

Structural Equation Modeling (SEM): Gaming Disorder Mediating Untreated Attention Deficit Hyperactivity Disorder to Disruptive Mood Dysregulation

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Abstract

Background: When a youth was addicted in gaming, they became dysregulation with their mood especially for those youth with untreated Attention Deficit Hyperactivity Disorder (ADHD). So far, how internet gaming disorder (IGD) mediating the pathways leading ADHD to emotional dysfunction are not entirely clear. This study aims to use structural equation modeling (SEM) analyze to elucidate the direct or indirect influence of gaming behavior on ADHD youth.

Method: The Swanson, Nolan, and Pelham, Version IV questionnaire (SNAP-IV) was used to measure symptoms of ADHD and Oppositional Defiant disorder (ODD). The Chen Gaming disorder Scale (CIAS) was used to test for Internet Gaming Disorder (IGD) and ADHD, ODD, and disruptive mood dysregulation disorder (DMDD) was diagnosed by a psychiatrist.

Result: Total 102 ADHD youth, 53 (52%) of them suffering from IGD were significantly more likely to have bad interpersonal relationships ($p < 0.01$) and mood dysregulation and gaming disorder ($p < 0.01$ and < 0.001) than non-gaming addicted ADHD youth. Under the mediating role of Gaming indirectly, ADHD youth had increasing risk of mood dysregulation.

Conclusions: Untreated ADHD youth with over gaming may develop emotional dysregulation. The intensive ADHD and IGD intervention were warranted to recent ADHD youth with Gaming Disorder.

Background

Internet gaming disorder (IGD) is a new mental disorder and quite prevalent among recent child and adolescent, especially in lockdown period of COVID-19¹⁹. Clinically, child and adolescent psychiatrist increasingly recognize many youth experience mood dysregulations in combination with irritability, frequent temper outburst after their parents stopping their overly internet gaming behavior. Usually, such severe mood dysregulation is more commonly noticed on children with ADHD and Oppositional Defiant Disorder (ODD)¹, but only for many recent internet gaming addicted ADHD youth, there is an increasing tendency they develop specific mood dysregulation just look like disruptive mood dysregulation disorder (DMDD). Gaming disorder might mediate unrecognized or untreated ADHD and ODD to become DMDD.

Internet Gaming Disorder (IGD) is a new mental disorder and has high prevalence rates ranging from 4-6% in European countries like Germany to 13.5% in China among child and adolescent². Especially during the lockdown period of Covid-19, more youth become problematic gaming user³. In modern digital days, children and adolescent grow up under unresistant attraction of gaming. But bad consequence of IGD in earlier year including negative psychologic well-being⁴, school refusal and social withdrawal or so-called hikikomori syndrome^{5,6}, internet-related cognitive bias and coping⁷, Anxiety and depression, impaired social and family life⁸. Recent researcher found unsafe internet usage, in early adolescents is seriously related to the presentation of impulsive behavior^{9,10}, temper loss¹¹, or presenting disruptive behavior disorder¹². As a more terrible result, recent young pathological internet

gamer indeed had their increasing risk of impulsive/aggressive tendency in their violent behavior¹³. Therefore, worldwide child psychiatrist starts to increase the awareness of aggressive or disruptive mood dysregulation disorder (DMDD) like symptom after youth having internet gaming disorder.

Attention Deficit Hyperactivity Disorder (ADHD) and IGD both are commonly seen mental disorder among child and adolescent. From the literature review, ADHD and IGD were correlated closely by results of a meta-analysis¹⁴. Among up to 83% of youth with IGD, they were youth with ADHD¹⁵. Clinically, nowadays child psychiatrist intuitively recognized IGD may play a role to lead children with ADHD escape tedious learning processes during their difficult learning days¹⁶. As more severe symptom in IGD, more severe the ADHD symptom was¹⁷. IGD can be an early predictor to expand the symptom severity of ADHD. Furthermore, youth with ADHD become increasingly aggressive, violent, or delinquent possibly cause these youth spent more time on with IGD watching more severe dangerous content in internet gaming process¹⁸ or remained in disruptive emotional dysregulation state if only parent stop their overly gaming behavior. There is a need to explore the how IGD mediating recent ADHD experience emotional dysregulation symptoms exactly look like disruptive mood dysregulation disorder (DMDD) especially after their parents stopping their overly internet gaming behavior.

DMDD is a new DSM-5 diagnosis and characterized by a long-term dysphoria with at least three severe anger episodes per week for a year. DMDD highly coexists with ADHD^{19,20}, concomitantly in 87% of children with DMDD comorbid with ADHD according to research conducted by Leibenluft in 2002 earlier²¹. According to recent family with ADHD youth, their parents noticed DMDD like emotional disruption usually occurred on ADHD youth while their parent strictly prohibits their children's gaming playing behavior. So, is gaming disorder possible mediate a developmental pathway leading child with ADHD become easily angry child with DMDD like symptom? Here we hypothesises Internet Gaming Disorder may play a mediator role leading child with ADHD to develop symptoms like DMDD.

No research before to explore how internet gaming disorder have an influence to escalate the ADHD children's symptoms of inattention to severe emotional disruption symptoms of DMDD during their developmental process. We claim the gaming disorder among modern youth is no more just quite commonly seen as entertainment of killing time or a harmless form of playing, but maybe the mediator to severely lead children with ADHD appearing irritable symptom of DMDD. This study sets out to test the risks account for youth with both ADHD and IGD, further developed DMDD like symptom eventually. To date, this may be the first study to examine whether the DMDD diagnosis might be one of bad consequence noticed among ADHD adolescents with gaming disorder. The results of this study can help child psychiatrists to understand how Internet gaming disorder in children and adolescents mask the new phenomenon that ADHD youth may develop DMDD like symptom. These data might be helpful for pediatric child mental health experts to define a suitable prevention strategy to effectively treat children with ADHD, IGD, and DMDD.

Method

Participants and data collection

Patients were recruited from the Out-Patient Units of Mackay Memorial Hospital (MMH) in Taipei, Taiwan. The research protocol was approved by the MMH Institutional Review Boards (IRB). Written informed consent was obtained from each subject in line with the IRB guidelines. The inclusion criteria were males or females with ADHD from 7–18 years old. The exclusion criteria were as follows: paediatric patients or their parent(s)/caregiver(s) with known or suspected psychotic disease, mental retardation, or other mental conditions that would prevent them from completing the study. After obtaining a signed consent from a legal guardian, each subject recruited for this study was invited to participate in the following programs and were interviewed to provide the following measurements:

Measurement

Baseline characteristics

Baseline characteristics of the children with ADHD between IA and non-IA groups includes: gender, school performance, interpersonal relationships, Comorbid diagnosis(ODD, CD, DMDD, Anxiety, Adjustment disorder, Somatization, Tics, Tourette's syndrome, Speech delay history, Dyslalia, Internet gaming disorder, Depression), subtype, family psychiatric history, Sibling suffer from ADHD, parent suffer from ADHD in Childhood, Strategy of parent deal with stress, Parental understanding of ADHD, Parental marital satisfaction, working days online chat or play game \geq 1Hr, Holiday online chat or play game \geq 3Hr, Drug response, Parenting group therapy, Compliance, Age, Height, Weight, Age of father, Age of mother, No. of Comorbidity.

Chen Gaming disorder Scale (CIA)

The CIA is a self-reported questionnaire consisting of 26 questions on a four-point scale that assesses with good reliability and validity²² the five dimensions of Internet use-related problems: compulsive use, withdrawal, tolerance, interpersonal and health problems, and time management problems. The internal reliability of the scale and the subscales in the original study ranged from 0.79 to 0.93. Higher CIA scores indicated increased severity of Gaming disorder. The CIA has good diagnostic accuracy (89.6%). The screening cut-off point had high sensitivity (85.6%) and the diagnostic cut-off point had the highest diagnostic accuracy, classifying 87.6% of participants correctly.

Swanson, Nolan, and Pelham, Version IV questionnaire (SNAP-IV)

The SNAP-IV consists of the following items: inattention, hyperactivity/impulsivity, and oppositional symptoms. These items reflect the core symptoms of ADHD and Oppositional Defiant Disorder as defined in the DSM-IV. The psychometric properties of SNAP-IV-Chinese in Taiwan showed the intra-class correlation coefficients for the three subscales of the Chinese SNAP-IV ranged from 0.59 to 0.72 for the parent form and from 0.60 to 0.84 for the teacher form. All subscales of both the parent and teacher forms showed excellent internal consistency with Cronbach's α greater than 0.88²³.

Statistical Analysis

Descriptive statistics were applied to show demographic characteristics. Differences of categorical variables between groups were compared by either chi-square tests or Fisher's exact tests when appropriate. Numerical variables were tested by the Student's t test. All statistical analyses were analysed by using SPSS v22.0 (SPSS Inc., Chicago, IL, USA). All statistical tests were two-sided, and the significant level was set at p-value < 0.05.

Structural Equation Modelling (SEM) was carried out using AMOS software version 22.0 (maximum-likelihood method) to examine the direct or indirect relationships among ADHD, DMDD, and IA. The latent variable ADHD was indexed with three antecedent indicator variables: inattention, hyperactivity/impulsivity, and oppositional symptoms. List wise deletion was used for 3 of the 105 participants with missing data on some of the variables at baseline, we used list wise deletion (in which cases that do not have data on all variables are omitted to handle the missing data).

SEM was conducted to verify whether the proposed mediated model was suitable for the collected data. The goodness-of-fit indicators were based on eight commonly used indices in SEM, the Chi-Square test ($p > 0.05$), SRMR (Standardized Root Mean Square Residual) less than 0.05, RMSEA (Root Mean Square Error of Approximation) less than 0.06, GFI (Goodness-of-fit Statistic) greater than 0.95, IFI (Incremental Fit Index) greater than 0.95, CFI (Comparative Fit Index) greater than 0.95, NFI (Normed Fit Index) greater than 0.95 and TLI (Tucker-Lewis Index) greater than 0.95. The guidelines of these indices for determining model fitness were proposed by Hooper et al.²⁴. For each observed variable for SEM analysis recommended by Bentler and Chou²⁵ is for at least 15 participants for each observed variable. Accordingly, a sample size of 105 participants has greatly exceeded the minimal requirements ($15 \times 5 = 75$).

Results

One hundred and five eligible ADHD children were enrolled, and 102 participants completed the baseline data of the three evaluation forms. The comparison of the baseline characteristics of the ADHD with IA and ADHD non-IA groups are shown in Table 1. As anticipated, children with gaming disorder are significantly more likely to have bad interpersonal relationships than the non-addicted children ($p=0.008$) group and the gaming disorder group also had significantly higher comorbid diagnoses of DMDD and internet gaming disorder than the non-addicted group (p -values= 0.006 and < 0.001 , respectively). (Table 1)

The zero-order correlations of the indicator variables are shown in Table 2. The basic model depicted the direct relationship between ADHD and DMDD (Fig. 1). The result of this model shows that the (standardized) total direct effect of ADHD on DMDD is 0.62. When ADHD increases by one standard deviation, DMDD significantly increased by 0.62 standard deviations (p -value < 0.001). This model provides a good fit for the data, as suggested by the non-significant chi-square ($p = 0.571$) and seven other goodness-of-fit indices (SRMR=0.014, RMSEA< 0.001, GFI=0.998, IFI=1.006, CFI=1.000, NFI=0.997,

and TLI=1.0383). The mediation models, as shown in Figure 2, evaluated the strength of the indirect relationship while controlling for the direct effect of ADHD on DMDD. The eight goodness-of-fit indicators of this mediation model provide a very good fit for the data (Chi-Square=1.087, $p=0.297$, SRMR=0.026, RMSEA=0.029, GFI=0.996, IFI=0.999, CFI=0.999, NFI=0.992 and TLI= 0.993). Of importance is that the standardized direct effect of CIAS on DMDD is 0.21 ($p=0.005$) after adjusting for the direct effect of ADHD on DMDD.

Discussion

The concept of IGD mediate ADHD pathways leading to DMDD are not entirely clear before. The purpose of the study was to prove how gaming disorder mediated the effect of ADHD to DMDD. Under the hypothesis, this SEM analysis (analysis of symptom developmental pathways) found gaming disorder enhancing the symptom of ADHD to DMDD. IGD is the risk and associated to the emotional dysregulation among ADHD youth.

If we explain this finding by the Research Domain Criteria (RDoC) dimensions model perspective, children with ADHD have deficit in domain of Cognition (specifically in Working Memory) and Positive Valence (in rewarding anticipation/ delay /receipt)²⁶. The children with IGD may exhibit problem on domain of Negative Valence Systems, Positive Valence Systems, Cognitive Systems, Systems for Social Processes, and Arousal and Regulatory Systems²⁷. Therefore, IGD and ADHD may have mixed or overlapped disturbance on domain of Executive function, Incentive Salience, and Negative Emotionality²⁸. Our result indicated that gaming disorder might aggravate negative emotional symptom of ADHD symptoms of ADHD become emotional dysregulation is congruent from RDoC model perspective. This SEM pathway analysis indicated IGD may indeed lead children with ADHD become severe in their symptom of inattention, hyperactivity/impulsivity, and ODD symptom.

Following explanation can be used to explain why IGD having mediating role to lead ADHD become severe in their symptom even developing negative mood. A vicious cycle started from gaming addicted ADHD youth characterized as following by our descriptive analysis: 1, more likely have poor interpersonal relationship. 2, more comorbid with DMDD clinically. 3, have an older parent. 4, have parent with more marital discord, and a poorer parenting strategy for managing stress than ADHD youth without gaming disorder. It means they live under a vulnerable state with their severe symptom presentation of ADHD with emotional irritability, also they had poor interpersonal relationship and poor family interaction. Through the long process of becoming IGD, these vulnerable youths became youth with DMDD. Vicious cycle is IGD might lead ADHD youth spend more time on gaming to avoid more family or social interaction, gradually gaming addiction lead them become lonelier and more irritable in mood especially when they were stopped to using gaming overly.

Our finding detailed the etiology from genetic and environmental aspect regarding the development of gaming disorder. For youth with IGD, the untreated ADHD were genetic loading to lead youth with IGD burst out severe symptom of ADHD, impulsivity, and irritability. Gradually, IGD might enhance the genetic

risk of untreated ADHD youth further present more severe symptom just like DMDD. Also, the environment or family risk like untreated ADHD living with a lower family cohesion, more family conflicts, and a poorer family relationship and family functioning²⁹, sooner or later these ADHD youth become more irritable mood even to disruptive mood through the process of long term addicted on gaming. Thus, for treatment toward family with internet addicted ADHD youth with irritable mood, there is a strong need to development bio-psycho-social modal. It means specific combining pharmacotherapy for ADHD or/and antipsychotic drug for disruptive mood with parental program including parent's marital therapy, improving communication with gaming addicted youth, and parental stress management in addition to healthy digital using principle.

In last two decades, more researcher focused on other comorbid psychiatric disorders among gaming addicted adolescents, such as IGD co-occurring more with depression^{30,31}, social anxiety, other substance use disorders³², nicotine use disorder, alcohol use disorder, somatoform disorders, pathological gambling, adult type ADHD symptoms, sleep disturbances, suicidal ideation, suicidal plans³³, social phobia³⁴, phobias, psychosis with the exception of paranoia³⁵, loneliness, and problematic behavioral disinhibiting³⁶, reported withdrawal psychosis^{37,38}. But this SEM study results only first further make an important association from children with ADHD will present increasing irritability, anger, bad temper, and to a degree their symptoms look like DMDD. It is important to know that this severe irritable mood is closely intensified by the long-term the process of overly playing gaming.

This study has the following limitations. First, the DMDD diagnosis in this study is made by a psychiatrist according to the new criteria in DSM-5; however, the stability of the DMDD diagnosis after gaming disorder has not been followed up on after this study. Therefore, the differentiation between the real DMDD and withdrawal symptoms after gaming disorder like DMDD symptoms need to be taken into consideration. Second, for convenience of study, only child and adolescent with ADHD diagnostic antecedents were selected as risks. Other risks like socially accepted internet overusing behavior leading parent self also being IGD victim may also lead children with ADHD with IGD develop DMDD related symptoms. Despite these limitations, the use of SEM to explore the multiple correlated risks leading to juvenile mood dysregulation and the fits all seem good or appropriate to indicate SEM being a useful way to elucidate the simultaneous risks leading more severe mental disorders.

ADHD should be treated earlier to prevent the serious consequences such as antisocial personality disorder, substance related and addictive disorder³⁹. Before these bad consequences developing, this study further implied overly gaming behavior among child and adolescent is not only a game playing problem, but also a serious risk to lead child with ADHD to have disruptive mood dysregulation disorder like symptoms.

Our present and future society will have more youth with IGD problem⁴⁰. The recent child psychiatrist should get insight to watch out the silent hazard brought by gaming disorder, especially for youth with untreated ADHD. Here we suggest for those severely internet addicted ADHD youth with warning sign of DMDD like irritable mood and aggressive behavior, the intensive treatment program should include the

standard combining pharmacotherapy for ADHD or/and antipsychotics pharmacotherapy for children with disruptive mood with cognitive behavior therapy for IGD youth and their parents.

In summary, Internet Gaming Disorder among youth with ADHD is neglected and remains under-treated, new mental disorder in our society. This study finding indicated gaming disorder indirectly mediate children with ADHD present irritable symptom like DMDD. Therefore, no more as usually phenomenon that children with ADHD commonly being neglected or undertreated in some developing countries. Since now, child and adolescent psychiatrists and related pediatric ADHD experts should consider Internet Gaming Disorder as a warning sign of possible escalating child and adolescent's neurodevelopmental disorder of ADHD to disruptive mood dysregulation symptoms.

Declarations

Acknowledgements

Not applicable.

Authors' contributions

Author R.F. Tzang, C.H. Chang, Y.C. Chang, designed the study and wrote the protocol. Authors Y.C. Chang undertook the statistical analysis, and all authors contributed to and have approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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Tables

Table 1. Comparisons of the baseline characteristics of the children with ADHD between IA and non-IA groups

		Internet Addiction (CIAS \geq 57)		<i>p</i> -value
		No (n = 49)	Yes (n = 53)	
Gender	Male	38 (77.6%)	32 (60.4%)	0.087 ^a
	Female	11 (22.4%)	21 (39.6%)	
School performance	Average	24 (50.0%)	23 (44.2%)	0.689 ^a
	Bad	24 (50.0%)	29 (45.8%)	
Interpersonal relationships	Good	36 (75.0%)	25 (48.1%)	0.008 ^a
	Bad	12 (25.0%)	27 (51.9%)	
Comorbid diagnoses				
ODD	Yes	34 (69.4%)	45 (84.9%)	0.096 ^a
	No	15 (30.6%)	8 (15.1%)	
CD	Yes	0 (0%)	2 (3.8%)	0.496 ^a
	No	49 (100.0%)	51 (96.2%)	
DMDD	Yes	26 (53.1%)	42 (79.2%)	0.006 ^a
	No	23 (46.9%)	11 (20.8%)	
Anxiety	Yes	0 (0.0%)	1 (1.9%)	1.000 ^a
	No	49 (100.0%)	52 (98.1%)	
Adjustment disorder	Yes	0	0	1.000 ^a
	No	49 (48.0%)	53 (52.0%)	
Somatization	Yes	3 (6.1%)	3 (5.7%)	1.000 ^a
	No	46 (93.9%)	50 (94.3%)	
Tics	Yes	5 (10.2%)	3 (5.7%)	0.476 ^a
	No	44 (89.8%)	50 (94.3%)	
Tourett's syndrome	Yes	3 (6.1%)	4 (7.5%)	1.000 ^a
	No	46 (93.9%)	49 (92.5%)	
Dyslalia	Yes	0 (0.0%)	1 (1.9%)	1.000 ^a
	No	49 (100.0%)	52 (98.1%)	
Speech delay history	Yes	1 (2.0%)	1 (1.9%)	1.000 ^a
	No	48 (98.0%)	52 (98.1%)	
Internet gaming disorder	Yes	18 (36.7%)	49 (92.5%)	< 0.001 ^a
	No	31 (63.3%)	4 (7.5%)	
Depression	Yes	0 (0.0%)	1 (1.9%)	1.000 ^a
	No	49 (100.0%)	52 (98.1%)	

		Internet Addiction (CIAS \geq 57)		p-value
		No (n = 49)	Yes (n = 52)	
Subtype	Combined	35 (71.4%)	30 (56.6%)	0.150 ^a
	Inattentive	14 (28.6%)	23 (43.4%)	
Family hereditary history	Yes	11 (22.4%)	10 (18.9%)	0.807 ^a
	No	38 (77.6%)	43 (81.1%)	
Sibling suffer from ADHD	Yes	11 (22.4%)	9 (17.0%)	0.619 ^a
	No	38 (77.6%)	44 (83.0%)	
Parents suffer from ADHD in Childhood	Yes	13 (26.5%)	19 (35.8%)	0.394 ^a
	No	36 (73.5%)	34 (64.2%)	
Strategy of Parents deal with stress	Appropriate	31 (64.6%)	23 (43.4%)	0.046 ^a
	Inappropriate	17 (35.4%)	30 (56.6%)	
Parental understanding of ADHD	Yes	21 (42.9%)	21 (39.6%)	0.841 ^a
	No	28 (57.1%)	32 (60.4%)	
Parental marital satisfaction	Satisfied	43 (87.8%)	38 (71.7%)	0.053 ^a
	Unsatisfied	6 (12.2%)	15 (28.3%)	
Working days online chat or play game	\geq 1Hr	23 (46.9%)	43 (81.1%)	$< 0.001^a$
	$<$ 1Hr	26 (53.1%)	10 (18.9%)	
Holiday online chat or play game	\geq 3Hr	21 (42.9%)	45 (84.9%)	$< 0.001^a$
	$<$ 3Hr	28 (57.1%)	8 (15.1%)	
Drug response	Good	14 (50.0%)	11 (31.4%)	0.195 ^a
	Bad	14 (50.0%)	24 (68.6%)	
Parenting group therapy	Yes	7 (23.3%)	8 (20.0%)	0.775 ^a
	No	23 (76.7%)	32 (80.0%)	
Compliance	Good	13 (48.1%)	10 (27.8%)	0.118 ^a
	Bad	14 (51.9%)	26 (72.2%)	
Age		10.16 \pm 3.05	12.29 \pm 3.69	0.002 ^b
Height		138.80 \pm 18.15	148.98 \pm 18.71	0.007 ^b
Weight		35.89 \pm 15.06	45.85 \pm 18.24	0.003 ^b
Age of father		42.63 \pm 6.30	46.76 \pm 7.87	0.005 ^b
Age of mother		40.22 \pm 7.25	43.53 \pm 6.98	0.021 ^b
No. of Comorbidity		1.90 \pm 1.21	2.89 \pm 0.91	$< 0.001^c$

a: Fisher's Exact test

b: Independent t-test

c: Mann-Whitney U test

Table 2 Zero-order correlations among study measures

	Inattention	Hyperactivity	Emotionality	CIAS	DMDD
Inattention	1	0.476 ^{***}	0.355 ^{***}	0.270 ^{**}	0.177
Hyperactivity		1	0.508 ^{***}	0.020	0.141
Emotionality			1	0.211 [*]	0.616 ^{***}
CIAS				1	0.350 ^{***}
DMDD					1

CIAS: Chen Internet Addiction Scale;

DMDD: *Disruptive Mood Dysregulation Disorder*

*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$

Figures

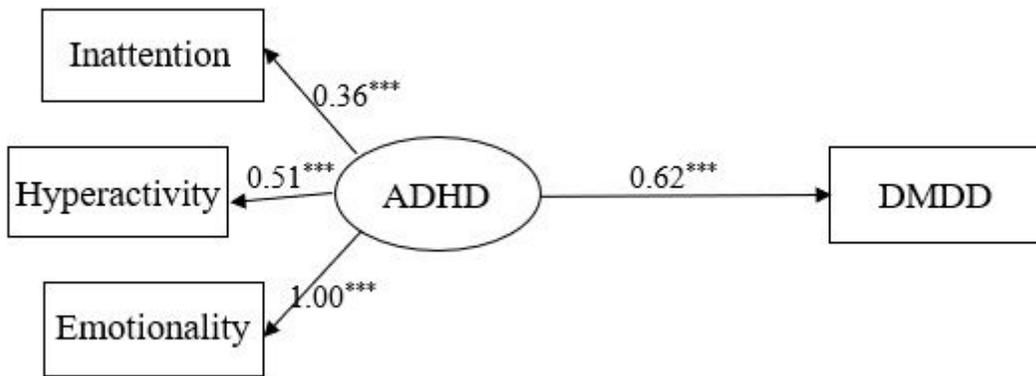


Figure 1

The basic model depicted the direct relationship between ADHD and DMDD. Circles represent unobserved latent variables. Rectangles represent observed measured variables. Values are standardized path coefficients. Goodness-of-fit indicators: Chi-Square=0.322 ($p=0.571$), SRMR=0.014, RMSEA< 0.001, GFI=0.998, IFI=1.006, CFI=1.000, NFI=0.997, and TLI=1.0383. *** $p<0.001$. ADHD: Attention Deficit Hyperactivity Disorder; DMDD: Disruptive Mood dysregulation Disorder; SRMR = Standardized Root Mean Square Residual; RMSEA= Root Mean Squared Error of Approximation; GFI: Goodness-of-fit; IFI: Incremental Fit Index; CFI = Comparative Fit Index; NFI: Normed Fit Index; TLI = Tucker Lewis Index

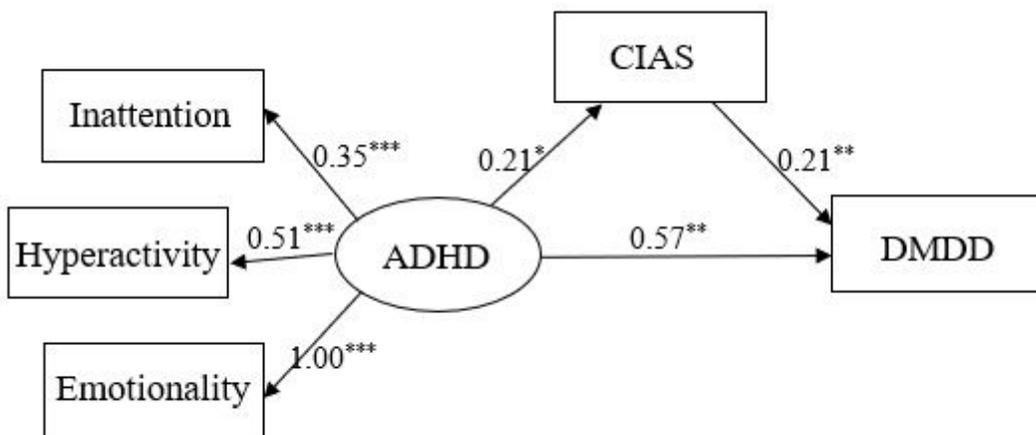


Figure 2

The mediation models. Circles represent unobserved latent variables. Rectangles represent observed measured variables. Values are standardized path coefficients. Goodness-of-fit indicators: Chi-Square=1.087 ($p=0.297$), SRMR=0.026, RMSEA=0.029, GFI=0.996, IFI=0.999, CFI=0.999, NFI=0.992, and

TLI=0.993. * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$. ADHD: Attention Deficit Hyperactivity Disorder; DMDD: Disruptive Mood dysregulation Disorder; CIAS: Chen's internet addiction scale; SRMR = Standardized Root Mean Square Residual; RMSEA= Root Mean Squared Error of Approximation; GFI: Goodness-of-fit; IFI: Incremental Fit Index; CFI = Comparative Fit Index; NFI: Normed Fit Index; TLI = Tucker Lewis Index

Supplementary Files

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- [Tabletoscientificreport.docx](#)