

HOW IMPULSIVITY RELATES TO COMPULSIVE BUYING AND THE BURDEN PERCEIVED BY CAREGIVERS AFTER MODERATE-TO-SEVERE TRAUMATIC BRAIN INJURY

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KEYWORDS

Impulsivity · Executive functions · Compulsive buying · Burden · Traumatic brain injury · Urgency

ABSTRACT

Background: Impulsivity is a core feature in patients with traumatic brain injury (TBI). The aim of the study is to investigate how a specific dimension of impulsivity, namely urgency (the tendency to act rashly when distressed), might shed new light on the aetiology of compulsive buying proneness in patients with TBI and to explore how urgency and compulsive buying relate to the burden perceived by the caregivers.

Sampling and Methods: Caregivers of 74 patients with TBI were given 3 questionnaires in order to assess their subjective burden as well as patients' impulsivity and compulsive buying proneness.

Results: Both urgency and compulsive buying tendencies significantly increased after TBI. Furthermore, path analyses revealed that current urgency was both directly and indirectly related to the subjective burden perceived by the caregivers, and this indirect pathway was mediated by compulsive buying.

Conclusion: Urgency plays a central role in understanding specific problematic behaviours after TBI and their impact on caregivers. These findings are discussed in light of the cognitive processes underlying the urgency component of impulsivity in relation to the occurrence of compulsive buying behaviours after TBI.

Introduction

Behavioural and emotional disturbances are a frequent consequence of traumatic brain injury (TBI) and might have a detrimental impact on the outcomes resulting from TBI (e.g. interpersonal relationships, community independence [1]). In addition, many studies have suggested that TBI has strong, pervasive and long-lasting negative effects on caregivers. Indeed, stress, emotional (depression, anxiety) and psychosomatic disorders, financial difficulties, or disturbances in social and family functioning have been frequently described by the patients' caregivers [2, 3]. In particular, behavioural and emotional changes displayed by patients with TBI are

better predictors of the caregiver burden than injury severity or cognitive impairments [4].

More specifically, poor impulse control is frequently described in patients with TBI [5, 6]. However, few studies have explored the nature of impulsivity changes after TBI and both its contribution to specific problematic behaviours and its impact on the subjective burden perceived by the caregivers. Interestingly, some authors have recently underscored the need to consider impulsivity as a multifaceted construct [7]. For example, Whiteside and Lynam [8] developed the UPPS Impulsive Behaviour Scale that assesses 4 dimensions of impulsivity: urgency (the tendency to experience strong reactions, frequently under conditions of negative affects); (lack of) premeditation (the tendency to think and reflect on the consequences of an act before engaging in that act); (lack of) perseverance (the ability to remain focused on a task that may be boring or difficult), and sensation seeking (a tendency to enjoy and pursue activities that are exciting and openness to trying new experiences). This multidimensional aspect of impulsivity has been recently confirmed in a sample of 82 patients with moderate-to-severe TBI with a short form of the UPPS Impulsive Behaviour Scale, which was specifically designed to assess impulsivity changes after TBI [9]. Confirmatory factor analyses performed on the version of the scale completed by the patients' caregivers revealed that a hierarchical model holding that lack of premeditation and lack of perseverance are facets of a higher-order construct (lack of conscientiousness), with urgency and sensation seeking as separate, correlated factors, fit the data best. More specifically, urgency, lack of premeditation and lack of perseverance significantly increased after TBI, whereas sensation seeking decreased. In addition, Cronbach's α indicated that all the subscales have acceptable to very good internal reliability (α between 0.73 and 0.92) [9].

The purpose here is to investigate how this multidimensional conception of impulsivity might shed new light on the aetiology of a specific problematic behaviour, namely, compulsive buying. In the current study, we particularly focus on the urgency dimension of impulsivity. Urgency has proved to be the dimension of impulsivity that is more frequently related to problematic behaviours in non-neurological participants. Indeed, higher urgency has been associated with tobacco craving [10], compulsive buying [11, 12], bulimia nervosa [e.g. 13], alcohol abuse [14], mobile phone dependency [e.g. 15] or problem gambling [16, 17]. However, no studies have specifically investigated how urgency contributes to these problematic behaviours and more specifically to compulsive buying behaviours in persons with TBI. Our choice to specifically focus on compulsive buying departed from several clinical observations of patients with TBI whose caregivers (or sometimes the patients themselves) complained of an increased tendency to buy things in a compulsive manner following the injury, which led to problematic consequences (e.g. financial, social). In addition, there is a lack of empirical data on this topic in the TBI literature. Furthermore, because of the strong negative impact that compulsive buying might have on the patients' and caregivers' lives (psychological distress, familial and social relationships, debts, or juridical problems, etc.), understanding this problematic behaviour may be beneficial.

Anecdotally, buying sprees have been described in some patients with TBI [e.g. 18], but to our knowledge, no studies have empirically investigated compulsive buying proneness after TBI. Compulsive buying involves repeated and excessive purchases of goods that may lead to psychological distress and to negative

consequences, such as debts, negative feedback from relatives and negative feelings [e.g. 19]. More specifically, individuals with compulsive buying tendencies are likely to experience repetitive and overpowering urges to purchase goods, as well as uncontrollable needs and growing tensions that can be relieved only by buying [19]. Interestingly, compulsive buying more frequently occurs in contexts of negative affects. Accordingly, a recent study found in a sample of young adults from the community that urgency was the only dimension of impulsivity to predict compulsive buying tendencies [11], confirming assumptions that buying may function as a self-regulatory mechanism that enables individuals to reduce their negative feelings, such as frustration, loneliness or sadness [see 20].

In summary, although the multidimensional aspect of impulsivity has been confirmed in patients with TBI [9], no studies have explored the contribution of these various factors of impulsivity to problematic behaviour disorders after TBI. In particular, from previous studies conducted on healthy young adults [11, 12], we hypothesize that changes in urgency are related to an increase in compulsive buying after TBI. An additional objective is to determine whether compulsive buying and urgency are related to the subjective burden perceived by the caregivers.

Methods

PARTICIPANTS

A convenience sample of 74 adults with TBI was recruited from 4 outpatient clinics in Switzerland. Only participants for whom a significant other could provide information about the patient's current and pre-injury behaviours were included in the study. Thus, caregivers of 74 patients with TBI (60 men, 14 women) between 19 and 64 years old ($M = 37.85$, $SD = 14.07$) completed several questionnaires to assess the patient's current and premorbid behaviours.

Table 1. Means, standard deviations and internal consistency (Cronbach's α) for the pre-injury and the current levels of urgency and compulsive buying

Factors	Preinjury		Current	
	M \pm SD	α	M \pm SD	α
Urgency	6.91 \pm 2.46	0.80	9.24 \pm 3.26	0.83
Compulsive buying	20.91 \pm 4.14	0.86	22.60 \pm 6.55	0.92

Among the relatives, 46% were spouses or husbands, 37.8% were parents, 4% were adult children, 10.8% were siblings, and the remainder could not be determined because of missing data. Patients' years of schooling varied from 8 to 24 ($M = 13.43$, $SD = 2.98$). The time after the onset of TBI ranged from 5 to 113 months ($M = 39.00$, $SD = 30.42$). Participants were included in the study only if there was documented evidence of a moderate-to-severe TBI (Glasgow Coma Scale of ≤ 12 or post-traumatic amnesia of >1 h) or if their records contained sufficient information to derive such a score. From this information, we determined that 63.50% of the patients had a severe TBI and 36.50% a moderate TBI.

Ethnic information was not collected, but the sample was predominantly Caucasian. Exclusion criteria were any history of pre-injury psychiatric or neurological disease. The study was approved by the ethics committee of the University Hospital of Geneva.

PROCEDURE

Each patient's caregiver was given 2 questionnaires designed to assess the patient's pre-injury and current level of impulsivity and compulsive buying, as well as a scale to assess their subjective burden. We used questionnaires completed by the caregivers only because lack of awareness may constitute a threat to the validity of a questionnaire completed by the patients themselves [see 9, 21].

QUESTIONNAIRES

The Short Form of the UPPS Impulsive Behaviour Scale

To assess the multidimensional aspect of impulsivity after TBI, we used the short version of the UPPS Impulsive Behaviour Scale, containing 16 items (4 per factor). This scale, recently validated on a sample of moderate-to-severe patients with TBI [9], assesses impulsive behaviours both at the pre-injury and at the current level on a 4-point Likert scale [from 1 (almost never) to 4 (almost always)]. For the purpose of the current study, only the urgency subscale was considered. A pre-injury and a current score of urgency were thus obtained, and the total score ranges from 4 to 16 on both scales. Higher scores indicate higher impulsivity.

QUESTIONNAIRE ABOUT BUYING BEHAVIOUR

The Questionnaire about Buying Behaviour, adapted from Lejoyeux et al. [22], consists of items representing the major basic features of compulsive buying (e.g. urges to shop and buy, negative feedback from family and friends, post-purchase guilt). On the original version of this scale, items were scored 0 or 1 (questions with 'yes' or 'no' answers). The version of the questionnaire used in the current study was slightly modified to be administered by the patients' caregivers and contained 18 items. Consequently, items were adapted so that patients' relatives could assess compulsive buying behaviours, both at the pre-injury and at the current level, on a 4-point Likert scale [from 1 (almost never) to 4 (almost always)]. Note that a Likert-type scale was used because it enables better quantification of the targeted behaviour than does a 'yes' or 'no' response. Two scores were computed: a pre-injury score and a current score of compulsive buying. The total score ranges from 18 to 72 on both scales. Higher scores indicate higher compulsive buying tendencies.

THE SCREENING VERSION OF THE ZARIT BURDEN INTERVIEW

The Zarit Burden Interview [23] is a self-rating scale that is the most consistently used scale for assessing the subjective burden perceived by caregivers of patients with Alzheimer's disease. The screening version of the Zarit Burden Interview contains 4 items that rate the impact of the disease or the head injury on the caregiver's physical, emotional or social status and constitutes a valid and reliable scale to assess the subjective burden perceived by caregivers [24]. Item scores range from 0 (never) to 4 (nearly always) and the total score ranges from 0 to 16, with a higher score indicating a greater burden.

The global score was used as a continuous variable to express the level of burden.

DATA ANALYSES

T tests were performed to appraise the changes between the pre-injury and the current scores on urgency and compulsive buying. In addition, correlation analyses were computed to investigate the relationships between compulsive buying, urgency, clinical and demographic variables, and subjective burden perceived by the caregivers. Path analysis was also used to investigate the direct and indirect relationships between relevant variables. All analyses were 2-tailed, with the α level set at 0.05.

Results

DESCRIPTIVE STATISTICS

The Cronbach α indicate that both urgency and compulsive buying have very good internal reliability, whether on the pre-injury or on the current level (table 1).

Descriptive analyses showed that 17.14% of the patients displayed a decrease in compulsive buying after TBI, whereas 35.71% showed an increase and 47.14% did not show any change from the pre-injury condition. Among the patients who had an increase in compulsive buying, 15 had an increase of 1-3 points, 6 had an increase of 4-10 points, and 4 had a score >15 points.

COMPARISONS BETWEEN PREMORBID AND CURRENT LEVELS OF BEHAVIOUR

The t tests performed to appraise urgency and compulsive buying changes between the pre-injury and the current condition on the scales completed by the relatives highlighted a significant increase in urgency, $t(73) = 5.60$, $p < 0.001$, as well as in compulsive buying, $t(73) = -2.07$, $p < 0.05$, from the pre-injury condition.

Table 2. Pearson correlations between urgency and compulsive buying current scores, subjective burden perceived by the caregivers, and clinical and demographic variables

QABB	Urgency	Zarit	Age	Education	Severity	Time since trauma
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QABB	-	0.48**	0.41**	-0.08	0.00	-0.03	0.13
Urgency		-	0.58**	-0.08	-0.31*	0.06	0.17
Zarit			-	0.10	-0.16	0.00	0.15

Pairwise treatment of missing data. n = 74. QABB = Questionnaire about Buying Behavior current score; Urgency = urgency current score; Zarit = total score of the Zarit Burden Interview; Education = number of years of schooling. * p < 0.01; ** p < 0.001.

CORRELATION ANALYSES

Correlation analyses were conducted with the urgency, as well as with the compulsive buying pre-injury and current scores. Of note, severity of trauma was considered a dichotomous variable, with a moderate level set at -1 and a severe level set at 1. Therefore, Pearson's point biserial correlation was used to evaluate the effect of severity of trauma on other variables: a positive correlation corresponds to a higher score for severe TBI. The correlation analyses (table 2) revealed that the compulsive buying current score is positively related to current urgency (0.48) and to the subjective burden perceived by the caregivers (0.41) which corresponds to medium effects [25]. In addition, the subjective burden perceived by the caregivers is significantly correlated with urgency (0.58), which corresponds to a large effect [25], and years of schooling was negatively associated with current urgency (-0.31). No significant relationship was found between pre-morbid urgency and current compulsive buying tendencies ($r = 0.06$, $p = 0.63$). However, pre-injury urgency was significantly related to current urgency ($r = 0.23$, $p < 0.05$), pre-injury compulsive buying to current compulsive buying ($r = 0.25$, $p < 0.05$) and pre-injury urgency to pre-injury compulsive buying ($r = 0.42$, $p < 0.001$). No other correlations reached statistical significance.

PATH ANALYSES

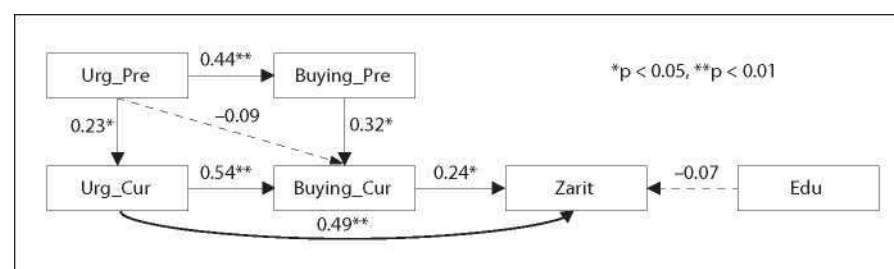
We further investigated the relationships between compulsive buying, urgency and the subjective burden perceived by the caregivers. In particular, we were interested in determining whether (1) current urgency predicts current compulsive buying tendencies when pre-morbid urgency and compulsive buying were controlled for, and (2) current compulsive buying tendencies mediate the relationship between urgency and the burden. To this end, we used path analysis. Models were computed with Mplus [26] by using the Maximum Likelihood statistic test. Because educational level has frequently been shown to be positively correlated with economic status [e.g. 27], which, in turn, plays a significant role in the burden perceived by the caregivers [e.g. 28], years of education was included in the model. In addition, because years of schooling negatively correlated with current urgency (table 2), both variables were allowed to correlate. The indirect effects were computed via the product of coefficient strategy [e.g. 29] provided by Mplus. To test single parameters, we adopted the 5% significance criterion (i.e. t value of parameters of 1.96). Model fit was evaluated using the χ^2 , the comparative fit index (CFI) and the root mean square error of approximation (RMSEA). A non-significant χ^2 indicates a good fit [30]. The RMSEA measures the difference between the model and the sample data per degree of freedom, with values <0.05 indicating a close fit and < 0.08 indicating a reasonable fit [30]. A CFI > 0.90 is generally interpreted as indicating an acceptable

fit. The results showed that the model had an acceptable fit: $\chi^2(6) = 8.21$, $p = 0.22$; CFI = 0.974; RMSEA = 0.071, confidence interval = 0-0.117. Standardized regression weights (b) for the model are illustrated in figure 1.

As can be seen in figure 1, both current urgency and pre-morbid compulsive buying tendency significantly predict current compulsive buying proneness ($b = 0.54$ and $b = 0.32$, respectively), whereas pre-injury urgency does not.

In addition, urgency is a strong predictor of compulsive buying, both at the pre-injury ($b = 0.44$) and at the current level ($b = 0.54$). Finally, current compulsive buying and current urgency significantly predicts the subjective burden perceived by the caregivers ($b = 0.24$ and $b = 0.49$, respectively).

Fig. 1. The structural equation model testing the relationships between urgency, years of schooling, compulsive buying and subjective burden perceived by the caregivers. Values of the singleheaded arrows on solid lines reflect standardized regression weights (arrows on dashed lines represent non-significant relations). Urg_Pre = Urgency pre-injury score; Urg_Cur = urgency current score; Buying_Pre = compulsive buying pre-injury score; Buying_Cur = compulsive buying current score; Zarit = Zarit Burden Interview score; Edu = years of education.



A test of indirect effects revealed that compulsive buying significantly mediated the relationship between urgency and the burden perceived by the caregivers (indirect effect through current compulsive buying: $b = 0.03$, $t = 1.99$, $p < 0.05$). This mediation should be considered to be partial [see 32] because the direct path between urgency and the burden is also significant ($b = 0.49$).

Discussion

The objectives of this study were to examine how a specific dimension of impulsivity, namely urgency, account for compulsive buying tendencies in patients with TBI and to explore how urgency and compulsive buying relate to the subjective burden perceived by the caregivers. The main results of the study emphasized the following: (a) patients with TBI displayed a significant increase both in compulsive buying and in urgency from the pre-injury condition; (b) urgency significantly predicts compulsive buying, thus confirming data observed in samples of young adults from the community [11, 12]; (c) higher compulsive buying tendencies are a significant predictor of a greater subjective burden perceived by the caregivers; (d) urgency was both directly and indirectly related to the subjective burden perceived by the caregivers, and this indirect pathway was mediated by compulsive buying, and (e) urgency is a strong predictor of compulsive buying, both at the pre-injury and at the current level. These results, associated with the significant increase in both urgency and compulsive buying from the pre-injury level, suggest that there is an amplification (in intensity and/or frequency) of a pre-existing association between

urgency and compulsive buying proneness after TBI.

To our knowledge, this is the first empirical study to show an increase in compulsive buying tendencies after TBI. One could argue that both the mean score of current compulsive buying and the difference in compulsive buying proneness between the pre-injury and the current condition are small when looking at the scores of the whole sample (see table 1), which may question the clinical relevance of the findings. However, the descriptive analyses showed that for at least a subgroup of patients, compulsive buying constitutes a frequent problem. In addition, path analysis showed that compulsive buying significantly predicts the subjective burden perceived by the caregivers. Therefore, we are confident that compulsive buying is a pervasive problem for some persons with TBI and their caregivers, and thus this problematic behaviour is worth studying and understanding. In addition, the results highlighted that impulsivity-related traits, especially urgency, may prove to be important when trying to determine the aetiological factors leading to compulsive buying in patients with TBI. Consequently, we will discuss the specific processes underlying the urgency component of impulsivity, namely, inhibition of prepotent responses and decision making under risk [12].

Recently, some authors highlighted in a sample of young adults from the community that a low capacity to inhibit a prepotent response in an emotional context predicts a tendency to act without forethought in a situation of decision making under risk, which results in more elevated levels of negative urgency, that is, a proneness to act rashly in intense negative emotional contexts; in turn, urgency predicted maladaptive behaviours such as compulsive buying [12]. Thus, rash actions may take place when the experience of intense emotions disturbs inhibitory control and precludes the activation of demanding deliberative processing, which is necessary in order to consider the immediate benefits of an action in relation to its future costs [see 12]. In this context, the significant increase in urgency from the pre-injury condition and the strong relationships between urgency changes and compulsive buying tendencies in patients with TBI is of much interest. First, the increase in impulsivity observed in the urgency dimension is congruent with the inhibition of prepotent responses [33] and decision-making [34] deficits observed after TBI. Second, the difficulty in deliberately suppressing a prepotent response associated with decision-making deficits may constitute a core feature of compulsive buying-related behaviours, both in healthy young adults [11, 12] and in patients with moderate-to-severe TBI. Third, although we do not have information about the areas of the brain that were injured, we might expect that damages to the fronto-striatal network lead to impulsive-related behaviours, such as compulsive buying. Indeed, fronto-striatal circuitry is frequently damaged in patients with TBI [e.g. 35] and plays a critical role in the compulsive-impulsive spectrum [e.g. 36]. Fourth, the strong relationship between urgency and compulsive buying is congruent with the literature that highlights, on the one hand, that negative emotion promotes compulsive buying, and on the other hand, that compulsive buying, acting as a self-regulatory mechanism, might contribute to a decrease in the intensity of the negative emotion [e.g. 37].

Interestingly, our results are also congruent with previous data showing that behavioural problems in patients with TBI constitute a strong predictor of the caregiver burden [e.g. 38]. Indeed, the results of the path analysis suggest that urgency and the behavioural consequences of urgency, such as compulsive buying, predict the care-

giver burden. Accordingly, compulsive buying proneness after TBI might predict the burden because this problematic behaviour is frequently associated with negative outcomes (e.g. psychological distress, debts or family conflicts).

More generally, because of the strong relationships between urgency and a wide range of problematic behaviours, this component of impulsivity might represent a major source of distress and burden for the caregivers.

Some limitations to the study should be discussed. First, the absence of control participants precludes inferences about whether compulsive buying has a higher prevalence in patients with TBI than it does in non-braindamaged persons. Second, the use of scales that were completed by the caregivers only could also lead to a misestimate of the behavioural disorder assessment because these problematic behaviours may sometimes happen without the caregivers' knowledge. Third, the caregivers' retrospective assessment of patients' impulsivity and compulsive buying concurrently with the current level of impulsivity and compulsive buying may be problematic because one can argue that caregivers construct, cognitively, a greater disconnection between prior and current impulsivity to fit with expectations. Moreover, this retrospective pre-morbid assessment might also be distorted as a result of memory biases because of the wide range of trauma-to-test intervals. Despite the limitations of this method, several authors still recommended estimating the pre-morbid level of functioning by asking the informant (a caregiver) to retrospectively rate the patients on measures of behavioural problems [e.g. 21]. This retrospective assessment of behavioural changes actually remains the most common method to obtain information about the degree of changes from the pre-morbid to the current behaviour. However, we acknowledge that this remains a potential limitation to the study, as there was no documentation available to corroborate patients' pre-injury level of impulsivity or compulsive buying proneness. Fourth, the current study is cross-sectional in nature. Thus, longitudinal studies are needed to better appraise how urgency, and associated cognitive mechanisms, account for patients' problematic behaviours in the long term.

From a clinical point of view, our results indicate that patients with high emotional dyscontrol tendencies because of an elevated urgency level after TBI have a higher risk for developing compulsive buying behaviours and may consequently represent a greater challenge for clinicians, as well as for caregivers. However, further studies are needed to investigate whether urgency and associated cognitive deficits contribute to other problematic behaviours after TBI, such as alcohol abuse, gambling and bulimia.

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