Stress and compulsive buying-shopping disorder: A scoping review

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ABSTRACT

Introduction: Theoretical frameworks of behavioral addictions mostly acknowledge the role of stress in the development and maintenance of these disorders, models of compulsive buying-shopping disorder (CBSD) however rarely incorporated stress. The association between stress and CBSD has not been reviewed yet.
Methods: A scoping review was conducted to evaluate empirical results on the association between stress and CBSD. A comprehensive search string was employed in three databases.
Results: 16 studies were included. Correlative studies suggested significant correlations between general perceived stress and CBSD symptom severity. Studies involving mean comparisons found higher general perceived stress levels in persons with problematic buying-shopping behavior/CBSD compared to control participants (large effects). Mixed results were found in studies involving regression/structural equation models and ecological momentary assessments. One study with a stress/negative mood induction observed more CBSD symptoms in a high stress group compared to a low stress group.
Discussion: The studies are heterogeneous concerning design, samples and measures. Only very few studies surpass the level of cross-sectional correlative data which limits the ability to draw clear conclusions. Future research should study the impact of experimentally induced stress on CBSD symptoms, examine the relationship between stress and CBSD longitudinally and assess objective stress markers.

1. Introduction

Compulsive buying-shopping disorder (CBSD) is characterized by preoccupations/urges to buy, impaired control over buying, not using consumer goods at all/appropriately, buying/shopping as mean to control emotions, persistence to buy despite negative consequences, and experiencing negative emotional and/or cognitive states when reducing or quitting with buying/shopping [1]. CBSD constitutes a rather prevalent phenomenon with a point prevalence of about 5% [2]. It is listed in the coding tool of the International Statistical Classification of Diseases and Related Health Problems (ICD-11) as an example of "other specified impulse control disorder" (6C7Y) but not as a standalone diagnosis [3]. Some researchers argue that CBSD would be better classified as a behavioral addiction. This is proposed due to similarities with other addictive behaviors, such as cue reactivity and craving, impaired control

over the behavior as well as reward and relief motivations [4–6].

CBSD was firstly mentioned in psychiatry textbooks more than 100 years ago (for an overview see: [7]). To that time, termini like *oniomania* or *impulsive mania* were used for CBSD-like phenomena [7]. From the 1980s and 1990s on, different terminology, e.g., *compulsive buying, pathological buying, shopping addiction*, was established [7]. In this article, we refer to the ICD-11 terminology *compulsive buying-shopping disorder*. The above-mentioned terms refer to the same phenomenon although with different conceptualization/nosology (either impulse-control disorder, obsessive-compulsive disorder or behavioral addiction) [7]. Impulsive buying on the contrary that is often investigated in the field of economy psychology or marketing research rather considers temporary overshopping that often lacks clinically relevant impairment and thus does not represent a form of CBSD [4]. Concepts like excessive buying or dysfunctional buying are related to certain aspects of CBSD (i.

e., loss of control or emotion regulation) but do not necessarily correspond to the full picture of CBSD [1].

An emerging field constitutes online CBSD which can be viewed as the virtual equivalent of traditional CBSD or a potential specific internet-use disorder [8,9]. Research on affective and cognitive mechanisms of CBSD demonstrates a profound level of evidence for cue reactivity and craving and mostly indicates inhibitory control deficits in individuals with CBSD [10]. Research on cognitive and affective biases provided mixed results and research on habit formation is not yet far enough advanced to be able to derive clear conclusions [10]. Precursors of CBSD include high impulsivity, strong materialistic values orientation, self-discrepancies, reward sensitivity and low self-esteem (e.g., [11–13]). Another factor that has been related to addictive behavior is stress. However, stress has been hardly investigated as an antecedent or correlate of CBSD.

Stress induces a neuroendocrine response which activates the sympathetic nervous system and the hypothalamic pituitary-adrenal (HPA) axis to cope with the demands of a homeostatic challenge (i.e., stress) and to re-establish homeostasis [14,15]. In individuals with addictive behaviors and substance-related disorders, stress may boost seemingly habitual (or even compulsive) behaviors at the expense of goal-directed, cognitively controlled behavior [16–18]. Stress is thought to increase the risk of relapse in addictions [17,19]. As outlined in the Interaction of Person-Affect-Cognition-Execution (I-PACE) model of addictive behaviors [20,21], stress may trigger affective responses or craving towards addiction-related stimuli [20].

To our knowledge, theoretical models of CBSD have not explicitly taken stress into account [22–26] (for details see Table 1, for further

Table 1
Theoretical models for CBSD and the role of stress.

Authors	Model	Disorder	Main components	Role of stress	Further remarks
Kyrios et al. [25]	–	CBSD	- Affective difficulties - Comprised self-perceptions and perfectionist expectations - Erroneous beliefs about objects, potential purchases and purchasing opportunities - Erroneous beliefs about the psychological benefits of buying - Decision-making difficulties	- Not mentioned in the model - Full text: "marked distress" (p. 242): negative consequences	- Stress not mentioned in model - Stress as C_{long}^-
Kellett et al. [26]	Cognitive-behavioral model of compulsive buying	CBSD	- *Antecedents*: early experiences, schemas (entitlement, recognition-seeking), specific cognitions (materialistic attitudes, commodity fetishism, buying beliefs), impulsive/compulsive cognitive vulnerability - *Triggers*: internal state (depressed, anxious, uncomfortable sense of self) & external cues (advertising, interaction with staff, credit) - *Buying*: attention (poor self-regulation, dissociated, absorbed), emotions (equal to others, buzz, relief), behavior (solitary, disorganized) - *Post purchase*: cognitions (awareness of breakdown in self-regulation), emotions (guilt, shame, regret, despair), behavior (hiding/ignoring purchases)	- Not mentioned in the model - Not mentioned in full text (excl. a reference to familial distress caused by compulsive buying behavior)	- Stress not at all discussed in the context of the model or in the model itself
Workman et al. [22]	Theoretical framework of compulsive buying	CBSD	- *Antecedents*: compulsivity, low self-esteem, negative affect, loneliness, arousal seeking, fantasizing, credit usage, gender, materialism, affect intensity, impulsivity - *Response*: none-low, normative evaluations/impulse control - *Short-term consequences*: emotional lift, self-esteem, debt, guilt - *Long-term consequences*: depression, low self-esteem, debt, relationship problems, guilt, legal issues	- Not mentioned in model - Full text: "family stress" associated with materialism: *antecedent* (p. 100) "Reduction of stress and tension": *short-term consequence* (p. 104) - "Personal distress": *long-term consequence* (p. 105)	- Stress: not mentioned in model itself - Indirect factor in development of CBSD - Stress as C_{short}^- → maintenance of CBSD - Stress as C_{long}^-
Trotzke et al. [23]	–	CBSD	- *Situational factors*: environment in shops, advertisement, stress etc. - *Personal factors*: materialism, self-worth, impulsivity, comorbidities etc. - *Impulsive system*: emotions, anticipated gratification, craving etc. - *Reflective system*: awareness of buying consequences, financial overview, inhibition, behavioral monitoring, "anti-buying" strategies - Decision to buy - *Short term consequences*: gratification, relief from tensions/negative mood, guilt/remorse *Long term consequences*: strain, financial and family issues, legal problems	- Stress mentioned as situational factor in the model	- Stress is regarded an internal trigger of CBSD - Stress as C_{short}^-
Rose et al. [24]	Conceptual model of online shopping addiction	Online CBSD	- Low self-esteem - Low self-regulation - Negative emotional state - Enjoyment - Female gender - Social anonymity - Cognitive overload	- Not explicitly mentioned in the model - Stress considered as negative emotional state that can be reduced by excessive shopping: "Shopping has been recognised to ease anxiety and stress" (p. 86)	- Stress as C_{short}^- → maintenance of online CBSD

Table 2
Correlative evidence regarding CBSD and stress.

Author	Convenience/clinical sample	N	Mean Age ± SD [years]	Study variables		Results	
				CBSD measure	Stress measure	Type of correlational analysis, Correlation coefficient	Interpretation
Ridgway et al. [41], USA Study 2	Convenience sample Consumers	555 (♀: 92.7%)	47.0, range: 20–77	Richmond Compulsive Buying Scale Compulsive Buying Scale (reverse coded)	Stress subscale of Depression Anxiety Stress Scale 21	Spearman correlations, Compulsive Buying Scale: $\rho = 0.23$, $p < .001$ Richmond Compulsive Buying Scale: $\rho = 0.26$, $p < .001$	Significant small to medium correlations Significant small to medium correlations
Williams et al. [46], Australia	Clinical sample Treatment-seeking individuals with CBSD and control participants	95 (♀:72, ♂: 23)	28.0 ± 9.3	Compulsive Buying Scale Compulsive Acquisition Scale [a] McElroy et al. criteria	Stress subscale of Depression Anxiety Stress Scale 21	Zero-order correlations, Compulsive Buying Scale: $r = -0.50$, $p < .001$ Compulsive Acquisition Scale – 'buying': $r = 0.58$, $p < .001$ Compulsive Acquisition Scale – 'free': $r = 0.39$, $p < .001$	Significant large correlation Significant large correlation Significant medium to large correlation
Singh et al. [40], India	Convenience sample Adolescents with high values of general perceived stress and familial conflicts	246 (♀: 149, ♂: 97)	16.0[1], Range: 15–18	Compulsive Buying Scale and Adolescent Compulsive Buying Scale according to the authors	Perceived Stress Scale	Pearson correlation, $r = 0.051$, $p < .010$	Significant below small correlations
Gallagher et al. [39], Canada	Convenience sample Undergraduate students	437 (♀: 339, ♂: 95)	18.4 ± 1.5	Compulsive Buying Scale Edwards Compulsive Buying Scale	Stress subscale of Depression Anxiety Stress Scale 21	Pearson correlations, Compulsive Buying Scale: $r = 0.25$, $p < .001$, Edwards Compulsive Buying Scale subscale 'Tendency or compulsion to spend': $r = 0.30$, $p < .001$ Edwards Compulsive Buying Scale subscale 'Feelings about shopping': $r = -0.01$, $p > .05$ Edwards Compulsive Buying Scale subscale 'Post-purchase guilt': $r = 0.26$, $p < .001$	Significant small to medium correlation Significant medium correlation Non-significant correlation Significant small to medium correlation
Moon et al. [47], Pakistan	Convenience sample of shopping mall visitors that approached clothing stores and bought at least one clothing-related item on their shopping trip	895 (♂: 41%)	Mostly 18–29 years	Revised form of Richmond Compulsive Buying Scale	Stress subscale of Depression Anxiety Stress Scale 21	Correlation, $r = 0.50$, $p < .050$	Significant large correlation
Vogel et al. [45], Germany	Convenience sample University students/general population	66 (♀: 43, ♂: 23)	23.8 ± 3.1	short Internet Addiction Test in modified version for shopping	Perceived Stress Questionnaire	Pearson correlation, $r = 0.50$, $p < .050$	Significant large correlation
Zheng et al. [42], China	Convenience sample young female consumers with online shopping experience	548 (♀: 100%)	21.4 ± 4.4	Online Compulsive Buying Scale	Stress subscale of Chinese version of Depression Anxiety Stress Scale 21	Pearson correlation, $r = 0.37$, $p < .010$	Significant medium to large correlation
Tarka et al. [43], Poland Study 2	Convenience sample Young consumers	756 (♀: 51%)	Range: 17–25	Polish version of Richmond Compulsive Buying Scale	Stress subscale of Depression Anxiety Stress Scale 21	Pearson correlation, $r = 0.34$, $p < .010$	Significant medium to large correlation
Maraz et al. [44], USA	Convenience sample Consumers	1430 (♀: 39.3%, ♂: 60%, 0.5% without indication of sex)	36.4 ± 11	Offline CBSD: Bergen Shopping Addiction Scale [a] Online CBSD: Compulsive Online Shopping Scale[a]	Perceived Stress Scale	Pearson correlations Bergen Shopping Addiction Scale: $r = 0.47$, $p < .001$, Compulsive Online Shopping Scale: $r =$	Significant large correlation Significant large correlation

Table 2 (*continued*)

Author	Convenience/clinical sample	N	Mean Age ± SD [years]	Study variables		Results	
				CBSD measure	Stress measure	Type of correlational analysis, Correlation coefficient	Interpretation
						0.45, $p < .001$	

Notes. CBSD = compulsive buying-shopping disorder. [a] Original version of the CBSD questionnaire containing a stress-related item or stress-related item included in the version of the scale reported in this study. Singh et al. [40] reported having measured CBSD with items based on the Compulsive Buying Scale and the Adolescent Compulsive Buying Scale. However, the items reported in the article seemed to be based rather on the Compulsive Buying Scale and did not contain the stress-related item of the Adolescent Compulsive Buying Scale.

symptom severity and general perceived stress. The studies by Gallagher et al. [39] and Ridgway et al. [41] found small to moderate correlations. A moderate to large correlation was observed in two studies [42,43]. Large correlations were found in the other four studies [44–47]. As shown in Table 2, these correlations were found in both adolescents and older persons. The stress subscale of the Depression Anxiety Stress Scale-21 (DASS-21 [48,49]) was used in six studies to capture general perceived stress [39,41–43,46,47]. Vogel et al. [45] used the Perceived Stress Questionnaire [50] and Maraz et al. [44] and Singh et al. [40] (at least partly) used the Perceived Stress Scale (PSS [51]). A variety of different scales to capture CBSD symptom severity was used: For general

CBSD symptom severity, the Compulsive Buying Scale ([52], used in [39,41,46]), the Richmond Compulsive Buying Scale respectively a Polish or revised version of it ([41], used in [41]; Polish version: [43]; revised version: [47]]), the Edwards Compulsive Buying Scale ([53], used in [39]), the Bergen Shopping Addiction Scale ([54], used in [44]), a six-item scale based on the Compulsive Buying Scale [52] and, according to the authors, the Adolescent Compulsive Buying Scale [55] used in [40] and the Compulsive Acquisition Scale ([56], used in [46]) were used. For online CBSD symptom severity, the Compulsive Online Shopping Scale ([57], used in [44]), the short Internet Addiction Test modified version for shopping ([58], adapted for shopping as in [59],

Table 3
Cross-sectional studies with mean comparisons.

Author	Convenience/clinical sample	N	Mean Age ± SD [years]	Study variables		Results	
				CBSD measure	Stress measure	Type of statistical test, test statistics	Interpretation
Williams et al. [64], Australia	Clinical samples (consisting of individuals with PG and CBSD) and CP	CBSD: 26 (♀: 24, ♂: 2), PG: 23 (♀: 9, ♂: 14), CP: 24 (♀: 19, ♂: 5)	CBSD: 28.3 ± 11.5, PG: 39.4 ± 11.8, CP: 28.9 ± 5.8	Yale Brown Obsessive Compulsive Scale - Shopping Version[a], Structured Clinical Interview for DSM-IV-TR for impulse-control disorders not elsewhere classified	Stress subscale of Depression Anxiety Stress Scale 21	CBSD vs. CP: $t(39.63) = 3.97, p < .001$, $d = 1.10$[1,2]	General perceived stress differs significantly between CP and persons with CBSD, large effect size
						CBSD vs. PG: $t(47) = 0.22$, $p = .982$, $d = 0.01$[1,2]	No significant difference between persons with CBSD and PG
Williams et al. [46], Australia	Clinical sample Treatment-seeking individuals and CP	95 (♀:72, ♂: 23) CBSD-AFI: 35, CBSD-NAFI: 30, CP: 30	28.0 ± 9.3	Compulsive Buying Scale, Compulsive Acquisition Scale[a], McElroy et al. criteria	Stress subscale of Depression Anxiety Stress Scale 21	CBSD-NAFI vs. CP: $t(58) = 4.75$, $p < .001$, $d = 1.23$[1,2]	General perceived stress differs significantly between CP and persons with CBSD (both groups), large effect size each
						CBSD-AFI vs. CP: $t(63) = 5.95$, $p < .001$, $d = 1.48$[1,2]	
Harvanko et al. [62], USA	Convenience sample University students	1857 (♀: 1085, ♂: 772) CBSD: 67 (♂:19:), CP: 1790 (♂: 753)	CBSD: 22.6 ± 4.0 CP: 22.7 ± 5.1	Minnesota Impulsive Disorders Interview	Perceived Stress Scale	$t(1767) = 7.65, p < .001$, $d = 0.98$[1]	General perceived stress differs significantly between CP and persons with CBSD, large effect size
Wegmann et al. [67], Germany	Clinical samples (consisting of individuals with CBSD and SNUD)	78 (♀: 78) CBSD: 37 SNUD: 41	CBSD: 31.3 ± 12.5 SNUD: 25.12 ± 4.38	Assessment of criteria for specific internet-use disorders (ACSID-11) and clinical interview for internet-use disorders (AICA-SKI IBS)	Trier Inventory for Chronic Stress	$t(76) = 0.97$, $p = .337$, $d = 0.22$	No significant difference between women with CBSD and women with SNUD

Notes. AICA-SKI IBS = Assessment of Internet and Computer game Addiction, Strukturiertes klinisches Interview zu Internetbezogenen Störungen [Structured clinical interview on Internet-use disorders], CBSD = compulsive buying-shopping disorder, CBSD-AFI = compulsive buying-shopping disorder with acquisition of free items; CBSD-NAFI = compulsive buying-shopping disorder without acquisition of free items, CP = control participants, PG = pathological gambling, SNUD = social networks-use disorder. [1] d was not provided in the original articles and was thus calculated by the authors (see supplementary material). [2] t-test was not provided in the original articles and was thus calculated by the authors (see supplementary material). [a] Original version of the CBSD questionnaire containing a stress-related item or stress-related item included in the version of the scale reported in this study.

used in [45]) and the Online Compulsive Buying Scale ([60,61], used in [42]) were employed. The studies by Vogel et al. [45] and Zheng et al. [42] explicitly considered online CBSD symptom severity only, whereas most studies examined offline CBSD symptom severity or had no explicit distinguishing characteristics. Only the study by Maraz et al. [44] examined both online and offline CBSD symptom severity. Overall, three studies investigated online CBSD symptom severity [42,44,45], including two studies [44,45] that reported among the strongest correlations of all included studies. The study with the youngest participant group found the weakest correlation between CBSD symptom severity and general perceived stress [40]. Samples varied from relatively small samples in laboratory settings [45] to large online surveys [44]. Convenience samples were used in all studies except for the study by Williams et al. [46] (see Table 2).

3.2. Between-group comparisons

Three studies examined the average differences in general perceived stress between individuals with problematic buying-shopping behavior/ CBSD and control participants (see Table 3). All studies found that individuals with problematic buying-shopping behavior/CBSD reported higher general perceived stress than control participants. It cannot be explicitly stated if these results refer to offline CBSD, online CBSD or a mixed form as shopping environment was not further specified. Harvanko et al. [62] collected data as part of a large computer survey of college students and assessed CBSD with the Minnesota Impulsive Disorders Interview [63]. General perceived stress was measured with the PSS. The results showed a high effect size ($d = 0.98$; for computation, please see supplementary material) for the significant difference. Persons with CBSD had higher general perceived stress levels than the control participants. In the study by Williams et al. [64], participants were screened by telephone, and those who reported symptoms suggestive of CBSD (symptom severity measured with Yale Brown Obsessive Compulsive Scale - Shopping Version [65], clinical interview: SCID-IV TR for impulse-control disorders not elsewhere classified) were allocated to the CBSD group. This group was compared to a group of patients with pathological gambling and a control group without problematic gambling or buying-shopping. These groups were matched regarding education, ethnicity and marital status. Significant differences, as measured by the stress subscale of the DASS-21, were found between the three groups in an analysis of variance. The comparison between the individuals with CBSD and the control participants revealed a large effect ($d = 1.10$). No group differences were found between the CBSD and the pathological gambling group ($d = 0.01$). The comparisons indicated higher values for general perceived stress in the patient groups compared to the control participants. Another study by Williams et al. [46] distinguished control participants and two groups of persons with CBSD (i.e., with or without excessive acquisition of free items). The results showed that there are significant differences in general perceived stress between control participants and both CBSD groups. The comparisons between the two CBSD groups (without or with acquisition of free goods) and the control participants also indicated large effect sizes ($d = 1.23$ respectively $d = 1.48$). Again, the DASS-21 was the measurement instrument for general perceived stress and for CBSD, the Compulsive Acquisition Scale and the Compulsive Buying Scale were used. Persons with CBSD fulfilled the McElroy et al. [66] criteria for CBSD. The CBSD groups had higher stress levels than the control participants.

Recently, Wegmann et al. [67] compared women with CBSD and women with social-networks-use disorder with respect to perceived chronic stress using the Trier Inventory for Chronic Stress (TICS [68,69]). CBSD and social-networks-use disorder symptom severity was measured with the Assessment of criteria for specific internet-use disorders (ACSID-11 [70]) and an adapted version of the *Assessment of internet and computer game addiction, Structured clinical interview on Internet-use disorders* [*Strukturiertes klinisches Interview zu Internetbezogenen Störungen*] (AICA-SKI:IBS [71]) was used as clinical interview for CBSD and social-networks-use disorder. The effect size ($d = 0.22$) indicated that persons with CBSD tended to report more perceived chronic stress than those with social-networks-use disorder. The comparison did however not reach significance.

3.3. Model-based investigations

Eight studies were identified that used either regression models or structural equation models to investigate the effects of general perceived stress and other variables on CBSD symptom severity (see Table 4). Moon et al. [47] investigated precursors and consequences of CBSD in shopping mall visitors in Pakistan using a structural equation model. Self-esteem, materialism, negative feelings as well as depression, anxiety and general perceived stress (as subscales of the DASS-21) were included as predictors in the model. CBSD symptom severity was measured with a revised form of the Richmond Compulsive Buying Scale [41] that was adjusted to non-western societies and that was reduced to a final version of four items [47]. According to the authors, CBSD symptom severity should predict positive feelings and hiding behaviors. Results confirmed the above-mentioned hypotheses as each of the predictors significantly predicted CBSD symptom severity leading to 97% of variance in CBSD symptom severity being explained by the set of predictors. Moon et al. [47] referred to general perceived stress as "the strongest antecedent of compulsive buying" (p. 561) as it showed the largest regression coefficient (see Table 4).

Aydin et al. [72] explored the impact of chronotype (morning-, evening- or neither type), impulsivity and fear of missing out on CBSD symptom severity in a sample of university students in Türkiye. They used the DASS-21 subscales together with sociodemographic factors, tobacco and caffeine use, impulsivity, sleep hygiene, fear of missing out, life satisfaction and chronotype in their hierarchical regression to predict CBSD symptom severity (measured with the Turkish version of Compulsive Buying Measurement Scale [73,74]). The model explained 30.4% of variance in CBSD symptom severity. General perceived stress was not a significant predictor of CBSD symptom severity.

Gallagher et al. [39] studied the effect of sex, anxiety sensitivity (i.e., "fear of arousal-related somatic sensations" [39], p. 38), and negative affect (depression, anxiety and general perceived stress as measured by the DASS-21 subscales) on CBSD symptom severity in a sample of Canadian university students. CBSD symptom severity was measured with the Compulsive Buying Scale [52] and with the three subscales 'Tendency or compulsion to spend', 'Feelings about shopping' and 'Post-purchase guilt' of the Edwards Compulsive Buying Scale [53] that resulted from an exploratory factor analysis the authors conducted. Four different hierarchical regression models were calculated ranging with variance explained from 9 to 17%. General perceived stress failed to predict CBSD symptom severity as measured with Compulsive Buying Scale. General perceived stress further failed to predict the Edwards Compulsive Buying Scale subscales 'Tendency or compulsion to spend', 'Feelings about shopping', but significantly predicted the subscale 'Post-purchase guilt'.

Tarka et al. [43] validated a Polish adaptation of the Richmond Compulsive Buying Scale [41] and intended to estimate the prevalence of CBSD in Polish young consumers. Besides this, they investigated if known precursors of CBSD found in previous literature in Western Europe/USA were valid also in Eastern Europe. They used a sample of students (high school, professional school and university students) aged 17–25 years and found that anxiety, depression, general perceived stress (as measured with the DASS-21 subscales), materialism, negative feelings and self-esteem were able to predict CBSD symptom severity. General perceived stress was the third most important predictor of CBSD symptom severity. Predictive ability for general perceived stress was stronger for female participants ($\gamma = 0.59$) than for male participants ($\gamma = 0.40$).

Singh et al. [40] conducted a study that examined familial and non-

Table 4
Model-based investigations.

Author	Convenience/clinical sample	N	Age [years] Gender	Study variables			Findings
				CBSD measure	Stress measure	Additional predictors	
Singh et al. [40], India	Convenience sample Adolescents (15 to 18 years) with high values of general perceived stress and familial conflicts	246	16.0 (♀: 149, ♂: 97)	Compulsive Buying Scale and Adolescent Compulsive Buying Scale according to the authors	Five items of Perceived Stress Scale-10	Family stressors, non-family stressors, post-purchase regret, gender (analyzed separately)	Stress significantly predicted CBSD symptom severity: $\beta_{PSS\ items} = 0.18/0.20^1$, $p < .050$
Gallagher et al. [39], Canada	Convenience sample Undergraduate psychology students	437	18.4 ± 1.5 (♀: 339, ♂: 95)	Compulsive Buying Scale; Edwards Compulsive Buying Scale	Stress subscale of Depression Anxiety Stress Scale 21	Sex, depression, anxiety, anxiety sensitivity (in three subscales)	• Stress failed to significantly predict CBSD symptom severity (Compulsive Buying Scale): $\beta_{DASS} = 0.06$, $p = .430$ • Stress failed to significantly predict tendency/compulsion to spend (Edwards Compulsive Buying Scale): $\beta_{DASS} = 0.10$, $p = .140$ • Stress failed to significantly predict feelings about shopping (Edwards Compulsive Buying Scale): $\beta_{DASS} = 0.01$, $p = .840$ • Stress significantly predicted post-purchase guilt (Edwards Compulsive Buying Scale): $\beta_{DASS} = 0.18$, $p = .010$
Moon et al. [47], Pakistan	Convenience sample of shopping mall visitors that approached clothing stores and bought at least one clothing-related item on their shopping trip	895	Mostly 18–29 years (♂: 41%)	Revised form of Richmond Compulsive Buying Scale	Stress subscale of Depression Anxiety Stress Scale 21	Self-esteem, materialism, depression, anxiety, negative feelings	Stress significantly predicted CBSD symptom severity: $\gamma_{DASS} = 0.74$, $p < .010$
Zheng et al. [42], China	Convenience sample of young female consumers with online shopping experience	548	21.4 ± 4.4 (♀: 100%)	Online Compulsive Buying Scale	Stress subscale of Chinese short version of Depression Anxiety Stress Scale 21	Moderator: Self-esteem Mediator: Negative coping Covariates: Frequency of online buying, amount of money spent online per month	Direct pathway: Online CBSD: $\beta_{DASS} = 0.21$, $p < .001$ Indirect pathway: Mediation by negative coping Direct pathway (Stress-online CBSD) and indirect pathway (Stress-Negative coping-online CBSD) moderated by self-esteem
Aydin et al. [72], Türkiye	Convenience samples University students	493	21.7 ± 2.3 (♀: 48.3%, ♂: 51.7%)	Turkish version of Compulsive Buying Measurement Scale[a]	Stress subscale of Depression Anxiety Stress Scale 21	Age, gender, tobacco use, caffeine use, impulsivity, sleep hygiene, life satisfaction, depression, anxiety, fear of missing out, chronotype	Stress failed to significantly predict CBSD symptom severity: $\beta_{DASS} = -0.13$, $p = .072$
Maraz et al. [44], USA	Convenience sample Consumers	1430	36.4 ± 11 (♀:39.3%, ♂:60%, 0.5% without indication of sex)	Offline CBSD: Bergen Shopping Addiction Scale[a] Online CBSD: Compulsive Online Shopping Scale[a]	Perceived Stress Scale (14-items version)	Age, income, economic position	Stress significantly predicted offline and online CBSD symptom severity Bergen Shopping Addiction Scale (offline CBSD): $\beta_{PSS} = 1.45$, $p < .001$ Compulsive Online Shopping Scale (online CBSD): $\beta_{PSS} = 1.3$, $p < .001$
Tarka et al. [43], Poland Study 2	Convenience sample Young consumers	756	Range: 17–25 (♀: 51%)	Polish and adapted form of Richmond Compulsive Buying Scale	Stress subscale of Depression Anxiety Stress Scale 21	Self-esteem, materialism, depression, anxiety, negative feelings	Stress significantly predicted CBSD symptom severity: $\gamma_{DASS} = 0.59$, $p < .010$

Table 4 (*continued*)

Author	Convenience/clinical sample	N	Age [years] Gender	Study variables			Findings
				CBSD measure	Stress measure	Additional predictors	
Wegmann et al. [67], Germany	Clinical sample of women with CBSD	37	31.3 ± 12.5 (♀: 100%)	Assessment of criteria for specific internet-use disorders (ACSID-11) and clinical interview for internet-use disorders (AICA-SKI IBS)	Trier Inventory for Chronic Stress	Materialistic value orientation, impulsivity	Chronic stress did not significantly predict online CBSD symptom severity: ß$_{TICS}$ = 0.29, *p* = .125

Notes. AICA-SKI IBS = Assessment of Internet and Computer game Addiction, Strukturiertes klinisches Interview zu Internetbezogenen Störungen [Structured clinical interview on Internet-use disorders], CBSD = compulsive buying-shopping disorder, DASS = Depression Anxiety Stress Scale 21, PSS = Perceived Stress Scale. [1] Both figures were given as Singh et al. [40] refer to different figures on p. 261 and p. 263. [a] Original version of the CBSD questionnaire containing a stress-related item or stress-related item included in the version of the scale reported in this study. Singh et al. [40] reported having measured CBSD with items based on the Compulsive Buying Scale and the Adolescent Compulsive Buying Scale. However, the items reported in the article seemed to be based rather on the Compulsive Buying Scale and did not contain the stress-related item of the Adolescent Compulsive Buying Scale.

familial stressors, their association with general perceived stress as measured with five items of the PSS-10 [75] as well as the association of general perceived stress with CBSD symptom severity (measured with a six item-scale based on the Compulsive Buying Scale [52] and, according to the authors, the Adolescent Compulsive Buying Scale [55]) and the influence of CBSD on post-purchase regret. Only five items of PSS-10 were used because "[t] [...]he five items that did not particularly relate to younger people were excluded" (p. 259). The authors used an Indian sample of 15- to 18-year-old adolescents. They included adolescents with "higher value" (p. 258) on the PSS without stating how higher values were operationalized. Their analyses involved a structural equation model. General perceived stress was found to significantly predict CBSD symptom severity. Furthermore, the authors tested whether gender moderated the association between general perceived stress and CBSD symptom severity. They reported that gender did not significantly moderate the association between general perceived stress and CBSD symptom severity and concluded that "at higher level of general perceived stress, both boys and girls reported higher level of compulsivity" (p. 264). This study differed from most other studies as general perceived stress was the only predictor of CBSD symptom severity in this model whereas in most other studies, stress was one predictor among an entire set of predictors.

Maraz et al. [44] performed a study in which they assessed the impact of the first six months of COVID-19 pandemic (March to October 2020) on offline (measured with the Bergen Shopping Addiction Scale) and online CBSD behavior (measured with the Compulsive Online Shopping Scale). A second focus was placed on the impact of general perceived stress "above and beyond the association of income and [economic position] [...]" (p. 92) on CBSD symptom severity. They used subsequent cohorts of 25 persons so that measurement repeated data of individuals were not gathered. The authors used the PSS-14 as general perceived stress measure but restricted the reference period of the questionnaire to the last 7 days due to the dynamic conditions in times of COVID-19 pandemic. It was found that general perceived stress significantly predicted offline as well as online CBSD symptom severity but the effect of general perceived stress was considered "weak" (p. 92). Furthermore, the association between general perceived stress and CBSD symptom severity seemed to be particularly relevant in a high-income group compared to a rather low-income group. The authors concluded that it is rather income/economic position that determines CBSD behavior during COVID-19 pandemic but not general perceived stress itself [44].

Wegmann et al. [67] investigated potential predictors for symptom severity of online CBSD (measured with the ACSID-11) in a clinical sample. They computed a regression model in which online CBSD symptom severity should be predicted by a set of potential vulnerability factors of CBSD (i.e., materialistic values orientation, impulsivity, chronic stress). Perceived chronic stress, measured with the TICS, failed to significantly predict online CBSD symptom severity.

Zheng et al. [42] investigated the relationship between online CBSD symptom severity (measured with the Online Compulsive Buying Scale), general perceived stress (measured the Chinese version of the DASS-21), negative coping and self-esteem in a sample of young female consumers from China. The authors proposed a moderated mediation model with a direct path from general perceived stress to online CBSD symptom severity and a mediation from general perceived stress to online CBSD symptom severity via negative coping. According to Zheng and colleagues [42], both paths were assumed to be moderated by self-esteem. They found a significant direct relationship between general perceived stress and online CBSD symptom severity that was partially mediated by negative coping. Furthermore, the direct path between online CBSD symptom severity and general perceived stress as well as the indirect path via negative coping were moderated by self-esteem with stronger effects for consumers with low self-esteem. Besides the study of Singh et al. [40], this study was one of the two studies that (also) assessed a direct path between general perceived stress and CBSD symptom severity without the influence of further predictors.

3.4. Ecological momentary assessments

Two studies used EMA to explore the relationship between perceived stress during the day and CBSD episodes in the natural environment of clinical samples [76,77]. In addition, both studies were interested in the interplay of mood and CBSD episodes, whereas only results on stress will be reported here given the scope of this scoping review. In each study, the EMA was conducted over a time period of two weeks and signal-contingent, event-contingent as well as interval-contingent recordings were used to track CBSD episodes, (impact of) minor stressful events, and mood states during the day. For signal-contingent recordings, a sound reminded the participants at three semi-random time points during the day to answer a set of questions, while for the event-contingent recordings, the participants should provide information directly after a CBSD episode occurred. Finally, interval-contingent recordings were scheduled at the end of the day. While Silbermann et al. [77] assessed perceived stress during the day only during the signal-contingent recordings, Müller et al. [76] had participants report stressful events and perceived stress also after each CBSD episode. To assess minor stressful events, both studies used a subset of items from the Daily Stress Inventory [78]. To be eligible for participation, individuals had to meet the McElroy et al. [66] criteria and – only in the Silbermann et al. [77] study – the criteria for impulse-control disorder of the Structural Clinical Interview for DSM-IV [79]. Müller et al. [76] additionally relied on the Compulsive Buying Scale (52).

Participants experienced on average two [77], respectively six [76] CBSD episodes during the two weeks. The proportion of participants who did not report any CBSD episodes was 12% in the study of Müller et al. [76] and 31% in the study of Silbermann et al. [77]. Concerning the link between perceived stress during the day and CBSD episodes, Silbermann et al. [77] found that on days with CBSD episodes, participants reported significantly more stressful events. Additionally, the

participants felt more stressed by these events, although this difference slightly missed significance. In contrast, Müller et al. [76] did not find a difference in perceived stress during the day between days with and without a CBSD episode. The authors additionally conducted within-day analyses, but did not observe a change in the perceived stress levels reported before or after a CBSD episode [76].

3.5. Experimental investigation

Only one study used an experimental procedure to investigate the influence of induced negative mood which - according to the authors - was defined as stress induction on CBSD symptoms [80]. Besides the impact of induced stress/negative mood on CBSD symptoms in adolescents, Roberts et al. [80] were also interested in the moderating effect of gender. Their convenience sample consisted of 82 seventh-graders aged 12–13 years, with females being slightly overrepresented ($n = 46$). To induce stress (i.e. negative mood), the authors used text stimuli describing an academic stress scenario. Participants in the high stress condition received a scenario in which a student received poor results in the final exams and was punished therefore. In the low stress scenario, the student succeeded in the final exams and was rewarded. In both conditions, participants had to imagine how worried and upset they would feel in such a scenario. After the stress induction, CBSD symptoms were assessed with a ten-item scale developed by the authors for the purpose of the study (in the following, referred to as Compulsive Buying Scale by Roberts and colleagues). The items of the scale mainly covered aspects like craving, impulsive buying and buying to regulate one's mood (e.g., "When I go to the store, I always feel the urge to buy something" or "When I feel bad, I like to buy things") [80].

The manipulation check confirmed that the participants in the high stress scenario reported significantly higher levels of perceived stress than the participants in the low stress scenario. For the further analyses, however, the authors did not compare both experimental conditions, but grouped participants based on their stress ratings. Participants who reported perceived stress levels above the scale mean formed the high stress group, and participants with perceived stress ratings below the scale mean were allocated to the low stress group. The results revealed a significant main effect of stress, meaning that students in the high stress group displayed higher scores on the Compulsive Buying Scale by Roberts and colleagues compared to the low stress group. In addition, a main effect of gender was observed, meaning females scored higher on the Compulsive Buying Scale by Roberts and colleagues than males. A stress X gender interaction failed to reach significance. Based on their results, the authors concluded that compulsive buying is used, regardless of gender, as means to cope with stress [80].

4. Discussion

This scoping review aimed to evaluate research on the association between stress and CBSD. Drawing on the I-PACE model for behavioral addictions, two pathways in which stress might influence CBSD (symptoms) were examined. First, general perceived stress as person-related vulnerability factor (pathway 1) was investigated. This pathway of the stress-CBSD association refers to correlative research, mean comparisons and regression/structural equation models. Second, stress as a situational factor representing an internal trigger (pathway 2) was considered. This pathway comprises studies with ecological momentary assessments and experimental manipulations of stress.

**Hypothesis 1**. General perceived stress/chronic stress as stress vulnerability factor (pathway 1).

Concerning the first pathway, general perceived stress was shown to be positively associated with CBSD symptom severity as shown by nine studies of correlative examination. These correlations were found for both online and offline CBSD in different countries and different age groups, and the magnitude of the correlations varied. These results

confirm hypothesis 1 but do not enable inferences regarding the direction of the association.

Furthermore, three studies involving mean comparisons showed large differences and higher general perceived stress values in persons with problematic CBSD behavior/CBSD compared to a control group. Of interest is also the lack of differences in general perceived stress/chronic stress between individuals with CBSD and individuals with other behavioral addictions [64,67]. This indicates a relationship between general perceived stress/chronic stress and addictive behaviors regardless of the type of behavioral addiction, which is in line with theoretical models of addiction [20]. Again, the direction of the stress-CBSD relation cannot be derived from these analyses.

Mixed evidence in the field of general perceived stress originated from regression/structural equation models that studied the impact of general perceived stress on CBSD symptoms severity. Five studies found that general perceived stress was among the significant predictors in their predictive set of variables for CBSD symptom severity [40,42–44,47] whereas three studies (mostly) did not report significant prediction [39,67,72]. The most obvious reason for these discrepancies lies within the methodological nature of the statistical approaches used in these studies: Regression coefficients of multiple regression models or structural equation models are specific to the particular set of predictors and results might change enormously if only one predictor is removed or added [81]. To obtain accurate regression coefficients a "perfectly specified model" ([82], p. 2; i.e., model containing all relevant predictors and that thus is (almost) optimal) is required. However, "[t] […] he problem is that the true model is rarely, if ever, known" ([82], p. 2) which also applies to CBSD research as theoretical models in this field are rather sparse. Relying on single evidence can lead to ambiguous conclusions e.g., when it comes to including gender as a factor that might account for differences in CBSD. Singh et al. [40] for instance studied the sole effect of general perceived stress on CBSD symptom severity whereas Aydin et al. [72] incorporated general perceived stress in a set together with eleven other predictors. Furthermore, these models do not show the actual direct contribution of general perceived stress to CBSD symptom severity beyond significance of a predictor and no conventions exist for interpreting beta weight as the predictor set is highly specific. Theoretical models of behavioral addictions such as the I-PACE model [20,21] assume a complex interaction of several person-related factors (e.g., stress vulnerability, impulsivity, genetic aspects, motives, values) as the basis for the development of behavioral addictions with affective, cognitive and executive factors. Given this theoretical basis, it does not seem surprising that direct pathways between stress and CBSD symptom severity are only partly of statistical significance. Thus, the stress-CBSD relationship might be more complex than just a linear relationship and might be influenced by several other mechanisms due to the interplay of several factors. Moreover, different measures were used for operationalization of general perceived stress and CBSD symptom severity in regression/structural equation models. This might be particularly relevant for general perceived stress as those studies using the DASS-21 [48,49] measured general perceived stress only with a subscale of the actual scale and used depression and anxiety as further predictors. This implies a certain risk for multicollinearity as depression and anxiety are usually strongly correlated with general perceived stress and studies should therefore conduct multicollinearity assessments like Moon et al. [47] did. Computing structural coefficients would have enabled further assessment of suppression or multicollinearity effects as differences in the magnitude of regression coefficients and structural coefficients might be indicative of these effect [81,83]. This was unfortunately not possible as not all authors provided bivariate correlations between CBSD symptom severity and general perceived stress that are necessary for structural coefficient computation [84,85].

Taken together, evidence attributed to the first pathway (stress vulnerability, general perceived stress and chronic stress as person-related factors) suggest an association between stress and CBSD (see

Person-related factors
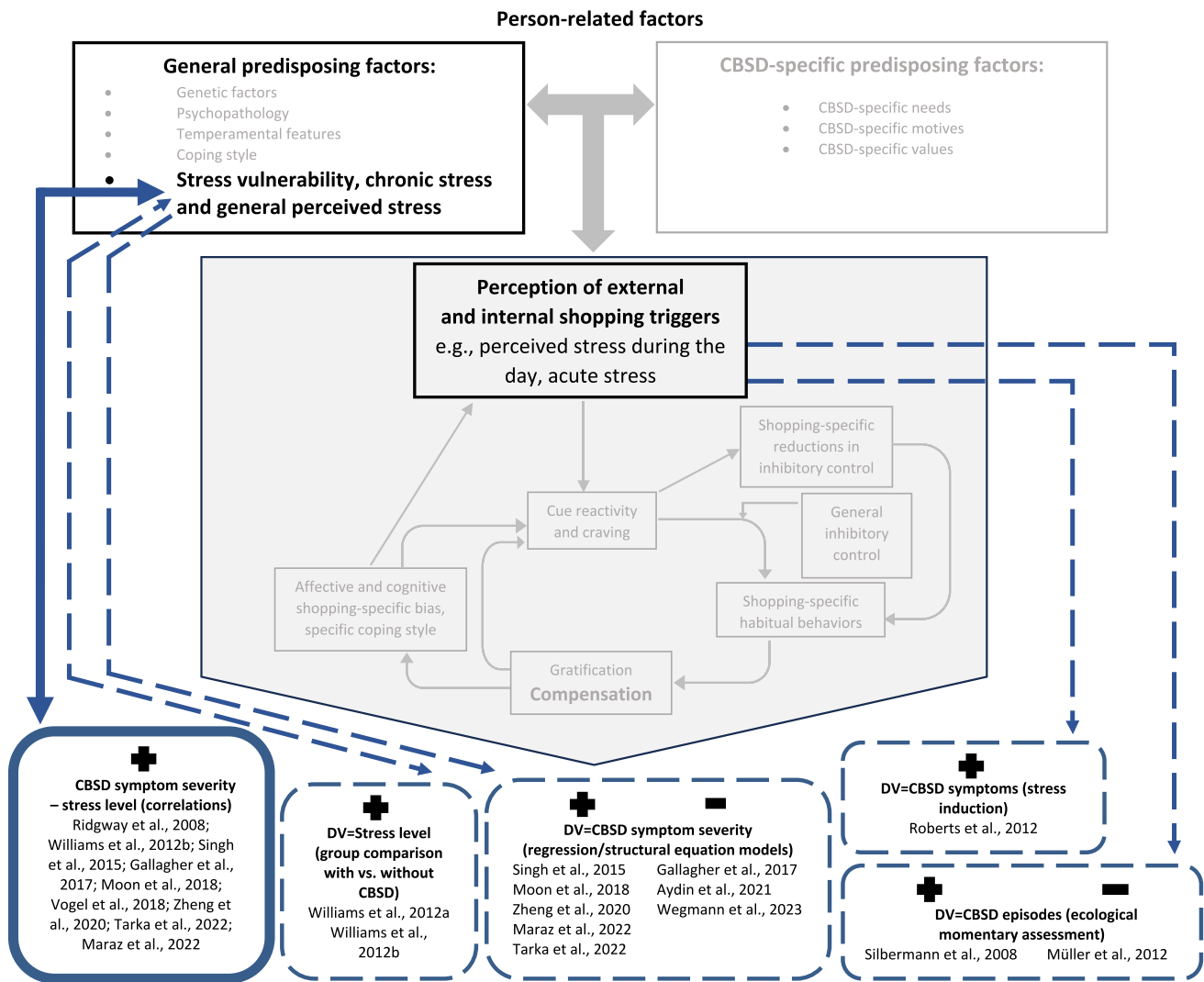
Note. DV=dependent variable, CBSD=compulsive buying-shopping disorder

Fig. 1. Evidence for stress acting as vulnerability factor (predisposing variable) or situational factor for CBSD supporting (+) or not supporting (−) the assumptions of the I-PACE model for addictive behaviors (Brand et al., 2019).
Note. DV = dependent variable, CBSD = compulsive buying-shopping disorder.

Fig. 1). Results from different models however rather point towards a complex interaction of stress with other factors rather than a sole, strong and direct influence of stress on CBSD.

Hypothesis 2. Acute stress and perceived stress during the day as situational triggers (pathway 2).

Regarding the second pathway, perceived stress during the day was captured in two studies using EMA. The diverging findings of the two EMA studies may be explained by different statistical approaches [76]. In the study of Müller et al. [76], perceived stress on days with and without CBSD episodes was compared with a methodologically superior approach (mixed model analysis) to the Wilcoxon test for dependent samples used by Silbermann et al. [77]. Apart from this methodological consideration, there might be another explanation for the different results. The participants in the study of Silbermann et al. [77] had started a group therapy for their pathological buying behavior, simultaneously with the beginning of the EMA study. Hence, they may already have begun to change their pathological buying behavior, an assumption that is supported by the lower number of CBSD episodes compared to the study of Müller et al. [76]. On days without perceived stressful events,

they might have been more successful to restrain from compulsive buying than on days with a higher number of or more intense stressors. On stressful days, they might have fallen back into their pathological buying habits, since stress can override goal-directed behavior [18] and promote relapse in addictions [86]. In contrast, the participants in the study of Müller et al. [76], who were not in treatment at the time of the study, might have been less aware of or intended to change their pathological shopping behavior less. Consequently, they may have habitually engaged in CBSD episodes, even on less stressful days. Following the I-PACE model, perceived stress during the day might act as an internal trigger [20]. This trigger then leads to an urge to shop which activates the inner circle of the I-PACE model and finally results in CBSD episodes as a dysfunctional coping strategy to reduce stress. For hypothesis 2 that built upon the role of perceived stress during the day as an internal trigger, mixed evidence was reported. This might be explained by methodological shortcomings of the studies but may also question the ubiquity in which stress leads to CBSD episodes. This process might only run under specific circumstances (e.g., unavailability of other, more functional coping strategies) that need to be further investigated, as some stressful situations seemed to lead to CBSD episodes whereas

others did not.

The work of Roberts et al. [80] was, to the best of our knowledge, the only study that tried to experimentally manipulate stress and to study its impact on CBSD symptoms. While the authors' approach to experimentally manipulate stress is a valuable and much-needed addition to the mostly correlational questionnaire studies in this research area, the study has some shortcomings that challenge the interpretations made by the authors. First, participants had to indicate how worried and upset (i. e., stress according to the authors) they would feel if they were in this scenario. It can be debated if reading the academic failure scenario induced rather bad mood than stress and if reading the academic success scenario was rather a good mood scenario than a neutral condition. Second, asking participants to indicate how they would feel *if they were in this scenario* does not necessarily imply that the participants *experienced* more stress when reading those scenarios. Third, analyzing the effect of stress by comparing participants based on their stress ratings instead of comparing the two experimental conditions, weakens the possibility to make causal conclusions. Hence, the interpretation that stress triggered compulsive buying may be questioned. Alternatively, participants with higher CBSD symptom severity may have provided higher stress ratings, given that stress vulnerability has been suggested as predisposing factor for behavioral addictions [21]. Consequently, the high-stress group might have consisted mainly of individuals with higher symptom severity of CBSD, leading to the observed link between stress and CBSD symptom severity. Adding to this line of argumentation, the Compulsive Buying Scale by Roberts and colleagues [80] the authors used does not measure momentary CBSD symptoms, cognitions or craving. To capture the effect of stress on CBSD symptom severity in an experimental setting, a measure that assessed affective and cognitive responses, for example craving or the desire for mood regulation, would have been more suitable. Besides its limited appropriateness to measure stress-induced CBSD tendencies, another shortcoming of the questionnaire used was the sparse information regarding its psychometric properties, given that the scale was developed for this very study and had not been validated before. Although the authors provided evidence for its internal reliability, which was with 0.79 close to a good reliability [87], evidence for its (diagnostic) validity is missing.

Overall, evidence for the second pathway in which stress acts as an internal trigger and situational factor is rather mixed (see Fig. 1). Further investigations concerning this pathway are needed.

4.1. General limitations of the studies included

Some studies relied on the Compulsive Buying Scale, a valid questionnaire that has been in use for many years [52]. This being an advantage also brings the disadvantage with it that some items of the scale are rather outdated as they refer to payment methods that are not in frequent use any more such as checks (item 2c [88,89]). Besides this, the Compulsive Buying Scale does not capture all aspects of the proposed diagnostic criterion "A" for CBSD ("Persistent and/or recurrent dysfunctional buying/shopping-related behaviors, thoughts and related phenomena" [1], p. 217). The questionnaire refers only partly to negative consequences experienced by excessive buying/shopping (financial aspect A5d mostly) and does not refer to buying/shopping items "without utilizing them for their intended purposes" (A3 [1], p. 217) and it uses a rather non-intuitive evaluation procedure which operates with negative values and item-related weights [52]. Other shortcomings associated with this questionnaire are a potentially under-exclusive cut-off value, further problems with particular items or the factor structure and signs of missing cultural fairness as a test [90]. Regarding the Edwards Compulsive Buying Scale [53], Manolis et al. [90] also assumed psychometric shortcomings without being able to concretize this further. Maraz et al. [91] conducted further research on the Edwards Compulsive Buying Scale and failed to replicate the postulated five-factor structure [91]. They instead created a revised version of the final scale that also contains items of the initial item pool of the Edwards

Compulsive Buying Scale and concluded that the Edwards Compulsive Buying Scale particularly refers to an emotional/affective dimension of CBSD [91].

Taken together, this review has to be considered under the prerequisite that it is based on studies with this or these specific questionnaire (s) and comparisons between studies with different operationalizations of CBSD are difficult as CBSD questionnaires differ also with regards to their classification of CBSD (impulse control disorder vs. obsessive-compulsive spectrum vs. behavioral addiction [92]). Fig. 2 shows an overview of the questionnaires used to capture CBSD and positions them within the nosological frameworks of impulse control disorders, obsessive-compulsive disorders and behavioral addictions. As can be seen, the underlying conceptualizations of the CBSD scales used in the included studies are diverse. Still, the results of the correlations and regression/structural equation models seem to be rather robust across different CBSD conceptualizations. Only few studies used the gold standard of clinical interviews to detect persons with CBSD (e.g., [67,77]).

A further limitation concerns the assessment of general perceived stress. The studies that were included in this review mostly used either the PSS that asks for stress in a reference of four weeks [51,93] or the DASS-21 that refers to the last week [48,49]. Hence, although these two general perceived stress measures are correlated [94], they still cannot be compared without difficulties. Besides this, both scales rather capture shorter or longer excerpts of stressful experiences but not chronic perceived stress (e.g., as measured by the TICS [68,69]). Chronic perceived stress might be captured with a reference period of three months or longer as some studies even assume that chronic perceived stress would be lasting longer than 12 months [95]. Moreover, none of the studies assessed stress biomarkers for chronic (e.g., hair cortisol) or acute stress response (e.g., cortisol, alpha-amylase). This might be problematic as subjective and physiological reactions to (acute) stress might differ. In a review, only 25% of the included studies observed a significant correlation between subjective and physiological stress measures [96].

Another shortcoming of the studies especially applying to regression/structural equation models is their cross-sectional nature. A stronger level of evidence for stress being a predisposing variable/antecedent or consequence of CBSD would involve longitudinal data such as studies showing that stress can predict or follow CBSD episodes.

A further point that needs to be considered when interpreting the questionnaire-based results on the stress – CBSD association is that some scales capturing CBSD also ask about CBSD-related stress (e.g., 'For me, shopping is a way of facing the stress of my daily life and of relaxing' [73], used in [72]). This is the case in four of the included studies [44,46,64,72]. One could argue that the stress items in the CBSD scales might partially explain the correlations or regression coefficients found in the respective studies. However, significant associations of perceived general stress with CBSD were found in all studies reporting correlative results – independent from including a stress-related item in the CBSD scale. Furthermore, Aydin et al. [72] also failed to observe a significant prediction of CBSD by perceived general stress despite using a CBSD scale with an item on CBSD-related stress. Of course, stress is often associated with strong negative affects which is captured in most CBSD scales. When responding to this item, participants might have not been able to clearly differentiate between stress and negative affect, so that the above-mentioned artifact cannot be entirely dispelled. At least, it became evident that the association between stress and CBSD seems not to be solely driven by the stress-related item in some CBSD scales.

Unfortunately, not all studies provided a clear outline of methodology/procedure further limiting the ability to draw conclusions from these results. The number of studies with methodological and statistical sound procedure is low. Studies relying on cross-sectional correlative evidence cannot be interpreted in a causal way. According to these results, stress could be both an antecedent and a consequence of CBSD as increasing debts and interpersonal conflicts might enhance stress levels
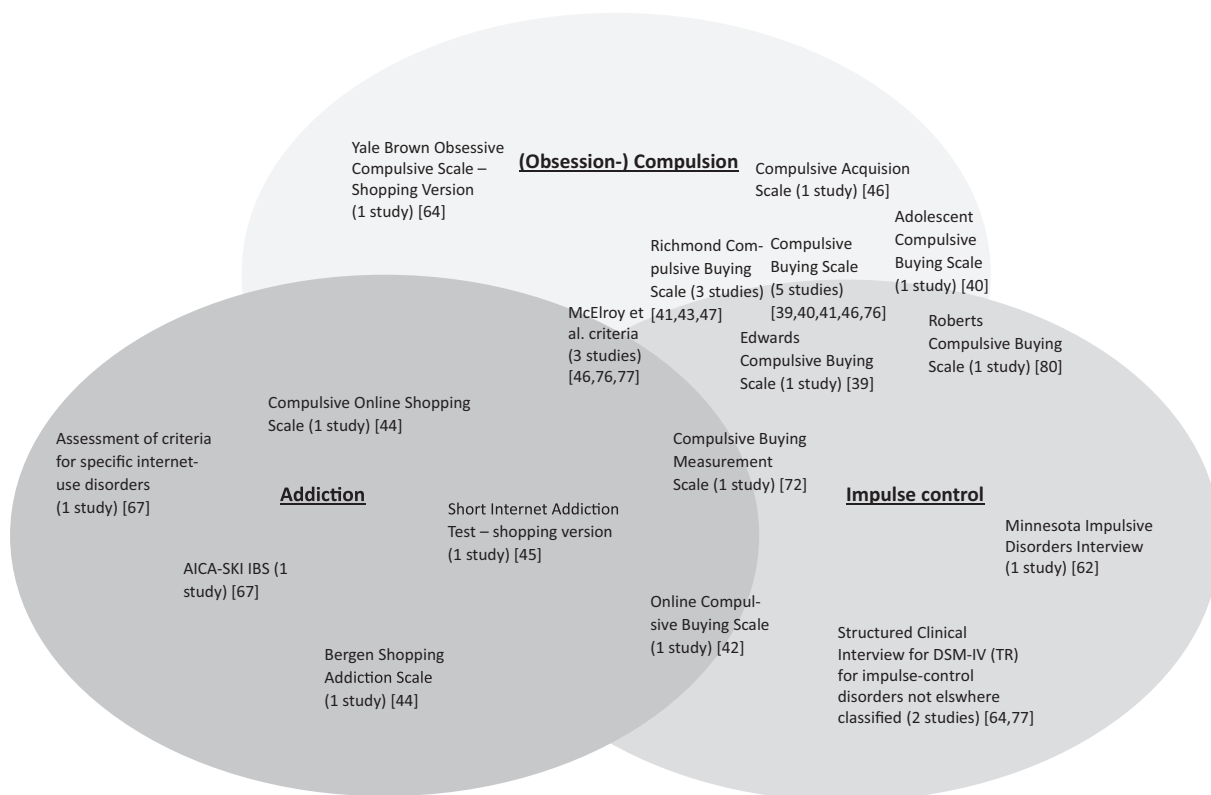
Fig. 2. Questionnaires in the included studies by conceptualization (as impulse control disorder, obsessive-compulsive disorder or behavioral addiction). *Note.* AICA-SKI IBS: Assessment of Internet and Computer game Addiction, Strukturiertes klinisches Interview zu Internetbezogenen Störungen [Structured clinical interview on Internet-use disorders]. In the Singh et al. [40] study, the authors reported having used two scales (Compulsive Buying Scale and Adolescent Compulsive Buying Scale). The CBSD-items published in the article [40] rather contained items of the Compulsive Buying Scale but not the Adolescent Compulsive Buying Scale as the latter also contains a stress-related item in the scale. In the item list included in the article [40], the stress-related item was not mentioned.

as well. Another option would be a bidirectional relationship between stress and CBSD in which stress triggers CBSD episodes, which in turn result in stress and vice versa. This bidirectional relationship might establish a vicious circle in which shopping is carried out to escape from stress but on the same time elicits stress e.g., by negative consequences such as familial conflicts. This might result in a stronger need to escape negative emotions which may accelerate an already problematic shopping behavior. As there are several potential directions of the relation between stress and CBSD, regression and structural equation models could be criticized for assuming that stress predicts CBSD without a very profound theoretical basis in CBSD literature supporting this assumption. The study by Roberts et al. [80] attempted to manipulate stress and examine its influence on CBSD tendencies. However, the methodological shortcomings of the study mentioned above hinders the conclusions that can be drawn.

4.2. Specific limitations and strengths of this scoping review

For this scoping review, three databases (PubMed, Scopus, Web of Science) were considered. Articles that are not listed in these databases could thus not be incorporated. However, the databases searched are the most common ones and the potential loss of studies listed otherwise should be rather low. Articles were included if they considered perceived or objective stress levels measured with standardized questionnaires (subscales) or objective markers but not specific stressors (such as academic workload or others). Articles could only be included if written in English or German which again potentially narrows down the number of studies that could be assessed and might lead to a potential loss of articles. Unfortunately, the heterogeneity of the studies' design and statistical analyses and the low number of studies included prevented meta-analytic investigations. The complexity of methodological

approaches also hinders the ability to draw a unite conclusion of the relevance for stress in CBSD. Moreover, this scoping review was not pre-registered. To the best of our knowledge, this is the first review article on the association between stress and CBSD and no pre-registered but un-published reviews on this topic were found at an international prospective register of systematic reviews (PROSPERO). Still, having pre-registered this article would have minimized the risk of duplication of effort. Also, it may be argued that pre-registration is linked to reduced publication bias and an increase in transparency. For reasons of openness and transparency, extensive information on the search string, the number of results and the decisions to in- or exclude original articles was described in the methods section of this work and was given in the supplementary material.

This review also has several strengths. To the best of our knowledge, it is the first scoping review on an understudied topic. The careful discussion of the advantages and limitations of included works allows an overview of the current state of research on the interplay of stress and CBSD. Most importantly, the findings help to develop further research ideas and implications for clinical practice.

4.3. Future directions

There is a particular need to conduct studies that surpass the level of questionnaire-based evidence as no EMA or experimental studies on the association between stress and CBSD have been carried out since 2012 (see Fig. 3). Future research might consider conducting research with experimental stress induction in order to allow causal inferences, e.g. with the Trier Social Stress Test [97], socially evaluated cold-pressor test [98] or the Maastricht Acute Stress Test [99]. Experiments should be accompanied by the assessment of stress biomarkers such as heart rate variability, breath frequency, blood pressure and stress hormones (e.g.,
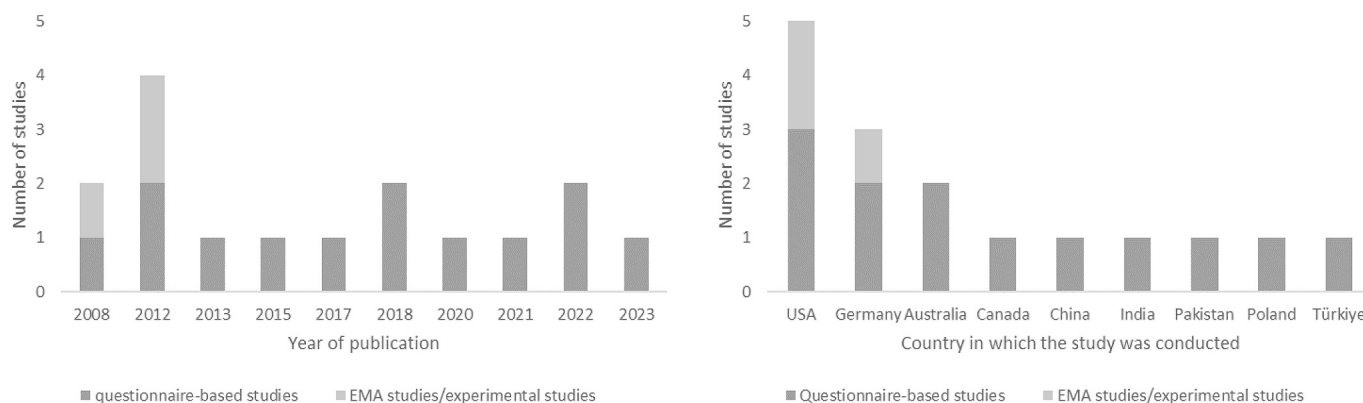
Fig. 3. Number of studies by year of publication and country in which the study was conducted and grouped by study type (Questionnaire-based vs. EMA/empirical study).

salivary cortisol as a marker of the HPA axis system, salivary alpha amylase as a marker for sympathetic nervous system activity, hair cortisol as a marker for chronic stress).

Experimental approaches could be used to study stress reactivity in persons with CBSD, in analogy to studies on other behavioral addictions (for an overview: [Schmid et al., submitted]). Other potential topics could be cue reactivity and craving in persons with CBSD after acute stress induction or after placebo condition and transfer from goal-directed to stimulus-response habits and its modulation by acute stress [100]. Research on stress induction and cognition in persons with CBSD could also be enriched by the use of neuroimaging techniques as van Timmeren et al. [101] did in their recent study on the balance between goal-directed and habitual decision making after stress induction. Experimental approaches however do only apply to the effects of acute stress. Future research might also investigate perceived chronic stress and perceived stress during the day.

Chronic stress should be taken into account in the development of CBSD. For gambling, it was shown that stressful life events predicted problem gambling in a life course calendar study [102]. The same could be valid for CBSD. Chronic stress could be captured using self-report measures such as the TICS [68,69,103] or objective indicators of chronic stress such as hair cortisol (e.g., [104,105]). Conducting research concerning the development of CBSD and its antecedents by means of a prospective design might enormously benefit the design of prevention programs for CBSD that are currently lacking [Thomas et al., in preparation].

Also, perceived stress during the day represents a facet of stress that might be worth closer investigations. Ecological momentary assessment could be accompanied by objective markers such as saliva cortisol or alpha amylase, and cardiovascular outcomes to objectify subjectively reported stress responses during the day (for an overview: [106]).

Besides this, stress proved to be an important factor in risk of relapse or therapy outcome for both alcohol use disorder [107,108] and gambling disorder [109,110]. This could also be valid for cortisol levels that might be able to predict relapses in individuals with alcohol use disorder who are currently abstinent from alcohol [111]. Examining the role of stress in the development of CBSD and considering its role in relapse/therapy outcome seem to be important areas of future research fostering tailored prevention, therapy and relapse prevention strategies.

As mentioned above, the questionnaire-based studies included in this review reported general perceived stress that either occurred in the last month or last week. Most studies relied on convenience samples and persons with problematic buying-shopping behavior based on questionnaire-cut-off values. Future research should involve clinical samples and determine CBSD status using clinical interviews. Although the association and concrete mechanisms in which stress contributes to CBSD need further clarification, this scoping review shows associations between stress and CBSD. This link could also be integrated into

(theoretical) models for CBSD.

4.4. Clinical implications

The findings of the studies reported above at least partly suggest an association between stress and CBSD. This conclusion should be further confirmed in future research and should then be incorporated into psychotherapy, for instance in the following ways:

First, therapy itself should also, besides typical cognitive behavioral therapy modules (e.g., psychoeducation, motivational interviewing, problem solving strategies, exposure therapy [112]) include aspects of stress management techniques [113], and should support patients in implementing functional coping strategies that also contribute to stress reduction [114].

Second, patients should be informed about a potential association between stress and CBSD by psychoeducation. In psychoeducation, the diathesis vulnerability-stress model (e.g., [36,115]) that emphasizes the impact of stress in development, maintenance and relapse of CBSD could be used. The role of stress could be illustrated by using a barrel as a metaphor for the vulnerability-stress relationship. First, adverse life events and the associated stress can be regarded a vulnerability factor (contributing to the general "fill level" of the barrel in the diathesis-stress metaphor). Second, stress might act as a situational factor which might activate dysfunctional coping strategies such as excessive buying for mood regulation (contributing to "barrel overflow"). Research on other disorders such as schizophrenia has shown that this is particularly effective when instruction and psychoeducation are extended to significant others so that the environment is also aware of warning signals [116]. This might also be beneficial for CBSD.

Third, relapse prevention should include individual "prodromal" symptoms of CBSD episodes, high risk situations and "warning signs" of a relapse [117]. Strategies for relapse prevention could also include a periodical reflection of stress levels, e.g., with the help of a stress protocol/diary or technological systems involving electrocardiogram and respiratory parameters to detect high stress phases [118]. A study protocol of a promising micro-randomized trial that used machine learning-based stress detection and prompt stress management intervention might, if results are as expected, also offer an opportunity to ameliorate relapse prevention for CBSD [118]. A further aim of relapse prevention should be maintenance of social support and functional coping strategies at a high level and further consolidation of these [114].

5. Conclusion

Evidence from correlative studies suggested a substantial association between general perceived stress and CBSD symptom severity. General perceived stress seems to be elevated in persons with problematic CBSD behavior/CBSD compared to control participants but not compared to

persons with other behavioral addictions. Studies that relied on different statistical models proposing stress as antecedent of CBSD symptom severity showed mixed results. Inconclusive results also originated from EMA studies that investigated stress as situational factor contributing to CBSD episodes. Taken together, these findings suggest an association between general perceived stress and CBSD but the direction and relevance of this association remains subject for future research. It may be that absent links from stress to CBSD in cross-sectional models are due to the complex interplay of factors predicting CBSD symptom severity. Drawing on the I-PACE model, stress rather contributes to interactions involving affective, cognitive and executive aspects as vulnerability or situational factor but might not possess standalone predictive power. Further research should focus on experimental induction of stress, ameliorated procedures to capture real-life stress and objective markers of stress. This knowledge should then be incorporated into the prevention and therapy of CBSD.

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CRediT authorship contribution statement

Tobias A. Thomas: Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization. **Anna M. Schmid:** Writing – original draft, Formal analysis, Data curation. **Annica Kessling:** Writing – original draft, Formal analysis, Data curation. **Oliver T. Wolf:** Writing – review & editing, Funding acquisition. **Matthias Brand:** Writing – review & editing, Visualization, Supervision, Funding acquisition. **Sabine Steins-Loeber:** Writing – review & editing, Supervision, Funding acquisition. **Astrid Müller:** Writing – review & editing, Visualization, Supervision, Methodology, Funding acquisition, Conceptualization.

Declaration of competing interest

All authors declare that they have no conflict of interest. The authors alone are responsible for the content and writing of the paper.

Data availability

No data was used in this publication.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.comppsych.2024.152482.

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