The Role of ADHD Symptomatology and Emotion Dysregulation in Gambling Disorder

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Abstract

Objectives: Although emotion regulation deficits have been implicated in gambling disorder and ADHD, the interplay between these factors has yet to be systematically studied. We examined relationships between ADHD symptoms, emotion regulation, and gambling disorder severity in a sample of treatment-seeking gambling disorder patients (n = 98). We also examined clinical differences between patients with and without ADHD symptomatology. **Method:** Structural equation modeling (SEM) evaluated direct and indirect effects of ADHD and emotion regulation on gambling disorder severity. **Results:** Significant correlations between ADHD symptomatology and emotion regulation and between emotion regulation and gambling disorder severity were identified. Differences in emotion regulation were found between gambling disorder patients with and without ADHD symptomatology. Path analysis revealed emotion regulation to be a mediator between ADHD and gambling disorder. **Conclusion:** Our findings indicate the presence of ADHD symptomatology to be associated with greater severity of gambling disorder and greater emotional dysregulation.

Introduction

Data suggest ADHD may represent a risk factor for gambling disorder (GD) (Aymamí et al., 2015; Chamberlain et al., 2015). Close to 20% of individuals with GD also experience ADHD (Theule et al., 2016). From a transdiagnostic perspective, these disorders share numerous clinical features, including elevated impulsivity, difficulties in selfcontrol, and deficits in executive functioning (Chamorro et al., 2012; Derevensky et al., 2007; Grall-Bronnec et al., 2011; Leeman & Potenza, 2012; Steward et al., 2017; Theule et al., 2016). Both disorders are serious mental health concerns in adults and are a source of significant social and psychological complications (Fauth-Bühler et al., 2017; Mannl et al., 2016; Potenza, 2017; Waluk et al., 2016). ADHD may complicate outcomes in standard treatment approaches for GD (Waluk et al., 2016). ADHD has been associated with emergence and persistence of GD in clinical settings (Bruneau et al., 2016). Thus, there exists a need to consider ADHD symptomatology as a clinical marker associated with the progression of GD and greater GD severity, psychopathology, cognitive distortions, emotional instability, and predisposition to stress (American Psychiatric Association [APA], 2013; Davtian et al., 2012; Fatseas, Alexandre, et al., 2016; Fatseas, Hurmic, et al., 2016; Romo et al., 2016).

The co-occurrence between GD and ADHD may seem paradoxical because individuals with ADHD show difficulties maintaining attention, while a hyper-engagement of attention in gambling environments is typical in GD (Abouzari et al., 2015). However, deficits in attention in ADHD may cease when engaging with highly rewarding stimuli, such as those found in gambling settings (Abouzari et al., 2015). Similar patterns of inattention and reward-related focused attention may also be operative in other behavioral addictions such as gaming disorder (Kietglaiwansiri & Chonchaiya, 2018). Emotion regulation (ER) impairments have been implicated

in both GD and ADHD (Barrault et al., 2017; Estévez et al., 2017; Hirsch et al., 2018; Rogier & Velotti, 2018). Non-adaptive strategies, such as emotional suppression, avoidance, rumination, or catastrophizing, are commonly used by individuals with GD or ADHD when facing negative emotions (Faraone et al., 2018; Rogier & Velotti, 2018; Shushakova et al., 2017). Both disorders feature limitations in tendencies to curb (e.g., down-regulate) values, intensities, or durations of emotional experiences relevant to longterm goals or desires (Gross & Jazaieri, 2014; Rogier & Velotti, 2018).

Regarding GD, deficits in ER and their association with GD severity have been reported (Estévez Gutiérrez et al., 2014; Weatherly & Cookman, 2014). Some authors suggest that negative emotions in the context of gambling do not have enough effect to halt maladaptive gambling behavior (Del Prete et al., 2017; Navas et al., 2017; Rogier & Velotti, 2018) due to gamblers' difficulties in identifying and discriminating their emotions, their need to use additional cognitive-control resources to regulate emotions, and the reduced sensitivity to losses that individuals with GD often present (Navas et al., 2016, 2017).

Regarding ADHD and ER, irritability and abnormally elevated emotional reactivity to negative stimuli have been described in both children and adult populations (Hirsch et al., 2018; Rosen et al., 2015; Shushakova et al., 2017; Villemonteix et al., 2017). In the case of adults with a diagnosis of ADHD, between 34% and 70% show impairments in the use of adaptive regulatory strategies (Hirsch et al., 2018).

Relatively few studies have examined inter-relationships between ADHD symptomatology, ER, and GD severity in clinical populations. This study aimed to examine associations between ADHD symptomatology, ER, and GD severity in treatment-seeking GD patients. Our second aim was to examine clinical differences between GD patients with

and without ADHD symptomatology.

Method

Participants and Procedure

The study sample included 98 patients diagnosed with GD who were being treated at the GD Unit within the Department of Psychiatry at a University Hospital. Patients voluntarily sought treatment for GD and were referred to the Unit by general practitioners or other health care professionals. Patients were consecutive referrals for assessment and treatment from April 2017 to May 2018.

Exclusion criteria included the presence of active psychotic disorders, intellectual disabilities, or neurodegenerative conditions such as Parkinson's disease. A face-to-face clinical interview was conducted to confirm the presence of *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; APA, 2013) criteria for GD. Additional clinical and sociodemographic information was obtained during the interview process, and patients individually completed all instruments examined in this study before initiating outpatient treatment.

This study was conducted in accordance with the latest version of the Declaration of Helsinki. The University Hospital Clinical Research Ethics Committee approved the study, and signed informed consent was obtained from all participants.

Measures

GD severity

DSM-5 criteria. Patients were diagnosed with GD if they met *DSM-5* criteria (APA, 2013). The presence of the disorder uses a cut-off point of 4 or more inclusion criteria.

South Oaks Gambling Screen (SOGS). This self-report 20-item questionnaire categorizes respondents into probable pathological-, problem-, and non-problem-gambling groups (Lesieur & Blume, 1987). The Spanish version used has shown excellent internal consistency ($\alpha = .94$) and

test–retest reliability (r = .98) (Echeburúa et al., 1994).

ADHD symptomatology

Adult ADHD Self-Report Scale (ASRS-v1.1). The ASRSv1.1 was used as an indicator of current self-report ADHD symptoms in adulthood (Kessler et al., 2005). The ASRSv1.1 includes six of the most predictive items of the Adult ADHD Self-Report Scale (ASRS) (Adler et al., 2006). The ASRS is a self-administered scale with adequate psychometric properties, based on the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; APA, 1994) criteria and adjusted to reflect ADHD symptoms as seen in adults (Rösler et al., 2006). The Spanish adaptation of the ASRS was used for rating symptom frequencies on a 5-point Likert-type scale (0–4), with the cut-off being set at 12 (Ramos-Quiroga et al., 2009).

Emotional regulation

Difficulties in Emotion Regulation Scale (DERS). The DERS is a 36-item self-report measure that assesses individuals' levels of emotion dysregulation across six domains: nonacceptance of emotional responses, difficulties pursuing goal-directed behaviors when experiencing negative emotions, difficulties controlling impulsive behaviors when experiencing negative emotions, lack of emotional awareness, limited access to ER strategies, and lack of emotional clarity (Gratz & Roemer, 2004). Higher values indicate greater difficulties in ER. The DERS has been found to demonstrate good reliability (Cronbach's α = .93; test–retest reliability over a period ranging from 4 to 8 weeks = .88) and adequate construct and predictive validity. It has also been associated with objective (i.e., behavioral, physiological, and neuropsychological) measures of ER (Gratz & Roemer, 2004). A previously validated Spanish version of the DERS was used (Gómez-Simón et al., 2014; Wolz et al., 2015).

Emotion-Regulation Questionnaire (ERQ). The ERQ is a 10-item self-report questionnaire that assesses trait-like

differences in the use of the ER strategies of expressive suppression (e.g., "I keep my emotions to myself") and cognitive reappraisal (e.g., "When I want to feel more positive emotion . . . I change what I'm thinking about") (Gross & John, 2003). Participants are instructed to indicate the degree to which they utilize each strategy on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The ERQ provides adequate internal consistency on both the reappraisal subscale and the suppression subscale (Cronbach's alpha = .80 and .73, respectively) (Gross & John, 2003).

Other sociodemographic and clinical variables. Additional demographic, clinical, and social/family variables related to gambling were measured using a semi-structured face-to-face clinical interview described elsewhere (Jiménez-Murcia et al., 2006).

Statistical Analysis

Statistical analysis was conducted with STATA15 for Windows. First, partial correlation coefficients adjusted for patients' sex and age estimated the relationships between the study variables (due to the strong association between significance test sand sample size, $|r| > 0.10$ was considered a low effect size, $|r| > 0.24$ was considered a medium effect size, and $|r| > 0.37$ was considered a large effect size, with thresholds corresponding to Cohen's d values of 0.20, 0.50, and 0.80, respectively; Rosnow & Rosenthal, 1996). The comparison between patients with negative versus positive screening scores on the ASRS questionnaire was based on analysis of variance (ANOVA), adjusted for sex and age. In these models, the effect size of each mean comparison was estimated through Cohen's d coefficient ($|d| > 0.20$ was considered a small effect size, $|d| > 0.5$ was considered a medium effect size, and $|d| > 0.8$ was considered a large effect size; Kelley & Preacher, 2012). In addition, increases in type-I error due to multiple comparisons were controlled via Finner's method, a procedure included in the familywise-

error-rate stepwise systems which provides a more powerful test than Bonferroni correction (Finner, 1993). Finally, path analysis implemented through structural equation modeling (SEM) explored the underlying mechanism between ASRS levels, emotional dysregulation (DERS and ERQ scales), and GD severity. A latent variable for the DERS was defined using the raw scores of the first-order scales of this questionnaire. The number of *DSM-5* criteria was selected as a measure of GD severity. The maximumlikelihood estimation method of parameter estimation was used and goodness of fit was evaluated using standard statistical measures (Barrett, 2007): the root mean square error of approximation (RMSEA), Bentler's comparative fit index (CFI), the Tucker–Lewis Index (TLI), and the standardized root mean square residual (SRMR). Adequate model fit was considered non-significant by chi-square tests and if the following criteria were met: RMSEA < .08, TLI > .9, CFI > .9, and SRMR < .1; the global predictive capacity of the model was measured by the coefficient of determination (CD).

Results

Sample Characteristics

Most participants were men (90.8%), born in Spain (90.8%), single (56.1%), with a primary school level of education (60.2%), of low socioeconomic status (61.2%) and employed (58.2%). The mean age was 42.7 years (SD = 12.7). Table S1 (Supplementary material) includes the frequency distribution for clinical variables analyzed in this study.

Associations Between Clinical Variables

Table 1 contains the correlation matrix for the partial correlation coefficients (adjusted for gender and GD duration). GD severity, as assessed by the DSM-5, was associated with greater suppression scores on the ERQ, DERS scores, and ADHD symptomatology severity. ASRS total scores demonstrated similar correlational patterns as GD-severity levels. Relevant associations were also found between ERQ

and DERS scores.

Path Analyses

Figure 1 contains the path diagram (adjusted for the participants' gender and duration of GD) assessing relationships between ASRS levels, ER, and GD severity. The complete results of the SEM are reported in Table S2 (Supplementary material). Goodness of fit was achieved (all fit statistics were in the good range). Regarding the latent class variable defined by the DERS scores, all the first-order scales achieved high significant coefficients, except for the lack of awareness scale.

No direct effect was obtained (the standardized coefficient was very low and non-significant) between the ASRS measure and GD severity. However, when considering ER difficulties, the DERS-latent-class measure was directly related to GD severity (the higher the DERS score, the higher the GD severity). No direct effect was found between the ERQ scales and GD severity. A meditational pathway also emerged: the DERS-latent-class variable mediated the relationship between the ASRS total score and GD severity (the direct effect between the ASRS and GD severity obtained a non-significant standardized coefficient equal to −0.011, the indirect effect obtained a significant standardized coefficient equal to 0.27, and the total effect was also significant with a standardized coefficient equal to 0.26).

Comparison of Patients With ASRS-Positive Versus ASRS-Negative Scores

Table 2 contains the ANOVA results (adjusted for gender and GD duration) comparing patients who met and did not meet ASRS criteria. Generally, patients in the ASRS-positive group (n = 23) reported higher GD severity and mean scores on the DERS subscales

Discussion

The primary aim of this study was to examine associations between ADHD symptomatology, ER, and GD severity in a sample of treatment-seeking GD patients. Furthermore, we

aimed to explore the clinical differences between patients who presented and did not present ADHD symptomatology. In support of our first hypothesis, an association between both disorders and ER difficulties was found. In the case of GD, discrepant results have emerged when examining its association with ER. These discrepancies could exist due to the existence of different models focused on a wide range of ER processes and their interaction with different GD clinical features (Rogier & Velotti, 2018). While some previous works failed to find significant associations (Ciccarelli et al., 2016; Rogier & Velotti, 2018; Schreiber et al., 2012), others have highlighted a strong relationship between gambling behavior and deficits in ER (Williams et al., 2012), suggesting that greater impairment in ER may result in greater attempts to gamble as a manner of coping with negative emotions (Jauregui et al., 2016; Rogier & Velotti, 2018; Tárrega et al., 2015). Therefore, gambling behavior may serve as a regulator of different emotional states (Rogier & Velotti, 2018). Specifically, in this study, GD severity was associated with all DERS subscale scores except with the lack of emotional awareness subscale, understood as the tendency to attend to and acknowledge emotions (Gratz & Roemer, 2004). This result dovetails with previous studies, which have also failed to report a significant association between this ER strategy and GD severity (Jauregui et al., 2016). In the case of expressive suppression and cognitive reappraisal, assessed via the ERQ, a significant association was found only between the former ER strategy and GD severity. Therefore, GD was directly associated with a form of response modulation that involves inhibiting ongoing emotion-expressive behavior (Gross & John, 2003). Our results partially coincide with previous studies, which found no relationship between these two ER processes and GD severity (Barrault et al., 2017; Williams et al., 2012). However, the role of these two regulatory strategies remains unclear, and recent evidence suggests that, in comparison with the general population, individuals

with GD may use emotional suppression more often, which is considered a resource-consuming strategy (Navas et al., 2017; Vohs & Heatherton, 2000). In contrast, the use of cognitive reappraisal strategies allows a significant reduction of both experimental and behavioral components related to negative emotions (Gross & John, 2003), and, therefore, it is not surprising that this strategy, which could be considered adaptive, is not associated with GD in this study.

This study also identified an association between ADHD symptomatology and ER, except in cognitive reappraisal and lack of emotional awareness strategies. This observation coincides with other research linking ADHD to emotion-related problems, such as intense reactions when facing emotionally evoking stimuli, low tolerance for distress, high emotional variability, and difficulties in inhibiting negative emotional reactivity (Faraone et al., 2018; Rosen et al., 2015). Previous findings also suggest deficits in cognitive reappraisal, an essential element of managing emotions, are associated mostly with difficulties in reversal learning, working memory, and perspective taking (Faraone et al., 2018), which may explain why an association between this adaptive strategy and the GD was not observed.

Our study also sought to assess the mediating role of ER in determining the association between ADHD symptomatology and GD severity. Our analyses indicate a direct association between ADHD symptomatology and ER and between ER and GD severity, with ER being a mediator between both disorders. However, a direct significant association between ADHD symptomatology and GD severity was not found. These results underscore the role of ER difficulties in the comorbidity between both disorders. ER deficits may, therefore, be a core clinical feature related to higher levels of psychopathology and impulsive behaviors, as suggested in previous studies (Berking & Znoj, 2008; Cavelti et al., 2017; Steward et al., 2016).

Finally, as hypothesized, GD patients with ADHD symptomatology,

as compared to GD patients without ADHD symptomatology, showed greater ER difficulties. Although only a few studies have focused on assessing ER difficulties in this clinical population, previous studies also suggest that the comorbidity between both disorders may be an aggravating factor at a clinical level (Bruneau et al., 2016; Waluk et al., 2016).

Limitations and Future Research

There are limitations that should be considered when interpreting the results of this study. One weakness is the paucity of information related to a history of childhood ADHD. Although there is some controversy about whether ADHD in children and adults are independent entities (Apter, 2018), some previous literature suggests that there is an association between both (Biederman et al., 2011; Matte et al., 2012). Therefore, future studies in GD should consider this diagnostic information. Second, as ADHD symptomatology data were obtained through self-report, it could be subject to bias or to a possible overestimation of ADHD symptomatology, as suggested by previous studies (Aymamí et al., 2015; Fernández-Aranda et al., 2013). Similarly, ER has been evaluated exclusively with self-report instruments, which limits an exhaustive understanding of this complex construct. Third, our sample is comprised mainly of male treatment-seeking GD patients, and the results of this study may not generalize to non-treatment-seeking individuals or women with GD. Finally, longitudinal research is needed to explore whether the presence of these constructs is stable over time or if clinical changes occur, for example, after the treatment for GD.

Clinical Implications

These findings emphasize the importance of evaluating both ADHD and GD in clinical populations to identify possible comorbidities, which could increase disorder severity and perhaps require therapeutic approaches specifically designed to address both disorders. Although little is known

regarding the most effective treatment programs for GD patients who present with co-occurring ADHD symptomatology, some studies have suggested that psychostimulants, dopaminergic medications, and cognitive behavioral therapy could aid in regulating emotional states and impulsivity levels (Grall-Bronnec et al., 2011; Peterson et al., 2009; Waluk et al., 2016). In this line, it has been suggested that impulsivity levels could moderate the treatment outcome in cases where Modafinil has been used to reduce GD symptomatology (Smart et al., 2013). However, given data suggesting links between pro-dopaminergic agents in Parkinson disease treatment and GD (Weintraub et al., 2010) and between GD and stimulant-use disorders in both adolescents and adults (Richard et al., 2018; Xian et al., 2014), these approaches should be monitored carefully. Moreover, these results may have important implications for developing specific adjuvant interventions focused on ER, perhaps most applicable for patients who experience both disorders, to improve treatment adherence and outcome. Although cognitive-behavioral therapy and other interventions have demonstrated abilities to change ER, basic regulatory elements from other approaches, such as ER therapy, mindfulness, videogame-based approaches, or dialectical behavioral therapy, could also be considered (Fernández-Aranda et al., 2012; Gross & Jazaieri, 2014; Sancho et al., 2018; Tárrega et al., 2015). Noninvasive neuromodulatory techniques could also be potential therapeutic options, especially for addictions, although more studies are needed (Pettorruso et al., 2019). Finally, considering that ADHD is a neurodevelopmental disorder and that multiple studies have suggested that it may be a risk factor for addictive and risky behaviors (especially if not treated), our results suggest the importance of implementing responsible gambling prevention programs targeted at especially vulnerable groups, as in the case of children and adolescents with ADHD.

Declaration of Conflicting Interests

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Table 1 Partial coefficients adjusted by the patients' sex and the duration of the GD

		2	3	4	5	6	7	8	9	10	11	12
1	GD: DSM5-criteria	**.582†**	.204	**.241†**	.168	**.360†**	**.357†**	**.304†**	-.014	**.339†**	**.278†**	**.397†**
2	GD: SOGS-total	-	.139	.214	.095	.165	.172	.046	.128	.190	.229	.224
3	ASR-total		-	**.242†**	.125	**.290†**	**.561†**	**.358†**	-.010	**.508†**	**.424†**	**.534†**
4	EQR suppression			-	**.600†**	**.417†**	**.376†**	**.275†**	.111	**.318†**	**.396†**	**.430†**
5	EQR reappraisal				-	**.381†**	.228	.144	-.179	.212	.142	**.246†**
6	DERS NonAccept					-	**.605†**	**.559†**	-.173	**.708†**	**.372†**	**.765†**
7	DERS Goals						-	**.698†**	-.040	**.751†**	**.474†**	**.835†**
8	DERS Impulse							-	-.058	**.756†**	**.468†**	**.827†**
9	DERS Awareness								-	-.062	**.427†**	.207
10	DERS Strategies									-	**.452†**	**.885†**
11	DERS Clarity										-	**.707†**
12	DERS Total score											-

Note. †Bold: effect size into the moderate (|*r*|>0.24) to high range (|*r*|>0.37).

Table 2 Comparison of participants with ASRS positive versus negative screening score: ANOVA adjusted by the patients' sex and the duration of the GD

	ASRS negative *n*=75		ASRS positive *n*=23			
	Mean	SD	Mean	SD	*p*	|*d*|
GD: DSM5-criteria	6.89	1.84	7.31	1.46	.329	0.25
GD: SOGS-total	11.48	2.88	11.30	2.50	.784	0.07
EQR suppression	3.91	1.29	4.25	1.71	.305	0.23
EQR reappraisal	4.39	1.26	4.27	1.29	.692	0.09
DERS Non acceptance	16.38	6.54	20.14	6.20	**.018***	**0.59†**
DERS Goals	12.85	4.55	17.40	4.45	**<.001***	**1.01†**
DERS Impulse	13.24	5.31	16.44	6.35	**.018***	**0.55†**
DERS Awareness	16.66	5.15	17.98	4.82	.281	0.26
DERS Strategies	18.13	7.20	23.00	7.24	**.007***	**0.67†**
DERS Clarity	10.86	3.77	15.06	4.53	**<.001***	**1.01†**
DERS Total score	87.52	23.34	109.42	21.54	**<.001***	**0.98†**

Note. †Bold: effect size into the moderate (|*r*|>0.24) to high range (|*r*|>0.37).

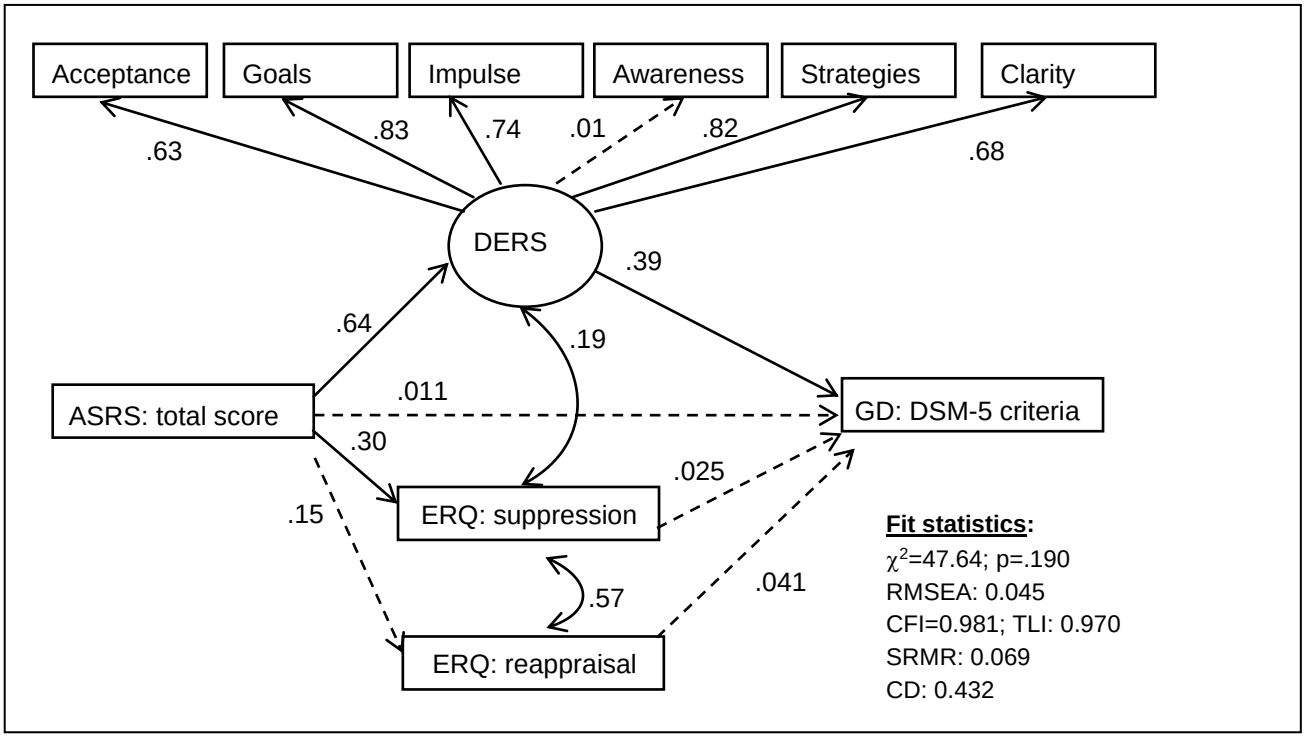

Figure 1c Path-diagrams, standardized coefficients (results adjusted by the patients' sex and the duration of the GD) (n=98)

Note. Continuous parameter: significant parameter. Dash line: non-significant parameter.