BA. The other inclusion criteria were lack of drug misuse and lack of any anxiety and epilepsy disorder at the time of the research. The exclusion criteria included any drug use, anxiety and other disorders.

The tools used in this study were as follows:

Cognitive Failures Questionnaire (CFQ): The CFQ is composed of 25 items pertinent to everyday lapses or errors in distraction (9 items), memory related problems (7 items), blunders (7 items) and lack of names remembering (2 items) (26, 1). Participants are asked to indicate, on a 5-point scale (0 = never, 4 = always), how often they have experienced the particular error described by the question (e.g., ''Do you bump into people?'', ''Do you fail to listen to people's names when you are meeting them?'', ''Do you forget where you put something like a newspaper or a book?''). Total scores range from 0 to 100, from total absence to highly frequent occurrence of lapses. Cronbach coefficient alpha is 0.81. Internal consistencies (Cronbach alpha) of CFQ as a single dimension ranged from 0.75 to 0.81, and it showed a significant test-retest correlation of 0.80 [28]. Cronbach alpha for the present data was 0.65.

UPPS Impulsive Behavior Scale Questionnaire: UPPS Impulsive Behavior Scale was developed by Whiteside and Lynam [29] using factor analysis method running on nine valid scales. UPPS incorporates 46 items each of which is rated on a four degree scale from disagree (4) to completely agree (1). It has four components including urgency (13 items), lack of premeditation (11 items), lack of perseverance (10 items), and sensation seeking (12 items). The alpha reliabilities in their study were 0.89, 0.87, 0.83, and 0.85 for Urgency, (lack of) Premeditation, (lack of) Perseverance, and Sensation Seeking, respectively. In this study, their coefficient Alpha turned out to be 0.56, 0.52, 0.58 and 0.55 respectively.

Meta-Cognition Questionnaire (MCQ): The MCQ consists of 65 items related to beliefs about worry and intrusive thoughts [25]. The short version of the

questionnaire was developed by Wells and Cartwright-Hatton [30]. It involves 30 items and the participants should respond to them based on a four-degree scale from "not agree" (1) to "completely agree" (4). The questionnaire has five components including positive beliefs about worry (6 items), cognitive confidence (6 items), cognitive self-consciousness (6 items), negative beliefs about the uncontrollability of thoughts and danger (6 items), and beliefs about the need to control thoughts (6 items). The questionnaire is scored in a way that higher scores show more inefficient metacognition. Alpha scores for MCQ short-form ranged from 0.72 to 0.93 demonstrating good-excellent internal consistency. The present study calculated its coefficient Alpha as 0.56, 0.52, 0.51, 0.60 and 0.50, respectively.

Results

From the filled and acquired questionnaires, 125 cases were immaculate and complete to be considered. With the presence of nine predicting variables in this study, the sample size was calculated by G*Power software [31] (α = 0.05, power = 0.8, effect size= 0.15) and determined that more than 114 subjects would be adequate.

Table 1 displays means, standard variations, skewness and kurtosis of variables. The range of values for both skewness and kurtosis are between ±1 that indicates proximity of distribution to normal distribution [32]. Furthermore, Shapiro-Wilk test was not significant in any of the variables (P>0.001) that indicates the normality of distribution.

To explore the associations between variables, Pearson correlation coefficient was used. Results depicted in Table 2 revealed urgency and cognitive confidence had significant association with cognitive failure. Nevertheless, there were no significant associations between other impulsivity and metacognition variables and cognitive failure. In the following procedure, to explore the role of the mentioned variables in predicting CF, stepwise regression was run (see Table 3 and 4).

Urgency and cognitive confidence, variables that had significant association with CF, were imported to stepwise regression analysis. ANOVA and brief regression model (table 3) showed that in the present model two steps could properly explain the significant association with CF. In the first step, cognitive confidence was imported to the model which explained 25% of Cf. At the second step, by importing urgency, the present model explained 31% percent of CF.

Table 1. Descriptive Statistics of Variables

Variable	M	SD	Skew	Kurto	Shapiro-Wilk	
					Statistic	Sig.
Urgency	28.66	7.21	.29	-.08	.99	.238
Lack of premeditation	19.66	4.73	.46	.11	.97	.013
Lack of perseverance	19.35	4.04	.19	-.30	.99	.234
Sensation seeking	25.44	7.41	.45	-.35	.97	.018
Positive beliefs about worry	11.53	3.41	.42	-.22	.98	.021
Cognitive confidence	12.30	4.11	.34	-.47	.97	.004
Cognitive self-consciousness	17.14	3.68	-.07	-.69	.97	.013
Uncontrollability and danger	17.25	5.05	-.09	-.81	.98	.037
Beliefs about need to control	15.74	3.12	-.15	-.47	.98	.049
Cognitive failure	33.99	14.26	.43	.66	.98	.139
Distraction	13.20	5.45	.18	-.15	.99	.483
Memory problems	8.34	4.47	.60	1.02	.97	.007
Blunders	9.94	4.75	.45	.45	.98	.041
Lack of remembering	2.46	1.91	.84	.31	.91	.003

Table 2. Pearson Correlations between Impulsivity and Metacognition and CF Variables

	imp2	imp3	imp4	mc1	mc2	mc3	mc4	mc5	CF	cf1	cf2	cf3	cf4
imp1	-.28**	-.35**	.16	-.21	-.41**	.01	-.49**	-.26	-.44**	-.40**	-.36**	-.44**	-.15
imp2		.55**	-.04	-.11	.16	-.49**	.05	-.09	.24	.26	.16	.23	.08
imp3			.08	-.01	.31	-.22	.14	.09	.31	.34*	.21	.27	.09
imp4				-.03	-.05	-.09	.05	-.05	-.03	.01	-.03	-.05	-.09
mc1					.23	.28	.30	.28	.17	.15	.20	.14	.05
mc2						-.03	.42**	.34*	.51**	.55**	.36**	.44**	.36**
mc3							.29	.33	-.13	-.10	-.12	-.14	-.06
mc4								.47**	.31	.33	.25	.31	.03
mc5									.26	.26	.20	.24	.10
CF										.90**	.86**	.91**	.62**
cf1											.67**	.76**	.46**
cf2												.70**	.43**
cf3													.53**
cf4													

imp1: urgency, imp2: lack of premeditation, imp3: lack of perseverance, imp4: sensation-seeking, mc1: positive beliefs about worry, mc2: cognitive confidence, mc3: cognitive self-consciousness, mc4: uncontrollability and danger, mc5: beliefs about need to control, cf: cognitive failure, cf1: distraction, cf2: memory problems, cf3: blunders, cf4: lack of remembering.

***Correlation is significant at the .01 level*

** Correlation is significant at the .05 level*

According to Beta coefficients in Table 4, relative potion of cognitive confidence to predict CF was 51% in the first step and 40% in the second step. Relative potion of urgency in the second step was 27%. However, to assess precise portion of each predicting variable, semi-separation correlation coefficient square was calculated which is presented in Table 4. In addition, to estimate the effect size in each steps of regression, the value of Cohen's f^2 was calculated and according to the results, the effect size at first step was 0.35 and at the second step was 0.47.

Table 3. Model Summary and ANOVS of Stepwise Regression

Model	R	R^2	Adj R^2	R^2 Change	Durbin-Watson	ANOVA	
						F	Sig.
1	.51	.26	.25	.26	2.49	43.28	.001
2	.57	.32	.31	.06		28.84	.001

Table 4. Regression Coefficient

Model		B	Beta	T	Sig.	Squared Part Correlation	Cohen's $f2$	Tolerance	VIF
1	mc2	1.77	.51	6.58	.001	.26	.35	.99	1.00
2	mc2	1.38	.40	4.86	.001	.13	.47	.83	1.21
	imp1	-.54	-.27	-3.30	.001	-.06		.83	1.21

Discussion

The present study indicated that as urgency increases, cognitive failure in general and in particular, its three components decrease. The present study findings might be considered in line with some other studies such as Dickman [33] in which the performance of impulsive participants in cognitive tasks was explored positive. Sometimes, in performing tasks, too much pondering and delay lead to over-optimal stress and obsession that, in turn, causes the information processing to slow down and be done inappropriately. Functional impulsivity is related to fast information processing and immediate decision-making style in situations with low risk as well as situations in which the suitable cognitive response has already been learned and is now repeated. Urgency component could lead to fast decisions in a short time and this is important in situations that need fast and immediate actions. The urgency component might probably be considered as the distinctive characteristics of functional impulsive action (see [14]) compared to dysfunctional impulsive ones. Lack of perseverance showed a positive significant relationship with distraction. These findings are in accordance with those of Mobini [34], Davis et al. [35] and Romer et al. [36]. To justify the positive correlation between lack of perseverance (inability to maintain concentration in affairs) with cognitive failures, it could be stated that the individuals whose score was high for lack of perseverance, due to inability to self-regulate and high sensitivity toward immediate rewards and tendency to act without necessary caution, their process of attention and acquiring tenets and thinking and flexibility in offering responses encounter difficulties and as a result, cognitive failures such as distraction might arise.

To elucidate the relationship between metacognition's components with cognitive failures, it could be contended that inefficient cognitive confidence cause individuals to be more doubtful about their abilities and experience events as threats and precarious. These threats lead to psychological disturbance and weak cognitive function. Weak cognitive performance, in turn, increases cognitive failures and consequently, the individual will not be able to use executive functions efficiently and these, then, result in damage to persons' memory and attention. Concentration on metacognition improvement and having thought control decrease feelings of threat and failure and self-efficiency finally decreases cognitive failures.

The findings of the present study showed that little urgency and inefficient cognitive confidence influence on predicting the variance of cognitive failures. Urgency could cause fast information processing that in situations with low risk and in situations where hinders anxiety and stress is regarded as a positive trait. Slow speed and lack of reliance on information process can increase cognitive failures. It, however, should be pointed out that owing to the sensitivity of urgency component to annoying incentives [37], cognitive process in impulsive individuals with considering mood alterations needs to be taken into consideration in future studies.

Conclusion

The results of this study show the role of impulsivity and metacognition in cognitive impairments and emphasizes the importance of the effect of little urgency and inefficient cognitive confidence in explaining the variance of cognitive failures.

Conflict of Interest

The authors declared no conflicts of interest.

Ethical Approval

Ethical principles were considered in this article. The participants were informed about the purpose of the study. They were assured about the confidentiality of their information. Also, the results of the research would be available to them.

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