IMPACT OF DIGITAL MEDIA ON CHILDREN WITH ADHD DURING COVID 19 PANDEMIC

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ABSTRACT

Background*: As a result of the COVID-19 pandemic and quarantine, children have been consuming more media. Children with attention deficit hyperactivity disorder (ADHD) are particularly affected because they are already more likely to experience psychological and behavioural issues.*

Objectives: *to compare frequency of problematic digital media use (PDMU) among ADHD and their age and sex-matched healthy control during COVID pandemic and to study impact of PDMU on psychological state of children as well as family wellbeing. In addition, to study impact of PDMU on learning approach of them.*

Methods: *Observational cross-sectional research was performed on 200 children recruited from developmental and behavioral clinic and outpatient clinics. They were divided into; 100 ADHD and control group (n=100). Detailed history was taken including sociodemographic data, age, sex, total hours of using media and total hours of activity per week The following scales had been evaluated: Problematic use of mobile phones (PUMP) scale which estimate the dependence symptoms of mobile phone use (which used to classify patients to ADHD with and without PDMU according to its score), Revised Child Anxiety and Depression Scales (RCADS) , Difficulties in Emotion Regulation Scale (DERS), PedsQL Family Impact Module and revised two-factor study process questionnaire for learning approach assessment .*

Results: *The study showed 43 cases of ADHD had PDMU and 57 cases didn't have PDMU. ADHD children showed higher Anxiety and depression scores when compared to control group ($p<0.001$). ADHD children with PDMU showed significantly least ability to control their emotions followed by ADHD children without PDMU then control group($p<0.001$). ADHD children with PDMU have higher superficial approach and lower deep approach when compared to ADHD children without PDMU($p<0.001$).*

Conclusion: *The PDMU-affected ADHD youngsters had more intense negative emotions, increased depression and anxiety, and decreased motivation to learn. For the fundamental symptoms and related issues of ADHD to be managed, supervision of digital media use must be combined with more exercise.*

Keywords: *ADHD, COVID19, Media, children.*

INTRODUCTION:

With seemingly limitless and instant access to the internet, the COVID-19 pandemic was taking place in a novel technical and social settings [(1&2)]. According to *King et al.* (2020) [(3)], physicians have expressed worries about children and adolescents' problematic

media use in particular. Nevertheless, little is known about the precise impact on media use and attention deficit hyperactivity disorder (ADHD) in kids and teenagers [(4)].

While many children today grow up in a world of web-based media, which may be unfamiliar to many parents and even more so to most grandparents, childhood used to consist of unstructured play in big group games. Consideration should be given to the consequences of this "screen culture," which has revolutionised the field of preschool education. The average amount of time children spend using electronic media, such as the internet and video games, has climbed significantly to approximately three hours per day in the general population. Because some kids find it difficult to limit their internet use, an expanding corpus of studies has been conducted on "internet addiction" [(5)].

Similar to impulse control disorders, problematic digital media use (PDMU) is a larger, complex field of issues associated with utilising of the internet [(6)]. It describes the inability to regulate one's internet usage, leading to dysfunctional patterns (such as too much gaming, excessive social network usage, excessive video clip viewing, etc.) that have a serious detrimental impact on academic performance, interpersonal relationships, and emotional health [(7)].

Furthermore, a swift transition from presential to e-learning procedures was required due to the COVID-19 epidemic. Schools have forced to use remote solutions to quickly supply the whole medical curriculum, unlike planned e-learning programmes [(8)]. The quality of teaching and learning activities in education is correlated with students' learning attitudes, approaches and the procedures they follow either prior to or during a learning activity [(9&10)]. Students' learning styles can be used to determine which students have learning difficulties, compare teaching-learning experiences across classes and evaluate the efficacy of instructional interventions [(11&12)].

Everyone will probably find the COVID-19 pandemic's physical distance regulations and service and school closures difficult, but families of children with neurodevelopmental disabilities may be most negatively affected [(13)].

According to certain research, PDMU has a poor effect on social interactions, family connections, and academic performance [(14- 16)]. Fewer studies, if any, have examined the effects of COVID-19 quarantine during and after PDMU, and even fewer have examined the interaction between PDMU and learning motivation, negative emotions, Executive Function, ADHD symptoms, and family environment [(17&18)]. We hypothesized that children with ADHD have more screen time as well as psychological troubles during COVID 19 pandemic than normal children, we also predicted that prolonged screen time correlated with poor family relationship and poor motivation to learn.

AIM OF THE WORK:

So, the goals of this study were threefold, first to assess the frequency of problematic media use among children with ADHD and their age and sex-matched healthy control during COVID epidemic. Second, to study the impact of problematic digital media use on psychological state of children as well as family wellbeing. Third, to study the impact of PDMU on learning approach of them.

SUBJECTS AND METHODS:

Participants:

This cross-sectional study was performed at Developmental and Behavioral Pediatrics clinic as well as outpatient clinics over 6 months from October 2021 to April 2022. The study included 200 participants; they were divided into; 100 children with ADHD and Control Group (n=100) from the

same age group. All participants from 6 – 16 years and met the diagnostic requirements for children with ADHD according to the DSM-V criteria were included and those with history of brain damage or global developmental delay or epilepsy were excluded.

Procedure:

We approached children (n=120) who were undergoing regular follow up at Child Psychiatry Clinic, Children Hospital, Ain Shams University. Of these, 100 patients approved to participate and 20 declined.

During a scheduled visit, the invited children and their caregivers were informed of the study objectives, allowing further questions and discussion for further clarification and response to participants' concerns. The children completed Problematic use of mobile phones (PUMP) [(20)], Revised Child Anxiety and Depression Scales (RCADS) [(21)] Difficulties in Emotion Regulation Scale–Short Form (DERS) [(22)] and Revised two-factor study process questionnaire R-SPQ-2F [(23)] while the caregivers completed PedsQL Family Impact Module [(24)] and Conners parent rating scale-revised long version [(25)].

Tools:

The following scales had been evaluated after detailed history:

1. Arabic version of Problematic use of mobile phones (PUMP) self-reported scale:

which estimate the dependence symptoms of mobile phone use**.** It was used to classify patients to children with ADHD with and without problematic use of mobile phones (PDMU) according its score. The PUMP scale consists of twenty questions. Using a Likert-type scale, where strongly disagree is represented by a number one and strongly agree by a number five, the respondents provided their answers to each item. Greater scores indicate stronger levels of addiction. The PUMP score is computed by adding the results of each individual question [(20)].

2. Arabic version of Revised Child Anxiety and Depression Scales (RCADS):

to evaluate anxiety and depression symptoms based on the DSM. The kid self-report measure consists of 47 items that rate symptoms of anxiety and depression on a four-point scale (0 for never, 3 for always). The RCADS includes five anxiety scales: separation anxiety (7 items), generalised anxiety (6 items), panic disorder (9 items), social phobia (9 items), and obsessive-compulsive (6 items). It also includes a depression scale (10 items). Total scores are translated to T-scores using certain formulae that take into consideration each child's gender and grade. A higher score always indicates a higher level of symptom intensity [(21)].

3. Arabic version of Difficulties in Emotion Regulation Scale–Short Form (DERS) (self-reported form):

to evaluate issues with emotion control. The 16-item measure evaluates problems with controlling one's emotions. The Likert scale has five points for grading items. Higher scores indicate more difficulty controlling emotions. The scale consists of five subscales: two items measure emotional clarity; three items measure the inability to act in a goal-directed manner when distressed; three items measure the difficulty of controlling impulsive behaviour during distress; three items measure the inability to accept negative emotions; and five items measure the limited access to effective emotion regulation strategies [(22)].

4. Arabic version PedsQL Family Impact Module:

It assesses Parents' self-reported concerns, communication, and physical, emotional, social, and cognitive functioning. The Module assesses family interactions and everyday activities as described by parents. The six scales included in the 36-item

PedsQL Family Impact Module Scales measure how well parents describe functioning on their own: The scales measuring parent-reported family functioning are: 7) Daily Activities (3 items) and 8) Family Relationships (5 items). Physical Functioning (6 items), 2) Emotional Functioning (5 items), 3) Social Functioning (4 items), 4) Cognitive Functioning (5 items), 5) Communication (3 items), 6) Worry (5 items). A five-point Likert scale is used (0 = never an issue; 4 = often an issue). A 0–100 scale is created by reverse-scoring the items and linearly transforming them (0 = 100, 1 = 75, 2 = 50, 3 = 25, 4 = 0). Higher scores denote better functioning (less negative impact) [24].

5. Arabic version of Revised two-factor study process questionnaire R-SPQ-2F (self-reported form):

to assess students' methods of learning. It has twenty tasks that evaluate both surface and deep learning methods. The learning approaches are assessed using a five-point Likert scale (1 being "the item is never or only rarely true of me" to 5 being "the item is always or almost always true of me"). There were two components that carried the articles. Items 3, 4, 7, 8, 11, 12, 15, 16, 19, and 20 make up Factor 1. These are the Surface Approach (SA) in action. Surface strategy and motive are the two subscales of the approach. A student with a narrow target is characterised by the surface strategy (SS) subscale. The Surface Motive (SM) suggests that the student's fear of failing is the reason behind the adaptation of their plan. Factor 2, often known as the Deep Approach (DA), is represented by items 1, 2, 5, 6, 9, 10, 13, 14, 17, and 18. It can be divided further into Deep motive and Deep strategy. Students who strive to optimise the significance of their academic pursuits are aligned with the Deep Strategy (DS). A student who exhibits Deep Motive (DM) is one who has a natural interest in the material [23].

6. Arabic version of Conners parent rating scale-revised long version:

which is formed of 80 questions to assess severity of ADHD [25].

Statistical analysis:

According to *Shuai et al.* (2021) [19], a two-sided two-sample equal-variance t-test for quantitative measures and a two-sided z-test for independent two proportions for categorical variables yield a power of 80% to detect a great effect size of 0.8 with a significance level (alpha) of 0.050. The sample size of at least 55 cases is expected to be roughly divided into 25 with PDMU and 30 without PDMU.

The statistical software for social sciences, version 23.0 (SPSS Inc., Chicago, Illinois, USA), was used to analyse the recorded data. When the distribution of the quantitative data was parametric (normal), it was shown as mean± standard deviation and ranges; for non-parametric (non-normally distributed) variables, it was shown as median with inter-quartile range (IQR). The further examinations were conducted: Wallis Kruskall test and Post Hoc test, Tukey's test was employed for numerous comparisons between various variables. Fisher's exact test and the Chi-square test were only used to compare groups with qualitative data where there was an expected count of fewer than five in any given cell. The Mann Whitney U test and the independent-samples t-test of significance were employed to compare two means. The degree of association between two variables was evaluated using Pearson's correlation coefficient (r) test.

Ethical Considerations:

The protocol was submitted to the Ethics Committee of the Faculty of Medicine at Ain Shams University with the reference number (FWASU MS 597/2021). The collected data was used for research purpose only; approval of the patients' caregivers was taken by getting an informed consent after informing them about the study's objectives, steps,

potential benefits. written agreement was sought from the children and guardians of the subjects. The privacy of all data was guaranteed. The patients had an option to exit the research at any time, without having to give a reason, and without facing any consequences.

RESULTS:

According to Self-rating questionnaire for problematic mobile phone use score, ADHD group was divided into 43 children with PDMU and 57 children without PDMU. Table (1)'s demographic and clinical features of the ADHD with and without PDMU group and the control group showed that gender ($p = 0.483$), age ($p = 0.918$), living location, and school type did not differ significantly from between the groups. The 3 groups' daily routines and media consumption patterns differed significantly. The PDMU group's children with ADHD utilise digital media considerably more frequently ($P < 0.001$). Conversely, compared to children with ADHD without PDMU and the control group, the PDMU group's children exercised significantly less days ($p<0.001$). However, there were no significant differences in the types of activities. Nevertheless, ADHD subtype as well as the overall Conners score, which measures the intensity of ADHD symptoms, did not significantly differ between two groups of ADHDS ($P=0.861$).

Table 1: Sociodemographic data of the participants:

Baseline characteristics of children	With PDMU (n=43)	Without PDMU (n=57)	Control Group (n=100)	Test value	P-value
Age (years)					
Mean± SD	9.98±2.71	9.84±2.60	9.76±3.11	0.085	0.918
Range	6-16	6-15	6-16		
Sex					
Female	18 (41.9%)	30 (52.6%)	52 (52.0%)	1.457	0.483
Male	25 (58.1%)	27 (47.4%)	48 (48.0%)		
School					
Governmental	15 (34.9%)	19 (33.3%)	45 (45.0%)	2.556	0.279
Special	28 (65.1%)	38 (66.7%)	55 (55.0%)		
Mother Education					
Illiterate	2 (4.7%)	4 (7.0%)	6 (6.0%)	1.982	0.739
Post University	23 (53.5%)	27 (47.4%)	63 (63.0%)		
Pre-University	18 (41.9%)	26 (45.6%)	31 (31.0%)		
Father Education					
Illiterate	3 (7.0%)	4 (7.0%)	8 (8.0%)	1.434	0.838
Post University	25 (58.1%)	28 (49.1%)	57 (57.0%)		
Pre-University	15 (34.9%)	25 (43.9%)	35 (35.0%)		
Mother job					
No	32 (74.4%)	41 (71.9%)	68 (68.0%)	0.674	0.714
Yes	11 (25.6%)	16 (28.1%)	32 (32.0%)		
Father Job					
Average	21 (48.8%)	18 (31.6%)	49 (49.0%)	8.429	0.077
High	9 (20.9%)	8 (14.0%)	17 (17.0%)		
Low	13 (30.2%)	31 (54.4%)	34 (34.0%)		
Residence					
Rural	25 (58.1%)	26 (45.6%)	49 (49.0%)	1.618	0.445
Urban	18 (41.9%)	31 (54.4%)	51 (51.0%)		

Social Status					
Married	41 (95.3%)	57 (100.0%)	95 (95.0%)	3.536	0.472
Divorced	2 (4.7%)	0 (0.0%)	4 (4.0%)		
Widow	0 (0.0%)	0 (0.0%)	1 (1.0%)		
Having Mobile					
No	34 (79.1%)	43 (75.4%)	71 (71.0%)	1.104	0.576
Yes	9 (20.9%)	14 (24.6%)	29 (29.0%)		
Total hours of watch for media					
Mean± SD	3.81±1.06A	2.08±0.44B	1.18±0.35C	24.959	<0.001
Range	1-7	1-4	0-3		
	A	B	C		
V. games					
No	22 (51.2%)	32 (56.1%)	41 (41.0%)	3.632	0.163
Yes	21 (48.8%)	25 (43.9%)	59 (59.0%)		
Activity					
No	33 (76.7%)	26 (45.6%)	34 (34.0%)	22.109	<0.001
Yes	10 (23.3%)	31 (54.4%)	66 (66.0%)		
	B	A	A		
Type of Activity					
Football	4 (40.0%)	17 (54.8%)	21 (31.3%)	7.784	0.650
Swimming	6 (60.0%)	12 (38.7%)	39 (58.2%)		
Karate	0 (0.0%)	2 (6.5%)	3 (4.5%)		
Kong foo	0 (0.0%)	0 (0.0%)	1 (1.5%)		
Squash-Football	0 (0.0%)	0 (0.0%)	1 (1.5%)		
Gymnastics	0 (0.0%)	0 (0.0%)	2 (3.0%)		
Frequency (hrs)/ wks. for Activity					
Mean±SD	2.18±1.01C	3.52±0.85B	4.92±1.18A	44.388	<0.001
Range	1-5	2-7	2-10		
	C	B	A		
Type of ADHD					
Inattentive	12 (27.9%)	20 (35.1%)		0.578	0.447
Hyperactive	15 (34.9%)	22 (38.6%)		0.142	0.706
Combined	16 (37.2%)	15 (26.3%)		1.348	0.246
DSM-IV Total Symptom Count of Conners					
Mean±SD	75.56±8.11	75.30±6.69		0.031	0.861
Range	61-90	61-90			

Table (2) displays the outcomes of each participant's psychosocial conduct. When compared to the ADHD group without PDMU, the PDMU group exhibited significantly worse symptoms for emotional regulation (P=0.001). Additionally, compared to the healthy control group, the ADHD group without PDMU exhibited noticeably worse symptoms for emotional control. When compared to the control group, children with ADHD displayed higher levels of anxiety and depression; however, there were no significant differences between children with ADHD with PDMU and children with ADHD without PDMU. Figures (1 and 2) show that there was a substantial positive association between the total scores of PUMPS and RCADS (P=0.010) and DERS (P= 0.045).

Table 2: Comparison between groups according to Revised Child Anxiety and Depression Scales (RCADS) and emotions (DERS):

Revised Child Anxiety and Depression Scales	With PDMU (n=43)	Without PDMU (n=57)	Control Group (n=100)	F-test	P-value
Anxiety					
Mean± SD	70.28±5.20	53.10±5.95	35.91±3.10	1051.154	<0.001**
Range	60-80	45-63	30-45		
	A	A	B		
Depression					
Mean± SD	65.28±6.25	52.16±6.05	39.03±6.28	307.015	<0.001**
Range	54-80	41-66	27-52		
	A	A	B		
Total					
Mean± SD	70.09±5.96	52.96±6.57	35.83±4.23	735.008	<0.001**
Range	58-80	43-62	27-44		
	A	A	B		
Interpretation for RCADS					
Low Severity	8 (18.6%)	14 (24.6%)	100 (100%)	94.535	<0.001
Medium Severity	14 (32.6%)	21 (36.8%)	0 (0.0%)		
High Severity	21 (48.8%)	22 (38.6%)	0 (0.0%)		
	A	A	B		
Emotions (DERS)					
Clarity					
Mean±SD	7.07±2.10	6.00±1.80	4.92±2.07	34.523	<0.001**
Range	3-10	3-10	2-9		
	A	B	C		
Goals					
Mean±SD	9.63±1.76	7.48±1.40	5.32±1.70	127.194	<0.001
Range	6-13	5-12	3-11		
	A	B	C		
Impulses					
Mean±SD	10.86±2.17	7.81±1.97	4.76±1.30	271.363	<0.001
Range	5-16	4-13	3-9		
	A	B	C		
Strategy					
Mean±SD	12.47±1.96	11.55±2.87	10.62±2.76	198.095	<0.001
Range	9-18	7-18	5-17		
	A	B	C		
Non acceptance					
Mean±SD	9.77±1.89	7.94±1.74	6.10±1.86	82.434	<0.001
Range	6-13	5-11	3-9		
	A	B	C		
Total					
Mean±SD	50.09±5.12	40.91±4.43	31.72±4.86	278.553	<0.001
Range	37-62	29-53	21-43		
	A	B	C		
Interpretation for DERS					
Low	17 (39.5%)	35 (61.4%)	100 (100%)	47.3211	<0.001
Intermediate	25 (58.1%)	22 (38.6%)	0 (0%)		
High	1 (2.3%)	0 (0.0%)	0 (0%)		
	A	B	C		

Different capital letters indicate significant difference at ($p<0.05$) among means in the same row

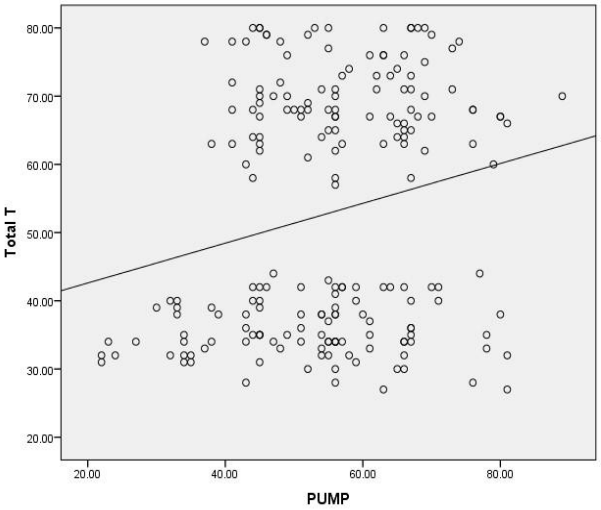

Figure1: Scatter plot showing positive correlation between PUMP score and (RCADS)

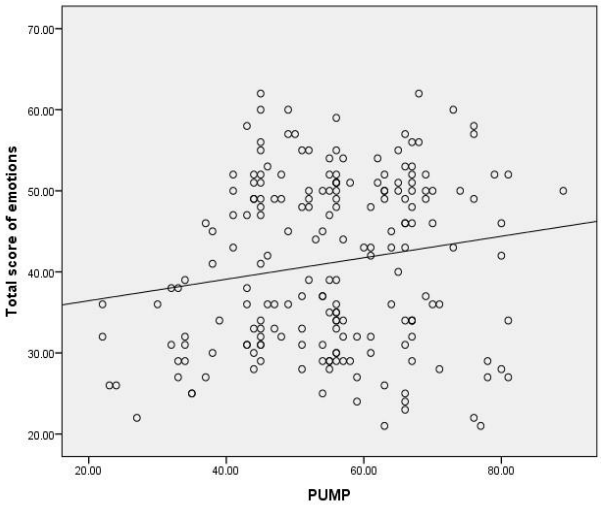

Figure 2: Scatter plot showing positive correlation between PUMP score and total score of emotions (DERS)

As regard academic learning approaches of all participants, both groups of ADHD showed less deep strategy, deep motion and deep approach as well as higher superficial strategy, superficial motion and superficial approach when compared to control group. Also, A significant differences was observed between children with ADHD with PDMU, when compared to children with ADHD without PDMU regarding those items ($p<0.001$) as they have higher superficial approach and lower deep approach Table (3). As regards learning motivation, both groups of children with ADHD (with problematic media use and without problematic media use) showed higher superficial approach which indicates that a student with a narrow target and suggests that the student's strategy has changed as a result of their fear of failing when compared to the control group. However, the control group demonstrated a deeper approach, indicating that the students made an effort to maximise the significance of their studies and to demonstrate a genuine interest in the subject matter Figure (3).

Table 3: Comparison groups according to strategies of learning by R-SPQ-2F questionnaire:

Learning	With PDMU (n=43)	Without PDMU (n=57)	Control Group (n=100)	test value	P-value
Deep strategy					
Mean±SD	9.53±1.87	12.44±2.02	15.35±2.82	98.373	<0.001
Range	5-12	7-18	8-23		
	C	B	A		
Deep motion					
Mean±SD	10.23±1.84	12.76±1.93	15.29±2.63	120.605	<0.001
Range	5-13	8-17	11-21		
	C	B	A		
Deep approach					
Mean±SD	19.81±3.26	25.23±3.52	30.65±4.32	133.320	<0.001
Range	10-25	15-33	20-41		
	C	B	A		

Superficial strategy					
Mean±SD	15.26±1.97	14.10±2.02	12.94±3.94	88.042	<0.001
Range	12-21	9-22	5-22		
	A	B	C		
Superficial motion					
Mean±SD	15.23±3.13	14.21±2.41	13.19±3.05	5.241	<0.001
Range	5-21	6.22	6-22		
	A	B	C		
Superficial approach					
Mean±SD	30.49±3.89	28.31±3.42	26.13±6.82	11.113	<0.001
Range	18-39	15-41	11-42		
	A	B	C		

Different capital letters indicate significant difference at ($p<0.05$) among means in the same row

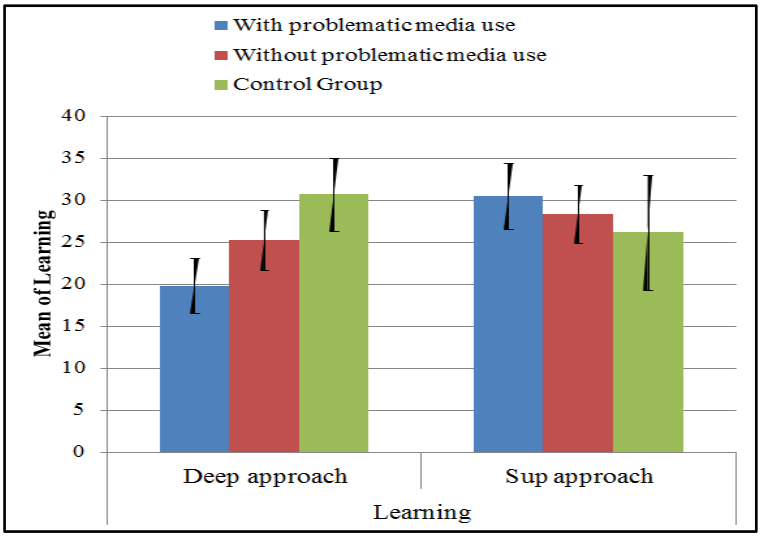

Figure 3: Comparison between the three studied groups regarding mean of strategies of learning by R-SPQ-2F questionnaire.

In comparison to the control group, the children with ADHD with and without PDMU demonstrated lower scores in all subscales (function, activity, social, emotions, cognition, communication, relation, and worry) of the home environment study. These results indicate substantial differences between the three groups under study. When comparing those items to children with ADHD without PDMU, a significant difference was seen, as all subscale scores were lower in the children with ADHD with PDMU group Table (4).

Table 4: Comparison groups as regard family environment by PedsQL Family Impact Module scale:

Family Environment Scale	With PDMU (n=43)	Without PDMU (n=57)	Control Group (n=100)	Test value	P-value
Physical Function					
Mean±SD	30.69±12.45	62.74±14.82	94.78±6.75	219.437	<0.001
Range	4.1-95.8	33-98	62.5-100		
	C	B	A		
Emotion					
Mean±SD	19.71±9.14	57.32±10.01	94.93±5.48	866.025	<0.001
Range	5-55	45.78	85-100		
	C	B	A		

Social					
Mean±SD	27.26±12.76	61.00±13.98	94.73±5.34	324.755	<0.001
Range	6.3-87.5	44.94	81.2-100		
	C	B	A		
Cognitive					
Mean±SD	22.91±11.00	59.62±10.95	96.33±4.66	1205.063	<0.001**
Range	0-40	44-70	88-100		
	C	B	A		
Communication					
Mean±SD	30.40±13.90	64.99±14.37	99.58±1.84	281.628	<0.001
Range	0-100	46-100	91.6-100		
	C	B	A		
Parent HRQol					
Mean±SD	25.45±10.59	60.40±12.81	95.34±4.36	1059.196	<0.001
Range	16.2-61.2	51-81	85-100		
	C	B	A		
Worry					
Mean±SD	18.10±8.86	58.30±6.83	98.50±2.97	2309.675	<0.001
Range	0-30	45-65	90-100		
	C	B	A		
Daily Activity					
Mean±SD	18.27±8.24	57.49±9.16	96.70±4.85	991.145	<0.001
Range	0-50	42.75	83.3-100		
	C	B	A		
Mean±SD	29.95±13.82	63.65±13.70	97.35±3.92	337.256	<0.001
Range	10-91.6	50-96	90-100		
	C	B	A		
Mean±SD	26.13±11.99	61.62±12.68	97.11±2.88	601.175	<0.001
Range	11.1-77.7	51-89	90.6-100		
	C	B	A		
Mean±SD	24.70±8.00	60.30±8.62	95.90±4.01	2114.708	<0.001
Range	16-43.7	51-72	86.8-100		
	C	B	A		

DISCUSSION:

ADHD symptoms and PDMU:

Children with ADHD have a fragile mental health, so it is important to look into whether and how the pandemic might impact this group. Lack of routines and changes in social distance can exacerbate an individual's symptoms of ADHD, leading to a variety of behavioural issues as well as feelings of uneasiness and dissatisfaction [(4)].

In the current research, it was shown that 26 % of the control children enrolled in this research did not have PDMU, however 43 % of ADHD children had PDMU. These PUMP score results cleared a significant difference between children with ADHD and the control group. This suggests that social media has a greater impact on children with ADHD than it does on the control group. Kids who struggle with attention deficit disorder may be more drawn to digital media items as a way to ease their boredom and make up for their lack of social skills or scholastic struggles [(19&26)].

Families with children with ADHD faced new issues as a result of both online education and home confinement. Because it was inconvenient to obtain medical attention

while the quarantine was in place, several patients' treatments were interrupted [19]. Due to the requirement for online classes, electronic devices and the internet were made available for free usage. Because of their employment obligations, many parents were consequently unable to watch over their kids [27]. Executive function, particularly inhibition, is one of the main traits associated with ADHD. Compared to control children, children with ADHD who exhibited a lack of self-control had a greater rate of problematic digital media use (PDMU) [28].

Cassuto et al., 2013 [29] stated that teenagers with ADHD may be particularly drawn to using digital media because they are more susceptible to outside distractions**.** Additionally, screen usage may make it more difficult to engage in activities that have been shown to improve cognitive function and attention span [30].

Psychosocial behaviour and emotions:

According to this study, children with ADHD with and without PDMU displayed significantly higher levels of anxiety and depression than the control group. Children diagnosed with ADHD sometimes internalise symptoms of anxiety and despair together. The pandemic's public health limitations resulted in widespread psychological suffering. These patterns are especially worrisome because children with ADHD also tend to have co-occurring mental health conditions and become more agitated when forced to stay inside.

Our work revealed that there was higher depression and anxiety scores in patients with PDMU than those without. However, it didn't reach statistically significant difference. Children who spend more time online are more likely to experience depression, according to numerous prior research [31-33]. This may indicate that inappropriate use of digital media products contributed to the higher likelihood of negative feelings experienced by youngsters with ADHD with PDMU. Social media may have encouraged lonely young people to make up for their loneliness by passively browsing other people's profiles, but this could have made them feel even more down [34].

Social media and gaming appear to provide deceptive digital communication tools for kids with anxiety, but they also lost the ability to share feelings and experiences with peers in person [35], which could make it harder for kids to interact with people in real life and result in social anxiety.

According to *Faraone et al.* (2019) [36], who reviewed the nature of emotional symptoms in ADHD, emotional impulsivity and poor emotion self-regulation lead to notable deficits and are prevalent and central enough to the illness to be taken into consideration. This current research demonstrated that there was significant difference between the 3 involved groups as regard emotions control. ADHD with PDMU have the highest score in DERS followed by ADHD without PDMU then the healthy children have the lowest scores in DERS which is supported by *Shuai et al.'s* 2021 [19], which found that children with ADHD with PDMU had more emotional issues overall than children with ADHD without PDMU.

It has been suggested that executive function impairment in individuals with ADHD may contribute to difficulties with emotional self-regulation [37&38]. Moreover, the brain's distractibility circuitry, which innervates emotion-related systems, may be malfunctioning in relation to emotion dysregulation [39]. A meta-analysis also found a link between problematic internet use and impairments in working memory, decision-making, and inhibitory control, which are aspects of executive functioning [40]. Furthermore, prior studies have discovered a detrimental correlation between problematic social media use and executive functioning [41] which explain why ADHD with PDMU had higher scores in DERS than those without PDMU.

Learning approaches:

COVID19 pandemic and quarantine was challenging to all population as they were forced to complete with remote learning but it was more challenging to children with ADHD. The current study showed that regarding learning; children with ADHD, showed less deep strategy and deep motion when compared to control group. ADHD children with PDMU, and children with ADHD without PDMU, showed higher superficial strategy and superficial motion when compared to control group. Also, a significant difference was observed between ADHD children with PDMU, when compared to children with ADHD without PDMU regarding those items. Compared to children with ADHD without PDMU, the children with PDMU showed worse interpersonal, learning, and life stress as well as poorer motivation for learning. The PUMP score and learning motivation were negatively correlated.

When compared to the control group, both groups of ADHD children displayed stronger superficial approach learning motivation, suggesting that the student had a focused aim and that their technique was changed out of fear of failing. The control group's deeper approach, on the other hand, suggests that the students there made an effort to maximise the significance of their studies and to demonstrate a genuine interest in the material.

Indeed, a study involving Chinese teenagers discovered that, in comparison to the healthy controls, those with problematic mobile phone use showed higher levels of stress from life events and less motivation to schoolwork [(42)]. This negative relationship between screen-based activities and academic performance may have its roots in the theory that screen media use plays a critical role in cognition, including the brain processes involved in knowledge, intellect, and action, which ultimately affect academic abilities and achievements. This theory also suggests that screen media use negatively impacts academic abilities and achievements [(43)]. For this reason, in order to enhance academic performance, screen-based activities must to be limited and monitored [(44)].

Evidence from the *Becker et al.,* [(45)] study showed that parents and teenagers with ADHD had more trouble with remote learning than did teenagers without ADHD. It is often known that teenagers with ADHD frequently struggle academically, and these results imply that challenges encountered during face-to-face instruction will probably manifest themselves during remote instruction as well [(46)].

In the future, it will be crucial for communities and schools to support parents as they navigate the uncharted landscape of remote learning, in addition to provide the required assistance to teenagers themselves, especially those who may be struggling with mental health issues or learning disabilities.

Family environment:

This work showed that there was negative impact on the families' environment that caring a child with ADHD. Furthermore, the PDMU added more negative impact on their family environment as regard function, activity, social, emotions, cognitive, communication, relation & worry. The families of children with PUMP and without PUMP showed lower scores in all subscales of family impact module questionnaire when compared to control group. A significant difference was observed between children with ADHD with PDMU, when compared to children with ADHD without PUMP regarding those items *($p<0.001$).*

The influence of children with ADHD on their families was demonstrated by *Catherine et al.* [(47)] study, which reported that frequent stress related to relationships and parenting within the family that resulted in emotional and mental health issues while caring for their child with ADHD.

Marital discord and arguments on how to handle their child's symptoms, sibling conflict due to the child's burdensome ADHD symptoms. Even more so, having a child with ADHD affected the social and professional lives of family members as it was difficult to keep their jobs and were having to adjust their work schedules to accommodate their child's needs. In addition, helping the child with ADHD start, finish, and manage homework took up a lot of time in Parents daily lives [48].

Given how commonplace screen time has become, it is critical to regulate how kids use digital media devices. Prevention and early intervention are key components of this management. Longer leisure screen usage in children with teens has been linked to increased media availability and decreased parental monitoring. It's important to recognise the symptoms of PDMU and seek treatment as soon as possible in order to avoid problems with a child's everyday social interactions with family members, academic performance, and physical functioning [14].

Fostering adolescent routines, lowering negative effect, and increasing parent confidence in managing remote learning are crucial strategies for easing the challenges that adolescents, especially those with ADHD, face while attempting to learn remotely [45].

This clearly implies that parents should supervise their children's use of digital media while simultaneously encouraging them to engage in more physical activity. Engaging in more frequent and intense physical activity and reducing screen time was linked to a lower risk of depression, anxiety, and life dissatisfaction as well as higher levels of self-steam. Increasing physical activity and decreasing screen time may have a positive impact on mental health outcomes.

Limitation:

It is important to note a few of the study's limitations. Firstly, all change ratings are based on parents' retrospective assessments, which means they could be skewed. Second, it's still unknown what particular social media platforms, digital media material, video games, and computer-related activities young people engaged in.

Implication:

Clinicians should investigate how much time teenagers spend in front of different digital devices during therapy as a primary potential way of reducing cognitive, behavioural, and clinical aspects of ADHD because of the implications of these findings for interventions. Public awareness campaigns on the risks of prolonged use of digital media for kids and teenagers in general, and children with ADHD and teenagers specifically, should be conducted in media and government health centres.

Conclusion:

When the entire study is considered, it not only shows a link between digital media use and symptoms, emotions, anxiety, and depression associated with ADHD, but it also indicates that children with ADHD who were exposed to more digital media during the epidemic quarantine period had more issues. Children with ADHD are more negatively impacted by the COVID-19 pandemic and quarantine than children without ADHD in terms of their emotional regulation, total media usage hours, anxiety, and depression because they are already more likely to experience psychological disturbances than other children. Therefore, monitoring how much time is spent on digital media and increasing physical activity are crucial for managing the primary symptoms of ADHD as well as its related issues.

List of abbreviations:

ADHD	: Attention deficit hyperactive disorder
PDMU	: Problematic digital media use
PUMP	: Problematic use of mobile phones
RCADS	: Revised Child Anxiety and Depression Scales
DERS	: Difficulties in Emotion Regulation Scale–Short Form
R-SPQ-2	: Revised two-factor study process questionnaire

Declaration:

Consent for publication:

Not applicable

Availability of data and materials:

Data is offered on demand due to privacy of the patients.

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تاثير مشاهدة الوسائط الرقمية علي مرضي اضطراب فرط الحركة ونقص الانتباه اثناء الحجر الصحي للكوفيد 19

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الخلفية: نتيجة لوباء كوفيد-19 والحجر الصحي، أصبح الأطفال يستهلكون المزيد من الوسائط. يتأثر الأطفال الذين يعانون من متلازمة نقص الانتباه وفرط النشاط بشكل خاص لأنهم أكثر عرضة بالفعل للتعرض لمشاكل نفسية وسلوكية.

الأهداف: مقارنة معدل استخدام الوسائط الرقمية بين مرضي متلازمة اضطراب فرط الحركة ونقص الانتباه ومجموعه من اقرانهم المطابقين لعمرهم وجنسهم أثناء جائحة كوفيد ودراسة تأثير فرط استخدام هذه الوسائط على الحالة النفسية للأطفال ونهج التعلم لهم وكذلك رفاهية الأسرة.

الطرق: شارك في هذه الدراسة 100 طفل من حالات متلازمة اضطراب فرط الحركة ونقص الانتباه و 100 حالة من اقرانهم الاصحاء. تم أخذ التاريخ التفصيلي بما في ذلك البيانات الاجتماعية والديموغرافية والعمر والجنس وإجمالي ساعات استخدام الوسائط وإجمالي ساعات النشاط في الأسبوع. تم حساب معدل اعراض الاعتماد علي استخدام الهواتف المحمولة ودرجة القلق والاكتئاب المنقحة لدى الأطفال ، والصعوبات في مقياس تنظيم العاطفة ، تاثر رفاهية الأسرة وتقييم نهج التعلم.

النتائج: أظهرت الدراسة أن 43 حاله استخدمت الوسائط الرقمية استخدام مفرط في حين 57 لم يستخدموها استخدام مفرط من مجموعة حالات اضطراب فرط الحركة ونقص الانتباه . كما أظهر الأطفال المصابون باضطراب فرط الحركة ونقص الانتباه درجات أعلى في القلق والاكتئاب مقارنة بمجموعة اقرانهم الاصحاء. أظهر الأطفال المصابون باضطراب فرط الحركة ونقص الانتباه الذين لديهم فرط في استخدام الوساءط قدرة أقل بكثير على التحكم في انفعالاتهم، يليهم الأطفال المصابون باضطراب فرط الحركة ونقص الانتباه الذين لا يعانون من فرط استخدام الوسائط الرقمية، ثم مجموعة الاصحاء. يتمتع الأطفال المصابون باضطراب فرط الحركة ونقص الانتباه الذين يعانون من فرط استخدام الوسائط الرقمية بنهج سطحي أعلى ونهج عميق أقل مقارنةً بأطفال اضطراب فرط الحركة ونقص الانتباه الذين ليس لديهم فرط في استخدام الوسائط الرقمية.

الاستنتاج: يعاني الاطفال المصابين باضطراب فرط الحركة ونقص الانتباه المتأثرين بفرط استخدام الوسائط الرقميه من مشاعر سلبية أكثر حدة، وزيادة في الاكتئاب والقلق، وانخفاض الدافع للتعلم. ولذلك لابد من وجود رقابه واشراف دائم على استخدام الوسائط الرقمية وزيادة ممارسة الانشطة لكي تتم الوقاية من نتائج الاستخدام المفرط للوسائط الرقمية.