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### **Measuring compulsive buying behaviour: Psychometric validity of three different scales and prevalence in the general population and in shopping centres**

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## ABSTRACT

Due to the problems of measurement and the lack of nationally representative data, the extent of compulsive buying behaviour (CBB) is relatively unknown. **Methods:** The validity of three different instruments was tested: Edwards Compulsive Buying Scale (ECBS; Edwards, 1993), Questionnaire About Buying Behavior (QABB; Lejoyeux & Adès, 1994) and Richmond Compulsive Buying Scale (RCBS; Ridgway, et. al., 2008) using two independent samples. One was nationally representative of the Hungarian population (N=2710) while the other comprised shopping mall customers (N=1447). **Results:** A new, four-factor solution for the ECBS was developed (ECBS-R), and confirmed the other two measures. Additionally, cut-off scores were defined for all measures. Results showed that the prevalence of CBB is 1.85% (with QABB) in the general population but significantly higher in shopping mall customers (8.7% with ECBS-R, 13.3% with QABB and 2.5% with RCBS-R). **Conclusions:** Due to the diversity of content, each measure identifies a somewhat different CBB group.

**Key words:** behavioural addiction; compulsive buying; measurement; prevalence; general population; shopping addiction; shopping malls; excessive shopping; instrument validation

# 1. INTRODUCTION

In today's consumer society, shopping is an integral part of everyday life as well as of our economy. Consumers are spoilt for choice and the function of shopping is more than just about the purchasing of items. More specifically, shopping has become both a form of entertainment and a rewarding behaviour (Mukhopadhyay and Johar, 2009). Consequently, it has become a habit that may be potentially abused by a minority of individuals and lead to a harmful psychiatric problem, called compulsive buying behaviour (Black et al., 1998; Christenson et al., 1994a; McElroy et al., 1994).

The consequences of compulsive buying behaviour (CBB) are often underestimated in the general population. Research by Christenson et al (1994b) noted that excessive shopping induces large debts (58%), guilt (46%), inability to meet payments (42%), criticism from acquaintances (33%), and criminal legal problems (8%) based on the examination of 24 individuals with CBB. Furthermore, those with CBB often describe an increasing level of urge or anxiety that can only lead to a sense of completion when a purchase is made (Black, 2007). Black et al. (1998) found that individuals with CBB are three times more likely to develop an eating disorder and over two times more likely to abuse substances or to have any mood or anxiety disorder than individuals without CBB.

Although compulsive buying is not a distinct category in the DSM-5 (American Psychiatric Association, 2013), it is considered by many to be a behavioural addiction (Davenport, Houston and Griffiths, 2012; Demetrovics and Griffiths, 2012; Lo and Harvey, 2012; Rose and Dhandayudham, 2014; Starcke et al., 2013). Like most addiction disorders, compulsive buying is characterised by both impulsive and compulsive properties (Hollander and Allen, 2006; McElroy et al., 1994; Ridgway et al., 2008a). As an impulse-control disorder, it is marked by irresistible impulses to perform harmful behaviours that are beyond the individual's control (i.e., debts that create problems at home or in work life). On the other

hand, as an obsessive-compulsive disorder, CBB is characterised by anxiety, obsessive thoughts and behavioural compulsions that interfere with normal functioning (i.e., buying things becomes the most important activity in the person's life and all other behaviour fits around it). The most widely accepted definition of compulsive buying behaviour was developed by McElroy et al. (1994). They emphasised that CBB is a maladaptive behaviour or preoccupation with buying or shopping, as a response to negative effects that interfere with everyday functioning and results in financial problems.

As yet, there are no robust longitudinal studies of CBB. However, based on retrospective studies, almost every study of individuals with CBB reports the episodic appearance of addiction-like symptoms, and some individuals describe the disorder as lasting for decades (Black, 2007; McElroy et al., 1994; Schlosser et al., 1994). This suggests that CBB can be asymptomatic without complete remission.

Due to the various conceptualizations of CBB, there are also a number of different instruments that measure the behaviour. The most frequently used self-report scale is Faber and O'Guinn's (1992) seven-item Compulsive Buying Scale (CBS). This scale assesses thoughts, affects, and behaviour (before, during and after the purchase) including items on general shopping behaviour. However, the CBS contains several culture-related items, such as "Wrote a check when I knew I didn't have enough money in the bank to cover it". In many countries the system of bank checks does not exist and in other countries, checks are considered to be an out-dated method of payment (Quinn and Roberds, 2008). For these (and other) changes in banking and payment culture, new instruments have been developed to assess compulsive buying behaviour. For example, the Edwards Compulsive Buying Scale (Edwards, 1993) is based on the Compulsive Buying Scale, and the Questionnaire of Addictive Buying Behavior (QABB) was developed by Lejoyeux and colleagues (Lejoyeux and Ades, 1994; Lejoyeux et al., 1997) and is based on McElroy et al.'s (1994) definition of compulsive buying. The more recently developed Richmond Compulsive Buying Scale

(Ridgway et al., 2008b) assesses CBB as an impulse control problem as well as an obsessive-compulsive disorder.

The lifetime prevalence rates of compulsive buying in representative studies are estimated to be between 1% (former East Germany) and 11.3% (Brazil) (Faber and O'Guinn, 1992; Koran et al., 2006; Mueller et al., 2010a; Neuner et al., 2005; Villella et al., 2011). The reported prevalence rates show wide variation despite the fact that most of the above studies have used the same instrument for screening CBB (i.e., Compulsive Buying Scale [Faber and O'Guinn, 1989]). On the other hand, in non-representative populations, lifetime prevalence rates may be substantially higher. For instance, 19% of Chinese high-school respondents of four, economically highly developed schools were classified as individuals with CBB whereas 25% of Thai respondents from Bangkok fell into this category (Guo and Cai, 2011). Lejoyeux et al. (2007) conducted a study where they assessed all women entering a prestigious Parisian department store. They reported that 32.5% out of 200 women met both McElroy et al.'s criteria of compulsive buying as well as scoring 10 or more (out of 19) on the Questionnaire of Buying Behavior (Lejoyeux et al., 1997).

Large heterogeneity in the prevalence of compulsive buying is due to the diversity of demographical variables (notably age and gender), sample differences, the use of instruments with different conceptual definitions of CBB, and the unreliable cut-off scores of these instruments. Furthermore, some instruments assess lifetime whereas others assess current prevalence of the disorder, resulting in further confusion in prevalence rates. However, it is unclear whether the prevalence rates obtained via the various instruments reflect existing differences in prevalence rates or are due to their different criteria. Furthermore, the prevalence of CBB in shopping malls relative to the general population is unknown.

The purpose of the current study was therefore threefold. The present study aimed to (i) test the validity and the factor structure of three different compulsive buying questionnaires and (ii) define a cut-off score for those questionnaires where it is lacking, and (iii) assess the

prevalence rate of CBB in both a nationally representative sample and on a specific sample of shopping mall customers. It was hypothesized that compulsive buying scores would correlate positively with distress, impulsivity, and sensation seeking, and would correlate negatively with self-esteem.

## **2. METHOD**

### **3. Participants and procedure**

#### *4. 1. 1. Sample 1: Shopping mall customers*

The study aimed to contact possible participants at three different shopping malls in Budapest and one in Győr (Western-Hungary) between April and November 2012. The shopping centres were carefully selected to attract different consumer groups from different capture areas within Budapest. Simultaneously, between two and five university students collected e-mail addresses on 155 occasions, covering all opening hours equally. On 79 occasions they stopped everyone who met the study inclusion criteria on entering the mall, while on 76 occasions they stopped those that were exiting. After introducing the goals of the study in detail, the participants were asked to sign the informed consent on which they provided their e-mail address.

Overall, 37,469 people passed the entrance at time of data collection. Customers that were excluded from data collection (N=8840) included those who (i) were below the age of 18 years (ii) did not have an email address, and/or (iii) did not speak Hungarian. Of the 28,629 individuals approached, 8,438 did not stop at all, while another 15,123 stopped and received information on the study but did not participate in the study. The remaining 5,068 persons agreed to participate (17.7%) by providing an email address. Those who agreed to participate were sent the study link within 24 hours following written consent along with an individual password. Reminder emails were sent 7 days and 14 days after the first call when

necessary. Participants that started but did not complete the questionnaire were also sent a reminder email. A total of 426 emails out of the 5,068 bounced back due to invalid email address and 2,866 individuals did not reply. A total of 1,776 individuals began the questionnaire with 1,447 of them completing and providing valid responses to all the compulsive buying measures (28.6%). Those that participated did not receive any financial remuneration for participating. However, all participants received brief feedback regarding their buying behaviour at the end of the study. The study design was approved by the Institutional Review Board of the appropriate university [name removed for review purposes].

#### 5. 1. 2. *Sample 2: Nationally representative sample*

Compulsive buying behaviour was assessed within the framework of the *National Survey on Addiction Problems in Hungary* (NSAPH) (Paksi et al., 2009). In this survey, both chemical addictions (i.e., tobacco smoking, alcohol and other substance use) and various behavioural addictions (i.e., pathological gambling, internet addiction, compulsive buying, eating disorders, work addiction, exercise dependence) were also assessed.

The target population of the survey was the total population of Hungary between 18 and 64 years of age (6,703,854 persons). The sampling frame consisted of the whole resident population with a valid address according to the register of the Central Office for Administrative and Electronic Public Services (6,662,587 individuals). Data collection was executed on a gross sample of 3,183 individuals, stratified according to geographical location, degree of urbanization, and age (overall 186 strata) representative of the sampling frame. Participants were surveyed with so-called ‘mixed methods’ via personal visits. Questions on background variables and introductory questions referring to specific disorders were asked in the course of face-to-face interviews, while symptom scales (including the QABB but not ECBS or RCBS) were self-administered as paper-and-pencil questionnaires. These

questionnaires were returned to the interviewer in a closed envelope to ensure confidentiality. Participants were informed both verbally and in a written form that participation in the study was voluntary and anonymous. The net sample size was 2,710 (response rate: 85.1%), however, only those that reported shopping activity at least once a week (N=203) were asked to fill out the QABB. Of these 203 individuals, 193 provided valid answers to the QABB.

## **6. 2. Measures**

*Demographics and shopping habits:* Major socio-demographic characteristics of buyers and the characteristics regarding their shopping habits were asked in form of a face-to-face interview. Participants' offline and online buying habits were also assessed.

*Edwards Compulsive Buying Scale (ECBS, Edwards, 1993):* Based on the scale of Faber and O'Guinn (1992), this instrument was developed to determine just how compulsive the individual is in their buying behaviour. Tested and validated on a sample of self-identified individuals with compulsive buying (N=104) and on a healthy comparison group (N=101), the original 29 items were reduced as a result of the exploratory factor analysis. The remaining 13 items load on five factors: 'Tendency to spend', 'Compulsion/Drive to spend', 'Feelings about shopping and spending', 'Dysfunctional spending', and 'Post-purchase guilt'. Items are scored on a 5-point Likert scale. The compulsive spending score (grand total) represents the mean average of all items and is regarded as an underlying continuous variable. No cut-off score has been developed for this scale. The Hungarian version of this instrument was developed using two independent translators. The questionnaire was translated (and back-translated) by the two experts. Inconsistencies were resolved by the involvement of a third expert (the corresponding author).

*Questionnaire of Addictive Buying Behavior (QABB, Lejoyeux and Ades, 1994; Lejoyeux et al., 1997):* This instrument focuses on buying impulses as well as on their

consequences. The scale was developed based on based on McElroy et al.'s (1994) criteria, and incorporated several clinicians and family members' experiences. QABB was validated on 143 healthy individuals. Principal factor analysis revealed three components: 'Addictive purchases', 'Difference between controlled and impulsive buying' and 'Pathological buying more or less severe'. The scale is self-administered and contains 19 'yes/no' items, where each 'yes' scores a point. The authors applied an ad hoc cut-off score, considering those with a score of 10 or more as individuals experiencing compulsive buying (Lejoyeux et al., 2007). Although this cut-off score has not been validated, the scale has been shown to be suitable to use as a severity index for compulsive buying tendencies (Billieux et al., 2008). The Hungarian translation of the instrument was carried out using the same method as for the ECBS (outlined above).

*Richmond Compulsive Buying Scale (RCBS, Ridgway et al., 2008b):* The RCBS conceptualizes compulsive buying as a disorder with elements of both impulsivity and compulsivity. Here, an individual's thoughts are preoccupied with buying, and the behaviour is carried out to reduce anxiety and consumers lack control over the urge to buy. Initially, a list of 121 potential items was developed based on literature review, press articles, and brainstorming exercises. Consumer researchers narrowed this number to 15 that was then tested on 352 undergraduate students. The final scale comprises six items, loading on two oblique-rotated factors (i.e., 'Obsessive-compulsive buying' and 'Impulsive buying'). Validation was carried out on 555 university staff members, and the factor structure was re-confirmed. Items are scored on a 7-point Likert scale. Validated with a clinical screener, respondents that achieved a score of 25 or above were classified as individuals with compulsive buying behaviour. The validity of the cut-off was confirmed by actual purchase data of internet shoppers. This is the first scale to be developed that does not contain income-related questions. The Hungarian translation was again carried out similarly to the ECBS.

*Barratt Impulsiveness Scale* (BIS, Sansone et al., 2011; Varga et al., 2014):

Impulsivity was measured by the Hungarian version of the BIS-11. This questionnaire contains six first-order factors that fit into two second-order factors – although this factor structure has been questioned by many researchers (e.g. Mueller et al., 2010b; Otero-López and Villardefrancos, 2013; Yi, 2013). The Hungarian version of the BIS-11 contains 21 items which load on three factors: Self-control, Impulsive behaviour, and Impatience (Varga et al., 2014).

*Brief Symptom Inventory* (BSI, Rose, 2007; Sansone and Wiederman, 2012):

Psychiatric symptoms were assessed by the *Brief Symptom Inventory*, which is the short version of the Symptom Checklist 90 - Revised (SCL-90-R) (Claes et al., 2010). The BSI is a 53-item self-report symptom inventory designed to reflect psychiatric symptom patterns of psychiatric and medical patients. Each item of the questionnaire is rated on a 5-point scale of distress from 0 (not at all) to 4 (very much). The BSI consists of nine primary symptom dimensions: somatization (i.e., distress arising from bodily perceptions), obsessive-compulsive (i.e., feelings of obsession and/or compulsion), interpersonal sensitivity (i.e., feelings of personal inadequacy and inferiority in comparison with others), depression (i.e., depressive symptoms, as well as lack of motivation), anxiety (i.e., symptoms of anxiety and tension), hostility (i.e., symptoms of negative affect, aggression, and irritability), phobic anxiety (i.e., symptoms of persistent fears as responses to specific conditions), paranoid ideation (i.e., symptoms of projective thinking, hostility, suspiciousness, fear of loss of autonomy), and psychoticism (i.e., a broad range of symptoms from mild interpersonal alienation to dramatic evidence of psychosis). The Global Severity Index (GSI) is calculated using the sums for the nine symptom dimensions plus the four additional items not included in any of the dimension scores, and dividing by the total number of items to which the individual responded (Urbán et al., 2014).

*Rosenberg's Self-Esteem Scale* (RSES, Rosenberg, 1965): Self-esteem was assessed using the Hungarian version of the RSES. This scale contains five positively and five negatively worded items and is answered on a 4-point scale. This construct of global self-esteem measured by the RSES has recently been confirmed in Hungarian population (Urbán et al., 2013).

*Brief Sensation Seeking Scale*: Sensation seeking was assessed by the Brief Sensation Seeking Scale (BSSS, Hoyle et al., 2002). The eight questions were derived from the SSS-V (Zuckerman et al., 1978) in a way that each of the four subscales (Experience seeking, Boredom susceptibility, Thrill and adventure seeking, and Disinhibition) is represented by two items from the original version.

## **2. 3. Data Analysis**

In relation to the Edwards Compulsive Buying Scale and the Richmond Compulsive Buying Scale, initial factor structures were tested with confirmatory factor analyses (CFAs). All CFAs were performed with robust maximum-likelihood estimation (MLR) in case of continuous indicators or mean- and variance-adjusted weighted least square (WLSMV) estimation in case of binary or ordinal indicators in MPLUS 6.0. The goodness of fit was evaluated using RMSEA and its 90% confidence interval (90% CI),  $p$  value smaller than 0.05 for test of close fit, standardized root-mean-square residual (SRMR) in case of MLR estimation, comparative fit index (CFI), and Tucker-Lewis Fit Index (TLI). As Brown (2006) and Kline (2005) recommended, multiple indices were selected in order to provide different information for evaluating model fit. A satisfactory degree of fit requires the CFI and TLI to be larger than 0.90. RMSEA below 0.05 indicates excellent fit, a value around 0.08 indicates adequate fit, and a value above 0.10 indicates poor fit. An SRMR value below 0.08 is considered a good fit.

Where the initial factor structure had not been developed or the originally proposed measurement model did not fit to the data, the factor structure was tested with exploratory factor analyses (EFAs) with robust maximum-likelihood estimation (MLR) and geomin rotation in MPLUS 6.0. The goodness of fit was assessed by the root-mean-square error of approximation (RMSEA<0.08) and its 90% confidence interval (90% CI), and *p* value smaller than 0.05 for test of close fit (Cfit>.05). To explore the factor structure of Edwards Compulsive Buying Scale, we conducted the analyses in two non-overlapping groups selected randomly. In Sample 1A (N=723) the factor solution was selected based on fit statistics and interpretability of factors. For further validation, the factor structure was then confirmed via CFA in the other half of the sample (Sample 1B, N=724) applying modification indices where necessary.

To check the overlap between RCBS and ECBS-R sub-scales, Average Variance Extracted (AVE) analysis and Divergent Validity Extracted (DVE) were applied to obtain Construct Reliability (CR) and Discriminant Validity (DV) (Kruedelbach et al., 1993; Soloff et al., 2003). AVE measures the explained variance of the construct. The value of AVE for each construct should be at least 0.50 (Morgenstern et al., 1997). CR should be greater than 0.6 (Fornell and Larcker, 1981).

Given that only the RCBS has a valid cut-off point, this instrument was used as the ‘gold standard’ to calculate the cut-off points for the other two instruments (i.e., QABB and ECBS-R). Sensitivity, specificity, positive and negative predictive values and the accuracy for ECBS-R and QABB were calculated at several cut-off points to establish the most accurate threshold. The most common way to quantify the diagnostic accuracy of a laboratory test is to calculate the area under the ROC curve (Area Under the Curve, AUC). Values are acceptable above 0.5 and values above 0.8 yield a good fit (Zweig and Campbell, 1993). For example, value of 0.8 means that a randomly selected individual from the diseased group has a test

value larger than that for a randomly chosen individual from the other, non-diseased group  
80% of the time.

### 3. RESULTS

#### 3. 1. Descriptive Statistics

*Sample 1 (Shopping mall customers):* Two-thirds (63%) of Sample 1 participants (N=906 out of 1,447) were female. Mean age was 31.2 years (SD = 12.1) with the youngest participant being 18 years and the oldest being 77 years old. Half of the sample (49%) had completed secondary, and 43% graduate education. Overall, 42.8% of participants claimed to have average standard of living, 41.9% claimed to live above, and 14.4% below average. At the time of data collection, the Hungarian average income was 635 USD (143,000 HUF) that meant approximately 63% of participants lived below (less than 635 USD per month) and 37% above the average. About half of the participants were in full time employment (48%), and 40% were unemployed. In total, 37% (N=538) shopped at least monthly, 32% (N=458) weekly and 6% every day (N=87).

*Sample 2 (Nationally representative):* In Sample 2 (N=2710), gender differences were more equal. Half the participants were women (50.8%), the mean age was 40.3 years (SD: 13.4, range: 18 - 64), and 57% completed at least 12 years of education and another 34% has a university degree. Overall, 49.2% of Sample 2 participants were in full-time employment, and 9.1% worked less than this.

#### 3. 2. Edwards Compulsive Buying Scale

*Confirmatory factor analysis (CFA).* The factor structure of the ECBS was tested by using CFA (N=1447) in Sample 1. Data indicated non-optimal fit to the original 13-item five-factor model based on the current sample ( $\chi^2=484.8$  df=55  $p<0.001$ ; CFI= 0.912; TLI=0.875; SRMR=0.054; RMSEA=0.073 [CI: 0.068-0.080]). In addition, given that only two items loaded on each three (out of five) factors, we have decided to explore a new factor structure.

*Exploratory factor analysis (EFA).* To test underlying factors, we performed an EFA on Sample 1A. The three reverse items (5, 6, 7) that did not fit the definition of compulsive buying were excluded. This left 26 items for analysis out of the initial 29.

A total of one- to six-factor solutions were examined. The five-factor solution provided the first adequate fit to the data ( $\chi^2=729.6$   $df=205$   $p<0.001$ ; CFI= 0.941, TLI=0.907, SRMR=0.026, RMSEA= 0.059 [CI: 0.055-0.064]. However, the factors obtained were difficult to interpret due to the diverse nature of items loading on one of the factors. For this reason, the four-factor solution ( $\chi^2=883.70$   $df=227$   $p<0.001$ ; CFI= 0.927, TLI=0.895, SRMR=0.030, RMSEA= 0.063 [CI: 0.059-0.068] was opted for. When excluding further items, the following rules were applied. First, items with factor loadings lower than 0.30 in all factors were excluded. Second, items with salient cross loadings ( $>.30$ ) were also excluded. Third, the loading value had to be at least twice as great on one factor than on any other factor. The factor structure was then tested on the remaining half of the sample (Sample 1B) and yielded an excellent fit ( $\chi^2=237.16$   $df=95$   $p<0.001$ ; CFI= 0.946, TLI=0.932, SRMR=0.048, RMSEA= 0.045 [CI: 0.038-0.053]. Factor 1 (Lack of Control) refers to uncontrolled spending habits. Factor 2 (Mood Modification) refers to the irresistible urge and mood elevating effect of shopping activity. Factor 3 (Guilt) contains items related to shame and regret, while Factor 4 (Unnecessary Buying) reflects the fact that the emphasis is the shopping activity itself rather than items bought. Following this rigorous process, 16 of the original 29 items were retained and constitute the Edwards Compulsive Buying Scale Revised (ECBS-R, see Table 1). Cronbach's alpha for the whole scale was 0.87.

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**Table 1 about here**  
**(Factor loadings of the Edwards Compulsive Buying Scale Revised)**  
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### 3. 3. Questionnaire of Buying Behavior

*Confirmatory factor analysis.* WLSMV estimation was performed on all 19 items of QABB in Sample 1's shopping mall customers. The one-factor solution provided adequate fit values based on the criteria ( $\chi^2=378.15$  df=149  $p<0.001$ ; CFI= 0.937, TLI=0.928, WRMR=1.383, RMSEA= 0.033 [CI: 0.029-0.037]). Factor loadings are presented in Table 2. Cronbach's alpha for the scale is acceptable (0.73).

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**Table 2 about here**  
**(Questionnaire About Buying Behavior CFA factor loadings)**  
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### 3. 4. Richmond Compulsive Buying Scale

*Confirmatory factor analysis.* To examine the factor structure of the RCBS, a confirmatory factor analysis (MLR) was performed to test the original two-factor solution on Sample 1 (N=1,447). The fit indices indicated adequate fit to the data ( $\chi^2=912.8$ ,df=15  $p<0.001$ ; CFI= 0.958; TLI=0.922, SRMR=0.037, RMSEA=0.057 [CI: 0.042-0.074]). Correlation between the two scales is  $r=0.47$  ( $p<0.01$ ). Cronbach's alpha for the whole scale was 0.78.

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**Table 3 about here**  
**(Richmond Compulsive Buying Scale CFA factor loadings)**  
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#### 3. 4. 1. Calculation of cut-off points

Based on the RCBS as a 'gold standard', the sensitivity, specificity, positive and negative predictive values and the accuracy for ECBS-R and QABB were calculated at several cut-off points to establish the most accurate threshold (see Table 4). For the ECBS-R, sensitivity is acceptable under the cut-off value of 42 while specificity is acceptable for cut-off values greater than 33. The highest accuracy appears to be at the value of 42. Therefore, this solution

was opted for. Individuals with an ECBS-R score equal to or greater than 42 were classified as individuals with compulsive buying. For QABB, the cut-off at 10 as suggested by Lejoyeux et al. (1997) results in high specificity (96%) but unacceptable sensitivity (47%) and becomes less acceptable as the cut-off points increase. The two acceptable cut-off values for both sensitivity and specificity were at the values of 7 and 8 (sensitivity: 83% and 75% specificity: 81% and 88% respectively). However, accuracy is better at 8 (88%) than at 7 (81%).

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**Table 4 about here**  
**(Sensitivity and specificity at different cut-off scores)**  
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Figure 1 represents the empirical receiver operating curve (ROC) that provides evidence for the ability of the ECBS-R and the QABB to discriminate between participants that were classified asymptomatic (non-cases) and symptomatic (cases) according to the RCBS. The Area Under the Curve (AUC) for ECBS-R is 0.90 ( $p < 0.001$ ) [0.84-0.96] and yields an excellent balance between the sensitivity and specificity of the ECBS-R. Another ROC analysis was performed for the QABB that also yielded good fit (AUC= 0.84 ( $p < 0.001$ ) [0.74-0.93]).

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**Figure 1 about here**  
**(Nonparametric ROC plot of QABB and ECBS-R discriminating between asymptotic and symptomatic classified individuals)**  
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**Table 5 about here**  
**(Correlation matrix between the different compulsive buying measures and other variables)**  
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### **3. 5. Convergent and divergent validity**

Table 5 represents the correlation between the different CB scales and other variables. Neither age, level of education, nor income appears to be strongly related to compulsive buying regardless of the instrument used to measure compulsive buying. However, there is an association between female gender and CB especially on the ECBS-R, although this correlation is weak ( $r=0.26$ ,  $p<0.01$ ). Impulsivity is reflected in all three scales at about the same level (between  $r=0.31$  and  $r=0.39$ ). However, while ECBS-R and QABB appear to be associated with the Global Severity Index, RCBS yields only a weak association. Similarly, self-esteem is associated with ECBS-R and QABB scores, while RCBS reflects self-esteem to a lesser extent. Despite the differences, the three scales were strongly correlated with one another ( $r=0.56$  for RCBS—QABB,  $r=0.65$  for RCBS—ECBS-R and  $r=0.67$  for QABB—ECBS-R, all  $p<0.01$ ). There also seems to be a reversed U-connection between income and compulsive buying tendency, but only when self-reported SES is taken into account and CBB is measured by the RCBS. In essence, there is no correlation between actual income and CBB.

### **3. 6. Prevalence**

**3. 6. 1. Sample 1 (Shopping mall customers).** Using the cut-off scores of 42 for ECBS-R, 8 for QABB, and 25 for RCBS, the lifetime prevalence rates of compulsive buying in Hungarian shopping mall customers was 8.7% ( $N=125$ ), 13.3% ( $N=193$ ) and 2.5% ( $N=36$ ) respectively. Each instrument identified a somewhat different compulsive buyer group (see Table 6). Nevertheless, individuals with CBB appear to be younger ( $t_{ECBS-R}=5.71$   $p<0.001$ ;  $t_{RCBS}=3.70$   $p=0.001$ ) than individuals without CBB except on QABB ( $t=0.94$   $p=0.35$ ). They

completed fewer years in education according to the ECBS-R ( $t=3.77$   $p<0.001$ ) but not according to QABB ( $t=1.30$   $p=0.193$ ) or RCBS ( $t=0.80$   $p=0.43$ ). As for the gender differences, ECBS-R and QABB indicated that women were significantly more likely to be individuals with CBB than men ( $\chi^2=13.27$   $p<0.001$ ;  $\chi^2=4.42$   $p=0.35$  respectively) but not on RCBS ( $\chi^2=0.26$   $p=0.611$ ). Taken together, 4.5% (ECBS-R,  $N=65$ ), 6.4% (QABB,  $N=93$ ) and 1.5% (RCBS,  $N=21$ ) of participants' reports compulsive buying and shops on at least a weekly basis.

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**Table 6 about here**  
**(Individuals with compulsive buying as identified by the different measures (Sample 1))**  
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**3. 6. 2. Sample 2 (Nationally representative).** To determine the prevalence representative to Hungary, the weighted prevalence rates were calculated according to the QABB in Sample 2 ( $N=2710$ ). Consequently, 1.85% of Hungarians were classed as individuals with CBB (i.e., had a score equal to or more than 8) and reported shopping at least weekly.

## 4. DISCUSSION

The present study (i) tested the psychometric validity of three different instruments that were developed to assess compulsive buying, and (ii) calculated the prevalence rate of compulsive buying in both a nationally representative sample of Hungarians and among Hungarian shopping mall customers. As a result, a new four-factor structure was explored, and cut-off scores were calculated for the Edwards Compulsive Buying Scale (Edwards, 1993), re-calculated (i.e., lowered the threshold) for the single-factored Questionnaire of Compulsive Buying (Lejoyeux and Ades, 1994; Lejoyeux et al., 1997), and confirmed the factor structure of the Richmond Compulsive Buying Scale (Ridgway et al., 2008b). Furthermore, it was

found that the prevalence of compulsive buying among nationally representative Hungarians was 1.85% (with QABB) that was substantially lower than in the shopping mall customers: 8.7% (with ECBS-R), 13.3% (with QABB) and 2.5% (with RCBS).

Taken together, these results suggest that the three instruments arguably measure a somewhat different concept of compulsive buying and capture different groups of individuals with CBB (depending upon the conceptual definition used by the instrument developers). The ECBS-R contains the most emotion-related items of compulsive buying and is in line with the definition of CBB (McElroy et al., 1994). This measure refers to current – rather than past – buying tendencies, and produces the highest proportion of females with CBB, and provides a medium estimation of CBB. Alternatively, the QABB refers mostly to past consequences of buying activity ('Have you ever...'), and only partly to current problems. Therefore, it is unclear whether the prevalence obtained via QABB reflects past or current pathological behaviour. For this reason, the older the participants, the more likely they are to have had a compulsive buying episode. This might also be the reason why individuals with compulsive buying identified by the QABB were older than those identified by the other two questionnaires in the sample. Finally, the third instrument – the RCBS – captures CBB from a cognitive perspective, and these individuals with compulsive buying reported less distress than those identified by the other measurements. Consequently, it omits those that suffer from CBB but do not think about it and/or have limited insight to their own behaviour. For this reason, the RCBS is likely to underestimate the prevalence rates, and is reflected by the fact that it yields over three and five times lower prevalence than the ECBS-R and the QABB respectively. Furthermore, QABB assumes that the course of the disorder is continuous, and therefore current compulsive buying behaviour has been preceded by past CBB episodes, while the ECBS-R and the RCBS do not make such an assumption. Based on these findings, the ECBS-R is arguably the most adequate measure of CBB due to its high psychometric and

content validity, and with a clear orientation towards current (rather than previous) shopping activity.

The prevalence rate in Hungary (1.85%) is lower than expected based on previous nationally representative studies. A lower lifetime prevalence rate of 1% was reported among a general population in former East Germany in 1991 (1% Neuner et al., 2005). However, in both East and West parts of Germany in 2001, the prevalence rates were substantially higher (5.1-8%, Neuner et al., 2005). Other studies report a somewhat higher prevalence in both Germany (6.9% Mueller et al., 2010a) and the USA (5.8% Koran et al., 2006). In light of the fact that CBB is not associated with income, it is likely that there are cultural reasons behind the relatively low compulsive buying tendencies as Black (2001) proposes. Unlike France or the United States, in post-communist countries such as Hungary, consumer culture has not had a long history. Nevertheless, it is also possible that there are methodological differences between these prevalence studies such as the screening instruments used to assess CBB. The prevalence of CBB in Hungary would possibly have been higher using other screening instruments. Similarly, exclusion of those that did not report shopping on a weekly basis resulted in the exclusion of individuals that were asymptomatic at the time of assessment but had CB episodes in the past. This resulted in increased reliability of current prevalence rates, however, lifetime prevalence (assessed by other studies) was underestimated in the current prevalence rate.

The present study showed that individuals with CBB were likely to be younger than individuals without CBB, although there was only a low linear association between age and compulsive buying tendency at a group level. Furthermore, women were more likely to be classified as individuals with CBB than men – especially by the ECBS-R – and supports previous literature showing that females appear to be more likely than males to experience shopping disorders (Koran et al., 2006; Mueller et al., 2010a; Neuner et al., 2005; Otero-López and Villardefrancos, 2013). This was probably because this instrument contained the

most emotion-related items. Interestingly, none of the scales was strongly related to income which contradicts several previous studies (see: Black, 2001; Koran et al., 2006; Mueller et al., 2010a; Neuner et al., 2005; Otero-López and Villardefrancos, 2013) despite the fact that all instruments uncovered a similar pattern of relationship between CBB and income. High actual and average perceived income appeared to be a risk factor for compulsive buying with the exception of RCBS that is unlikely to identify low-income individuals with CBB. Therefore, it is perhaps those that underestimate their income and perceive high revenue as average that are most at risk for developing CBB. Furthermore, these data highlight the methodological controversies of measuring income (i.e., objective and subjective income yield different association with compulsive buying).

In relation to the psychological associations, compulsive buying is associated with lower self-esteem and higher sensation seeking and is in line with our hypothesis based on previous literature (Billieux et al., 2008; Faber and O'Guinn, 1989; Hanley and Wilhelm, 1992; Lejoyeux et al., 1997). Additionally, CBB scores reflect impulsivity as strongly as compulsivity, suggesting that CBB is as much an impulse-control disorder, as an obsessive-compulsive one (Hollander and Allen, 2006).

Despite the many strengths of the present study, there are of course some possible limitations including the self-reported nature of data, especially regarding compulsive buying. Furthermore, when calculating the Hungarian representative prevalence, the sample only included those that shopped at least on a weekly basis, and therefore excluded former individuals with CBB that no longer pursued this habit. This might have led to an underestimation of the prevalence rates. Furthermore, the relatively low response rate raises the issue of generalizability. The problem of low response in mailing studies has been recognised in the literature (12% on average, Johnson and Owens, 2003). However, given that impulse control disorders are stigmatized and often denied (Grant et al., 2005), individuals with CBB were probably more likely to refuse participation in the study. Therefore, the

observed frequency of CBB is likely to be an underestimation of the real prevalence of CBD among visitors to shopping malls.

Pathological consumer behaviour such as compulsive buying is an activity that leads to significant harm for the individual and also for their social environment and to society in general. Therefore, it is paramount to carefully assess and estimate the occurrence of the problem in the general population in addition to 'at-risk' populations. Therefore, future studies are needed to assess the concept and consequences of compulsive buying disorder by considering the diversity in content, scope, and utility of instruments designed to measure CBB.

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