A script based study of compulsive buying behaviour: Empirical and theoretical contributions

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Abstract:

Compulsive buying corresponds to chronic, repetitive purchasing that becomes a primary response to negative events or feelings. This is an important issue for marketing and consumer behaviour research since it represents a considerably negative influence on society and individuals in terms of high level of indebtness, bankruptcies, credit card debt, anxiety, frustration, low saving, low self-esteem and dysfunctional families. The major findings in compulsive buying research weren't done with a methodology replicating real-life situations.

The present research aims to improve understanding of compulsive buying through examining executive functions, script manipulation, script execution and depression state.

An extensive normative study of The Faber and O'Guinn Scale (1992) was done prior to the study. Based on the scores of The Faber and O'Guinn Scale, participants were classified as either compulsive buyers or not. The study sample was composed by 46 compulsive buyers who took part to this normative work and 46 non-compulsive buyers.

A battery of executive functions and 4 script tasks were used. The Hamilton depression scale was also administered in order to study the effect of depression state on compulsive buying.

We predicted a significant weakening in executive functions (Cognitive inhibition, Mental flexibility, Planning) and script tasks.

Consistent with our expectations, compulsive buyer performed significantly worse than normal buyers on all the executive tasks ($p < .05$). They also scored significantly lower than normal buyers on script arranging and generation tasks. Compulsive buyers produced more errors (action order, adding irrelevant items to a list) and took a longer time to end the script.

We also found a significant relationship between Depression scores and performances scores on the executive functions and Script tasks.

Taken together, our results tend to indicate that compulsive buying, like other aberrant consumer behaviours, appears to be the result of an aggregate of multiple factors more than the effect of a single cause. The significant associations found between executive functions, script tasks and Faber and O'Guinn Scale scores are in favor of a close relationship between the frontal brain areas and compulsive buying.

Key words: Consumer behaviour, Compulsive buying, Script, Executive functions

1. Introduction

Compulsive buying is an important issue for marketing and consumer behaviour research since it represents a considerably negative influence on society and individuals in terms of high level of indebtness, bankruptcies, credit card debt, anxiety, frustration, low saving, low self-esteem and dysfunctional families.

Compulsive buying (d'Astous, 1990 ; d'Astous, Maltais & Roberge, 1990 ; Faber, O'Guinn & Krych, 1987 ; Valence, d'Astous & Fortier, 1988) has alternatively been labelled compulsive shopping (Krueger, 1988), addictive buying (Krych, 1989 ; Scherhorn, 1990 ; Scherhorn, Reisch & Raab, 1990) and compulsive spending (Hanley & Wilhelm, 1992).

Faber and colleagues' work (Faber et al., 1987 ; Faber & O'Guinn, 1992 ; O'Guinn & Faber, 1989) have largely contributed to the theoretical and empirical foundations of compulsive buying research. The screening scale that they developed was extensively used in empirical studies and added significantly to the understanding of normal and aberrant buying behaviour.

Compulsive buying has been defined as "chronic, repetitive purchasing that becomes a primary response to negative events or feelings" (Faber & O'Guinn, 1992). It is different from compulsive spending. Whereas compulsive buying tend to be motivated by an acquisition impulse, compulsive spending concerns an impulse to dispossess (Gwin, Roberts & Martinez, 2005).

Previous studies have tried to draw the profile of compulsive buyers in order to better distinguish compulsive from noncompulsive buyers and to facilitate the identification of excessive consumption buyers (Valence *et al.*, 1988) and predispositional biochemical, psychological and sociological factors (Hassay & Smith, 1996 ; Donovan, 1988 ; Faber & O'Guinn, 1992).

On the basis of the levels of emotional activation, cognitive control and reactivity, Valence *et al.* (1988) distinguish 4 types of excessive consumption buyers: emotional reactive consumers (strong emotional activation), impulsive consumers (strong emotional activation and strong reactive behaviour), fanatical consumers (strong emotional activation and high cognitive control) and compulsive consumers (strong emotional activation, high cognitive control and strong reactive behaviour).

With respect to biochemical factors, it appears that serotonin plays a significant role in the occurrence of compulsive behaviour. McElroy, Satlin, Pope, Keck & Hudson (1991) found that abnormal serotonin levels were associated with impulse control disorders such as pathological gambling, eating disorders and kleptomania. Studies focusing on the effect of

serotonin therapy give additional support towards the idea that compulsive buying could be at least partially explained in terms of unbalanced levels of serotonin (McElroy *et al.*, 1991).

The psychological factors reported as possible causes of compulsive buying include low levels of self-esteem (O'Guinn & Faber, 1989 ; Scherhorn, Reisch & Raab, 1990), anxiety (Scherhorn et al., 1990), depression (Schlosser, Black, Repertinger & Freet, 1994), high propensity to fantasize (O'Guinn & Faber, 1989), desire for stimulation and arousal (Faber, O'Guinn & Krych, 1987) and desire for recognition and approval (Faber, 1992 ; O'Guinn & Faber, 1989).

Finally, sociological factors that have a plausible role in compulsive buying behaviour concern early family experiences, gender roles and general disintegration of modern life (Elliott, 1994 ; Faber & O'Guinn, 1988 ; Scherhorn et al., 1990).

According to Faber (1992), social norms and media portrayals of using shopping as a way to overcome unhappiness may also play a significant role in the constitution of compulsive buying.

Baumeister and colleagues have studied the relationship between self-control and self-regulation failure, impulsive purchasing and compulsive buying (Baumeister, 2002 ; Baumeister & Heatherton, 1996 ; Masicampo & Baumeister, 2007). The results of their work suggest that compulsive buying, mindfulness and self-control failure may have common functioning.

A methodology based on the study of high-level cognitive processes engaged in decision making could give additional information about the cognitive characteristics of compulsive buyers. In the present study, script tasks and a neuropsychological assessment of executive functions (inhibition, planning, flexibility) are used. The Hamilton depression scale was also administered in order to study the effect of depression state on compulsive buying.

Psychologists define compulsive behaviour as a repetitive behaviour that a person feels compelled to perform and is primarily caused by a dysfunction in inhibitory and executive control (DSM IV).

Shallice (1982) and Grafman (1989) proposed a model of the cognitive processes that are involved in the selection and organization of behaviours mediated by the frontal lobes.

Both models postulate that the generation of adapted behaviours results from an adequate mental representation of the activity, and that the prefrontal cortex plays a major role in the processing of large conceptual units of knowledge. Among these are schemata or scripts, which are defined as routine activities of daily life that have a temporal and semantic structure; for example buying bread (Schank & Abelson, 1977).

Although it is interesting from a theoretical point of view and quite likely to be the case considering the types of cognitive impairments associated with compulsive buying, to our knowledge this is the first study where the relationship between compulsive buying and scripts is investigated.

Shallice (1982, 1988) was the first to interpret the functions related to the prefrontal cortex using the concept of schema. In this model the authors makes an initial distinction between "cognitive unit" which refer to individual cerebral functions that are based on specific neurological substrates (e.g. language, visuospatial processing, etc.) and schemata, which consist of complex series of actions (e.g. shopping for groceries) that are generally familiar to the subjects. The latter are thought to be hierarchically organized, such that higher order schemata (preparing dinner, for example) may include low-order ones (such as preparing the sauce accompanying a fish course). More importantly, however, Shallice (Norman and Shallice, 1980 ; Shallice, 1982) has also proposed two qualitatively distinct processes that determine which particular schema will be activated: (a) an automatic process, called Contention Scheduling (CS), which is involved in cognitive as well as in action schema that are routine, and depends upon the integrity of the basal ganglia, and (b) a controlled process, the Supervisory Attentional System (SAS), which modulates operations when situations are non-routine and depends upon the prefrontal cortex.

More specifically, the CS would be engaged in problem that it "knows" how to answer, that is, in situations where the thought operations (schemata) activated are sufficient to carry out the task satisfactorily.

By contrast, when no solution procedures to solve the problem are known, when procedures unexpectedly fail, or when the procedure have to be reorganized, then the SAS would be prompted to plan a new schema or reorganize an old one. Thus, according to this model, damage to the frontal lobes, and hence, to the SAS, should not affect the patient's performance on a routine task, but should cause, instead, an impairment on non-routine activities.

In contrast to Shallice, who has focused on the processes involved in the selection of schemata, Grafman (1985, 1989) has attempted to describe how the knowledge of schemata may be represented and stored at the level of the frontal lobes. Grafman has proposed that a schema corresponds to Schank and Abelson's (1977) concept of script, which he calls a "Managerial Knowledge Unit" (MKU). A MKU consists of a chronological sequence of real or imaginary events that have a beginning and an end (for example, to pursue the earlier

culinary analogy: warming the pan; melting the butter; adding the flour; cooking the roux; adding the capers; stirring until the sauce thickens). Grafman (1989) hhas also suggested that MKUs (familiar or not) proceed in a chronological sequence. These types of schema would provide a temporal coding of the time spent for the entire activity as well as for each action within the MKU.

Schank and Abelson (1977) stress the importance of goals as the general mechanism for understanding script events. Lichtenstein and Brewer (1980) go one step further and state that, with knowledge, of an individual's task goals, a plan (a more general form of script) can be constructed representing the order in which a sequence of behaviours is to be performed. In addition, Hoffman , Mischel and Mazze (1981) hypothesize that goal concepts have the ability to join behaviours cohesive, rule-guided patterns.

According to Grafman's hypothesis a deficit in the functioning of the frontal lobes should cause a deficit in the ability to integrate sequential information, and thus, should affect, the nature *per se* of the individual's cognitive representations of knowledge in both routine and non-routine situations.

The use of script tasks with compulsive buyer will help to understand the sequential organization of buying process in compulsive buyers.

Dempster (1992) and Hasher and Zacks (1988) developed a theoretical framework where inhibition is conceptualised as an explanatory mechanism of many cognitive and behavioural activities requiring the suppression of strong or unwanted responses.

Contemporary models of selective attention emphasize the joint role of both activation and suppression mechanisms in the efficient selection of relevant information and actions.

In the work of Hasher and Zacks (1988), attentional inhibition plays a critical role in regulating cognition and everyday behaviour. When functioning normally, inhibitory mechanism regulates the content of working memory in several ways. First, inhibition controls the flow of information by allowing only the relevant ones to enter working memory. Second, inhibition controls what is active in working memory by deleting or suppressing every irrelevant information or any information that becomes irrelevant because the goals have shifted (Hasher & Zacks, 1988 ; Hasher, Zacks & May, 1999). Finally, inhibition serves a restraining function by controlling and preventing strong responses.

With respect to the effects of frontal lobe lesions, increasing evidence seems to argue for a close relationship between the frontal areas and inhibitory mechanisms. At least, the anterior

part of the cortex seems to be a critical region implicated in the attentional inhibitory control deficits.

In harmony with the actual conception of frontal lobe pathology, desinhibition is considered as a part of what has been called the dysexecutive syndrome which refers, on the cognitive level to a wide range of impairments of action planning, flexibility, task coordination, concept formation. These functions correspond to what Burgess and Shallice (1996) called effortful and controlled processes. A strong relationship between frontal lobe integrity and normal executive functioning have been found (Fuster, 1989, 1999 ; Shallice & Burgess, 1996), suggesting that this area plays a major role in non routine and decision making tasks.

On the behavioural level, dysexecutive symptoms correspond to impulsivity, compulsive behaviour, anosognosia (patients with anosognosia cannot recognize their illness due to underestimation of the severity of their condition), environmental dependence, perseveration and failure of self-regulation, monitoring and metacognitive knowledge.

On the basis of the literature reviewed here, it appears that a neurocognitive approach to compulsive buying behaviour could add to its understanding and probably open new relational perspectives in order to improve the consumers-sellers trust.

The aims of this study were to add to the understanding of the relationship between frontal functioning and compulsive buying tendency.

The present investigation examined the cognitive characteristics of compulsive buyers using the Faber and O'Guinn Scale (1992), script tasks and a battery of neuropsychological tests sensitive to compulsion, inhibitory control and executive functions.

Researchers have found that mood state influence normal consumer reactions, and behaviours. Some studies have shown that consumers recall or evaluate marketing stimuli differently depending on their mood states (Gardner, 1985 ; Srull, 1984). Other have shown that mood states are related to the behaviours or behavioural intent of consumers (Gardner & Rook, 1988 ; Rook, 1987 ; Weinberg & Gottwald, 1982). The Hamilton depression scale was then administered in order to study the effect of depression state on compulsive buying.

We predicted a significant weakening in executive functions(Cognitive inhibition, Mental flexibility, Planning) and script tasks. In addition, because compulsive buying may be seen as a response to depressive mood, we expected close relationship between scores on the Faber and O'Guinn Scale and the Hamilton depression scale.

2. Method

2.1 Participants

An extensive normative study of The Faber and O'Guinn Scale (1992) was done prior to the study. Based on the scores of The Faber and O'Guinn Scale , participants were classified as either compulsive buyers or not. The study sample was composed by 46 compulsive (39 male and 7 female) buyers who took part to this normative work and 46 non-compusive buyers (42 male and 4 female).

2.2 Measures

2.2.1 The Faber and O'Guinn Scale (1992)

This is a seven-item clinical screener developed to identify compulsive buyers from within of the general population. The dependant measure was a dichotomous variable that classified each respondent as either a compulsive buyer or non-compulsive buyer. Any respondent who scored less than –1.34 was considered a compulsive buyer.

2.2.2 Measures of executive functioning

Tasks sensitive to frontal lobe pathology were utilized. These tasks are commonly used in the clinical evaluation of executive functions (Lezak, 1995).

Participants were then given the Modified Wisconsin Card Sorting Test, the Tower of London, the Stroop Test and the Hayling Sentence Completion Test . The Behavioural Assessment of the Dysexecutive Syndrome battery was added, so we could have an ecological evaluation of the executive efficiency of our compulsive buyers.

These tasks served for the assessment of three different executive level: flexibility (Trail Making Test, Wisconsin Card Sorting Test, Rule Shift Cards Test), inhibition (Stroop, Hayling Sentence Completion Test) and planning (Tower of London and Action Program, the Zoo Map, the Modified Six Element Test and Key search sub-tests of the BADS).

2.2.3 Script tasks

a) Script arrangement task

The procedure were identical to the one used by Sirigu, Zalla, Pillon, Grafman, Agid and Dubois (1996) and Zalla, Sirigu, Pillon, Dubois, Grafman and Agid (1998). The subjects were presented with twenty mingled cards on a table in front of the subject. The events correspond to the essential actions which constitute the scripts. The subjects were asked to sort the cards according to the script they belong to and to arrange them according to the order they belong to.

The script events were presented under three different conditions: (A) script event with headers, (B) script event with headers including distractor events, (C) script event without headers and distractors.

In condition A, the twenty events composed four independent scripts: purchase gasoline, buy a shirt, buy a magazine and buy a TV. Each script included five events. Each event corresponded to a salient step in the sequence. The script headers were written on separate cards and were displayed in front of the subject throughout the entire task, although the subjects were not informed of the number of events in each script. The instructions were the following: "Here you see four different themes. I am going to show you some cards; on each one is written an action that belongs to one of these themes. Your task is to sort the cards containing the activities and put these cards under the theme in the order that one would normally execute them. Put the action that one would execute first on the top, the second action just below it and so on".

In condition B, each script was composed of four instead of five events. Four distractors were added so that the total number of events remained twenty as in condition A. As in condition A, the script headers were written and displayed in front of the subject throughout the entire task. The script theme were: go out to buy ice cream, buy a CD album, buy a postcard, buy a mobile phone and buy a desk lamp.

There were two types of distractors. Two distractors events were totally unrelated to any of the script (semantically distant) and two distractors events had an associative link to one of the scripts (semantically near). The instructions were given as in condition A, but subjects were also told to put aside the events that, according to them, did not belong to any of the four themes.

In condition C, there were twenty events constituting four scripts, but no script header was provided in this set. The scripts were: buy a melon, buy an umbrella, buy 500g of cookies,

buy a webcam. The instructions were to explicitly identify each script's theme, and to arrange these script events in the order that you would normally execute them.

All the subjects were administered sets A, B, and C in the same order. All the instructions were written on cards which remained visible during the administration of each experimental condition. Once the subjects completed the task, the examiner recorded the sequences produced and the total time employed. The subject was then given the possibility to verify her/his production and queried for further information.

The following variables were analysed for the three conditions :

1) Response time: total time needed to reconstruct the scripts

2) Errors of sequence ordering: these errors were counted when an event order inversion occurred locally within a script. Event sequence errors were divided in two types: (a) "physical" when the event order is physically impossible and "unconventional" when, although physically possible, the event sequence is logically inconsistent.

3) Violation and boundary error. A violation error is when the event belonging to one script theme is inserted under another script theme. Another type of violation error consist in inserting a distractor event.

A boundary error occurred when a subject attempted to fill the gap between two events with another event which did not belong to the same script theme or was not temporally or sequentially related.

The fusion of two distinct scripts is considered as a boundary error. In this case, subjects do not define correctly the beginning and the end of a script sequence and they create a single longer script by filling the gap between two events which are sequentially and temporally distant.

a) Script generation task

Subjects are requested to verbally enumerate what people generally do over the course of an activity, and to place the actions in the correct chronological order. They were first given an example using the script "getting up in the morning" (e.g. Hear the alarm clock, get up, go to the toilet, …, put your coat, close the door). Following this example, subjects were asked to repeat the instructions before proceeding further, to insure that there was no misunderstanding. Each subject was then invited to generate actions of four familiar scripts: going to the cinema, shopping for groceries, going to restaurant and buy a train ticket.

The mean total number of actions produced in each script was considered. The four scripts were then scored according to the semantic and temporal criteria that have been proposed by

Brower, Black and Turner (1979) and Roman, Brownell, Potter, Seiblok and Gardner (1987). The norms used to score those scripts were based on a previous normative study with 30 francophone subjects.

The semantic aspect of the script was measured using inclusion criteria based on three types of actions (major, minor, trivial), and two types of errors (relevant and irrelevant intrusions).

To be included, an action had to be mentioned by at least 25% of the control subjects that had participated in the normative study. Actions that met this criterion were subsequently classified as major (mentioned by more than 65% of the normal control subjects), minor (mentioned by 45-65% of the normal control subjects), or trivial (mentioned by 25-44% of the normal control subjects). By contrast, actions that did not meet the inclusion criteria were listed as intrusions, which either belonged to the particular script (relevant) or not (irrelevant).

Difficulties in the temporal aspect of the script was evaluated by looking at sequencing errors, which correspond to a displacement in the natural sequence of actions within a script. Furthermore, perseverative errors, which consist of actions that are repeated more than once in a script were also measured.

2.2.4 The Hamilton Depression Scale

The Hamilton Depression Scale is a 17 items test measuring the severity of depressive symptoms in individuals. It is sometimes known as the Hamilton Rating Scale for Depression (HRSD) or the Hamilton Depression Rating Scale (HDRS).

The HDS is used to assess the severity of depressive symptoms present in both children and adults. It is often used as an outcome measure of depression in evaluations of antidepressant psychotropic medications and is a standard measure of depression used in research of the effectiveness of depression therapies and treatments. It can be administered prior to the start of medication and then again during follow-up visits, so that medication dosage can be changed in part based on the patient's test score. The HDS often used as the standard against which other measures of depression are validated.

The HDS was developed by Max Hamilton in 1960 as a measure of depressive symptoms that could be used in conjunction with clinical interviews with depressed patients. It was later revised in 1967.

The 17-item version of the HDS is more commonly used than the 21-item version, which contains four additional items measuring symptoms related to depression, such as paranoia and obsession , rather than the severity of depressive symptoms themselves.

In the 17-item version, nine of the items are scored on a five-point scale, ranging from zero to four. A score of zero represents an absence of the depressive symptom being measured, a score of one indicates doubt concerning the presence of the symptom, a score of two indicates mild symptoms, a score of three indicates moderate symptoms, and a score of four represents the presence of severe symptoms. The remaining eight items are scored on a three-point scale, from zero to two, with zero representing absence of symptom, one indicating doubt that the symptom is present, and two representing clear presence of symptoms.

For the 17-item version, scores can range from 0 to 54. One formulation suggests that scores between 0 and 6 indicate a normal person with regard to depression, scores between 7 and 17 indicate mild depression, scores between 18 and 24 indicate moderate depression, and scores over 24 indicate severe depression.

There has been evidence to support the reliability and validity of the HDS. The scale correlates highly with other clinician-rated and self-report measures of depression

3. Results

Series of one-way ANOVAs were conducted to test for group differences on demographic characteristics (Table 1). This analysis revealed no differences between the groups for age ($p = 0.98$) or level of education ($p = 0.76$).

As shown in Table 1, compulsive buyers performed significantly worse than normal controls on all the executive tasks ($p < .05$) and they had higher scores on the Hamilton Depression Scale ($p < .01$). This result supports the arguments towards the close relationships between frontal lobe dysfunction, depression state and compulsive buying.

The total time needed to reconstruct the scripts was significantly longer in compulsive buyers compared to normal controls (Table 2). Compulsive buyers performed remarkably slowly in all three conditions compared to normal controls (respectively $p < .05$ for condition A; $p < .01$ for condition B and $p < .001$ for condition C).

Sequences errors were counted for each of the four scripts that composed each condition. The total number of sequences errors was significantly higher in compulsive buyers ($p < .05$). Compulsive buyers made significantly higher number of errors in Condition B and Condition C. Globally, compulsive buyers showed greater difficulty while responding to Condition C.

Table 1 Demographic description, Faber and O'Guinn Scale and neuropsychological test results for the participants groups

Demographic variables	Compulsive Buyers (n = 46)	Normal controls (n = 46)	*p*
Age			
Mean	42.7 (15.2)	43.8 (13.6)	.77
Range	17 – 55	19 – 59	
Education			
Mean	9,7 (2.96)	9,5 (2.5)	.98
Range	5 – 18	5 – 16	

Test measurements	Frontal group	Normal controls	*P*
Trail Making Test			
Part A (time in seconds)	102,66 (55.33)	97.33 (45.04)	.001
Part B (time in seconds)	227,12 (98.33)	154.03 (33.36)	.005
Perseverative errors (Part B)	2,36 (1.15)	0.5 (0.3)	.05
Modified Card Sorting Test			
Categories achieved	4.25 (2.13)	7.8 (0.4)	.0001
Number of errors	13.75 (12.51)	3.2 (1.2)	.005
Number of perseverations	6.14 (5.21)	0.7 (0.4)	.001
Tower of London			
Number of correct solutions (max = 12)	6.52 (2.3)	8.8 (1.2)	.05
Stroop			
Stroop Color-Words (time in seconds)	166.23 (46.42)	110.17 (46.3)	.05
Stroop Color-Words (number of errors)	17.22 (15.3)	6.1 (3.6)	.001
Hayling test			
Response time (Part A)	18.5 (3.57)	18.02 (2.03)	.44
Response Time (Part B)	112.05 (28.33)	25.33 (8.65)	.005
Error score	11.2 (4.36)	4.3 (2.6)	.05
BADS			
Rule Shift Cards	3.17 (1.38)	/	/
Action Program	4.31 (0.91)	/	/
Key Search	2.50 (1.33)	/	/
Zoo Map	1.77 (1.26)	/	/
Temporal Judgement	1.64 (1.01)	/	/
Six Elements	2.71 (1.29)	/	/
Score (corrected for age)	81.95 (21.34)	/	/
Faber and O'Guinn Scale	-1.77	-0.5	.01
The Hamilton Depression Scale	9.3 (4.6)	5.2 (1.4)	.05

None of the normal controls made violation errors. In contrast, fourteen compulsive buyers made one or more such errors ($p < .001$).

In condition B, all normal controls discarded the irrelevant events while ten compulsive buyers included one or more distractor events (range: 0-8; $p < .001$) in their scripts. All the distractors incorporated into the scripts were semantically related to the script of event theme.

All normal controls produced four scripts and produced appropriate headers in condition C. in contrast, the majority of compulsive buyers produced fewer than four scripts.

Table 2 Mean (*S.D.*) time for sorting and ordering the three pre-established sets of script events by condition per group

Group	Condition A	Condition B	Condition C
Compulsive Buyers	155.4 (33.2)	187.6 (43.2)	203.6 (34.6)
Normal controls	98.7 (32.8)	110.3 (43.7)	123.2 (37.4)

Table 3 Script sequence and violation errors.

Group (Condition A, B, C)	Compulsive buyers	Normal controls
Sequence errors		
Number of subjects	21/46	2/46
Mean error (range)	6.3 (1-11)	0.87 (0-1)
Violation errors		
Number of subjects	14/46	0/46
Mean error (range)	5.7 (0-8)	-

Compulsive buyers generated significantly more actions than normal controls on the Script generation task. A two-way ANOVA (Group X Class of actions), with repeated measures on the last factor revealed significant main effect of Group [F (1, 90) = 5.66, $p < .05$] and class of actions [F (2, 180) = 6.3, $p < .001$], as well as a significant interaction [F (2, 180) = 7.4, $p < .05$]. Subsequent analyses of simple main effects showed that the scripts differed in the two groups with respect to the number of major ($p < .001$), minor ($p < .01$) and trivial ($p < .05$).

Both compulsive buyers and normal controls made sequencing errors. However, compulsive buyers produced significantly greater sequencing errors than normal controls ($p < .001$). Furthermore, the examination of the compulsive buyers responses revealed a significantly higher rates of irrelevant intrusions ($p < .01$) and perseverative errors ($p < .05$).

Table 4 Mean total number of actions as well as irrelevant intrusions, sequencing and perseverative errors for compulsive buyers and normal controls

	Compulsive Buyers	Normal controls
Total number of actions	35 (6.8)	17.3 (2.6)
Major actions	12.44 (7.3)	10.3 (0.8)
Minor actions	9.55 (9.32)	6.3 (2.33)
Trivial actions	14.6 (8.54)	4.7 (1.03)
Irrelevant intrusions	5.7 (2.66)	2.06 (0.66)
Sequencing errors	6.88 (1.7)	2.45 (1.66)
Perseverative errors	3.7 (0.77)	0.8 (1.34)

The relationships between compulsive buyers scores on the script tasks, Faber and O'Guinn Scale, and Hamilton Depression Scale were analysed by means of Pearson correlations. Pearson product-moment correlations are presented in Table 5.

Table 5a : Pearson correlations among scores for the Script arrangement task , Trail Making Test, Modified Card Sorting Test, Stroop Test, The Hayling Sentences Completion Test, BADS, Tower of London and Faber, and O'Guinn Scale of compulsive buyers

	Sorting time	Sequence errors	Violation errors
Trail Making Test			
Part B (time in seconds)	0.51 [c]	-0.43 [a]	-0.40 [a]
Perseverative errors (Part B)	-0.43 [b]	0.48 [b]	0.35 [a]
Modified Card Sorting Test			
Categories achieved	0.43 [a]	-0.53 [a]	-0.42 [c]
Number of errors	-0.47 [b]	0.57 [b]	0.55 [b]
Number of perseverations	-0.63 [b]	0.73 [b]	0.59 [b]
Stroop			
Stroop Color-Words (time in seconds)	0.44 [c]	-0.38	-0.55
Stroop Color-Words (number of errors)	-0.55 [c]	0.63 [c]	0.50 [c]
Hayling test			
Response time (Part B)	0.46 [b]	-0.44 [b]	-0.42 [c]
Error score	-0.52 [c]	0.72 [c]	0.52 [c]
Tower of London			
Number of correct solutions (max = 12)	0.41 [c]	-0.68 [a]	-0.52 [c]
BADS			
Rule Shift Cards	0.46 [a]	-0.56 [a]	-0.54 [b]
Action Program	0.51 [c]	-0.54 [c]	-0.47 [c]
Key Search	0.63 [c]	-0.68 [b]	-0.49 [b]
Zoo Map	0.52[a]	-0.62 [a]	-0.56 [a]
Temporal Judgement	0.23	-0.19	-0.19
Six Elements	-0.77 [c]	-0.77 [c]	-0.63 [b]
Score (corrected for age)	0.75 [a]	-0.68 [a]	-0.74 [a]
Faber and O'Guinn Scale	0.48[b]	0.62[b]	0.55 [a]
Hamilton Depression Scale	0.67 [a]	0.53 [a]	0.64 [a]

a: $p < .001$, b: $p < .01$, c: $p < .05$, d: $p < .005$.

Performance on script generation correlated with performance on neuropsychological tests of executive functions. We also find significant correlation between neuropsychological tests and measures of script generation. These correlations support the hypothetical relationship between executive function and compulsive buying. They also tend to demonstrate a deficit in script knowledge and manipulation in compulsive buyers.

We also found a significant correlation between the Hamilton Depression Scale and performance on script task. This finding emphasizes the relationship between mood states and consumer behaviour and tend to indicate that depressive state influence negatively script knowledge and script manipulation.

Table 5b : Pearson correlations among scores for the Script generation task , Trail Making Test, Modified Card Sorting Test, Stroop Test, The Hayling Sentences Completion Test, BADS, Tower of London and Faber, and O'Guinn Scale of compulsive buyers

	Total number of actions	Major actions	Minor actions	Trivial actions	Irrelevant intrusions	Sequencing errors	Perseverative errors
Trail Making Test							
Part B (time in seconds)	0.41 [c]	0.55 [c]	0.50 [c]	0.61 [c]	-0.42 [a]	-0.55 [a]	-0.52 [a]
Perseverative errors (Part B)	-0.62 [b]	-0.43 [b]	-0.51 [b]	-0.47 [b]	0.45 [a]	0.48 [b]	0.35 [a]
Modified Card Sorting Test							
Categories achieved	0.53 [a]	0.55 [a]	0.48 [a]	0.53 [a]	-0.48 [c]	-0.42 [a]	-0.47 [c]
Number of errors	-0.40 [b]	-0.42 [b]	-0.43 [b]	-0.62 [b]	0.54 [b]	0.52 [b]	0.63 [b]
Number of perseverations	-0.67 [b]	-0.68 [b]	-0.48 [b]	-0.55 [b]	0.52 [b]	0.61 [b]	0.66 [b]
Stroop							
Stroop Color-Words (time in seconds)	0.54 [c]	0.48 [c]	0.52 [c]	0.48 [c]	-0.55	-0.48	-0.53
Stroop Color-Words (number of errors)	-0.46 [c]	-0.43 [c]	-0.55 [c]	-0.58 [c]	0.44 [c]	0.63 [c]	0.57 [c]
Hayling test							
Response time (Part B)	0.56 [b]	0.40 [b]	0.42 [b]	0.44 [b]	-0.47 [c]	-0.41 [b]	-0.43 [c]
Error score	-0.50 [c]	-0.42 [c]	-0.45 [c]	-0.72 [c]	0.42 [c]	0.72 [c]	0.62 [c]
Tower of London							
Number of correct solutions (max = 12)	0.51 [c]	0.53 [c]	0.47 [c]	0.42 [c]	-0.52 [c]	-0.58 [a]	-0.53 [c]
BADS							
Rule Shift Cards	0.45 [a]	0.43 [a]	0.56 [a]	0.52 [a]	-0.50 [b]	-0.51 [a]	-0.54 [b]
Action Program	0.51 [c]	0.41 [c]	0.48 [c]	0.51 [c]	-0.47 [c]	-0.54 [c]	-0.43 [c]
Key Search	0.62 [c]	0.60 [c]	0.43 [c]	0.42 [c]	-0.52 [b]	-0.58 [b]	-0.46 [b]
Zoo Map	0.44 [a]	0.54 [a]	0.56 [a]	0.50 [a]	-0.46 [a]	-0.62 [a]	-0.48 [a]
Temporal Judgement	0.20	0.14	0.29	0.3	-0.19	−0.11	-0.12
Six Elements	-0.73 [c]	-0.62 [c]	-0.78 [c]	-0.57 [c]	-0.53 [b]	-0.62 [c]	-0.64 [b]
Score (corrected for age)	0.45 [a]	0.62 [a]	0.55 [a]	0.75 [a]	-0.74 [a]	-0.53 [a]	-0.54 [a]
Faber and O'Guinn Scale	0.43 [b]	0.62 [b]	0.52 [b]	0.58 [b]	0.65 [a]	0.62 [b]	0.45 [a]
Hamilton Depression Scale	0.57 [a]	0.44 [a]	0.47 [a]	0.62 [a]	0.54 [a]	0.63 [a]	0.48 [a]

a: $p < .001$, b: $p < .01$, c: $p < .05$, d: $p < .005$.

Discussion

The present investigation examined the cognitive characteristics of compulsive buyers using the Faber and O'Guinn Scale (1992), script tasks and a battery of neuropsychological tests sensitive to compulsion, inhibitory control and executive functions.

To our knowledge this the first study where script tasks, the Faber and O'Guinn Scale and executive functions tests are administered to the same participants, and especially to participant with a compulsive buying profile.

Our main finding is that participants with a compulsive buying profile had (qualitatively and quantitatively) low scores on script tasks and executive function tests.

In agreement with a large group of previous studies (Allain, Le Gall, Etcharry-Bouyx, Aubin & Emile, 1999 ; Le Gall, Aubin, Allain, 1993 ; Sirigu et al., 1995, 1996) we found significant associations between executive tests scores and Scripts scores. These associations emphasize the important role of executive functions (planning, flexibility, inhibition of inappropriate responses) in non-routine and goal-directed behaviour.

Our results offer solid arguments towards the neurocognitive components of compulsive buying behaviour and add two major contributions to the available literature.

First, our results are consistent with those of previous studies (Burguess & Shallice, 1996 ; Lezak, 1995) where a close relationship between frontal lobe dysfunction and abnormal inhibitory control has been reported. They add to the understanding of compulsive buying by giving empirical evidences supporting the idea that an abnormal functioning of the frontal lobes and the executive functions (lower sores on executive tests sensitive to frontal lobe functioning) plays a significant role in compulsive buying.

We extended findings from previous studies on compulsive buying behaviour by giving empirical evidence for an abnormal script knowledge and manipulation in compulsive buyers.

Secondly, the scores on the Hamilton Depression Scale tend to demonstrate, to a certain degree, that a depressive mood could explain at least partly compulsive buying behaviour and bad scores on the Faber and O'Guinn Scale and script tasks.

Our review of the literature suggests that subjects with self-control deficits exhibit also impairment in executive functions tests. Baumeister (2002) proposed that self-control depends on three major ingredients: standards, monitoring and the operational capacity to alter one's behaviour. Standards refer to norms, ideals, goals and other guideline that specify the desired and the ideal response. Consumers who know what they want precisely are probably less likely than others to indulge in impulse buying, and in general are probably less vulnerable to influences from sales personnel and advertisers. Uncertain or conflicting goals undermine the basis of self-control and make people more predisposed to aberrant buying behaviour.

Monitoring is a crucial ingredient of self-control and concerns the ability to keep track of the relevant behaviour. The implication for consumer behaviour is that when people keep careful track of their money and expenditure, impulsive purchases are less likely.

Monitoring and standards are useless without the capacity to change. In certain cases of aberrant consumer, the person might know what he or she wants and be quite aware of his or

her own behaviour but not able to make the self perform the necessary actions (inhibit compulsive buying).

Our results and those of previous research conducted with subjects having executive functions impairments, support what was said by marketing studies focusing on compulsive buying. Concepts like monitoring, standards, capacity to change and self-regulation correspond in psychological studies to what is observed and measured in executive functions.

Executive functioning have been reported as significantly involved in activities requiring emotion regulation, action planning, flexibility in behavioural responses, effective choice making and adaptation to changing social context, social interactions, socio-cognitive knowledge and norms learning, metacognition, inhibition of irrelevant actions and environmental adherence. This is in accordance with the conceptual framework developed by Valence et al. (1988), where compulsive buying is due to personality-situation interaction (social interactions and norms learning, flexible behavioural response, emotion regulation), family environment and genetic factors (genetic predisposition to abnormal frontal areas, social and norms on the basis of personality formation) and socio-cultural environment including culture, commercial environment and advertising activities (socio-cognitive knowledge, norms use, choice making).

Conclusion

Taken together, our results and those of previous marketing and clinical research tend to indicate that compulsive buying, like other aberrant consumer behaviours, appear to be the result of a variety of cognitive, emotional and social processes.

Our findings are complementary to previous consumer behaviour studies where decision makers deviate from rational choices, despite prior knowledge that could lead them in a different direction (Loewenstein, Weber, Hsee, & Welch, 2001).

In other respects, the conjoint use of marketing and neurocognitive methodology in the study of compulsive buying offers to researchers and professionals the possibility to have an integrative comprehension of this aberrant consumer behaviour and certainly offers new research perspectives.

Subsequent studies should try to better analyse the social, cultural, and cognitive factors in order to clarify the aetiology, the evolution, and the therapeutic solution of compulsive buying. Gender effect should also be studied since were unable to perform between sex comparison in our study.

Further studies with different scripts tasks will enable a better understanding of normal and aberrant consumer buying behaviours in real and virtual stores.

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