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Remote Learning and Stress in Mothers of Students with Attention Deficit and Hyperactivity Disorder during the Covid-19 Lockdown

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☞ The Covid-19 lockdown and the implementation of remote learning brought challenges to children with ADHD and their parents. This research aimed to examine the spatial and technical preconditions and quality of support for children with ADHD during remote learning and to determine their mothers' burdens with the children's school tasks during the first lockdown. Another aim was to determine the degree of academic accommodation of teaching, the mother's burden with the school tasks, and the impact of the intensity of the children's difficulties on mothers' stress levels. The study had 61 mothers of children with ADHD, aged 30 to 53, as participants. Data were collected using an online questionnaire. The perspective of mothers showed that spatial conditions were not appropriate for holding online classes. Furthermore, teaching materials during online classes were not adapted to the child's needs, teachers did not send teaching materials through the available online services in a proper manner, and more than a third of the mothers stated that there was no interactive teaching at all and that there was no individual contact with teachers. Most mothers state that they are burdened with the child's school tasks more than compared to the period before the lockdown. It has also been shown that attention symptoms, lack of academic accommodations, and school workload have statistically significant effects on maternal stress.

Keywords: ADHD, remote learning, stress in mothers, Covid-19 lockdown

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Učenje na daljavo in stres pri materah učencev z motnjo pomanjkanja pozornosti s hiperaktivnostjo (ADHD) med zaprtjem zaradi covid-19

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☞ Zaprtje zaradi covid-19 in izvajanje učenja na daljavo sta prinesla izzive za otroke z motnjo ADHD in njihove starše. Namen te raziskave je bil preučiti prostorske in tehnične predpogoje ter kakovost podpore otrokom z motnjo ADHD med učenjem na daljavo in ugotoviti obremenjenost njihovih mater s šolskimi nalogami otrok med prvim zaprtjem. Drugi cilj je bil ugotoviti stopnjo akademske prilagoditve pouka, obremenjenost mater s šolskimi nalogami in vpliv intenzivnosti težav otrok na ravni stresa pri materah. V raziskavi je sodelovalo 61 mater otrok z motnjo ADHD, starih od 30 do 53 let. Podatki so bili zbrani s pomočjo spletnega vprašalnika. Vidik, ki so ga izrazile sodelujoče matere, je pokazal, da prostorski pogoji niso bili primerni za izvajanje pouka prek spleta. Poleg tega učna gradiva, rabljena med poukom prek spleta, niso bila prilagojena otrokovim potrebam, učitelji učnih gradiv niso pošiljali prek razpoložljivih spletnih storitev na ustrezen način, več kot tretjina mater pa je navedla, da interaktivnega pouka sploh ni bilo in da ni bilo individualnega stika z učitelji. Večina mater navaja, da so bolj obremenjene s šolskimi nalogami otrok v primerjavi z obdobjem pred zaprtjem. Pokazalo se je tudi, da simptomi pozornosti, pomanjkanje učnih prilagoditev in šolska obremenitev statistično pomembno vplivajo na stres mater učencev.

Ključne besede: motnja ADHD, učenje na daljavo, stres pri materah, zaprtje zaradi covid-19

Introduction

Due to the Covid-19 pandemic in March 2020, Croatia introduced a lockdown. Consequently, the schools were closed, and classes switched to remote learning; prior preparation for such a form of teaching had not occurred. For students from the first to the fourth grades of primary school, teachers organised classes through public television. The schools could hold classes remotely by implementing various modalities. For upper grades of primary and secondary school, classes were held remotely. Some teachers held real-time interactive classes via online platforms (e.g., Microsoft Teams), and some sent teaching materials and assignments to students electronically. In the context of the definition of remote learning as a learning experience in a synchronous or asynchronous environment using different devices with Internet access, whereby students can be located anywhere during learning and interaction with teachers and other students (Singh & Thurman, 2019), the teaching thus took place both synchronously and asynchronously.

Huang et al. (2020) identified the following factors for the effectiveness of online learning: 1) reliable communication infrastructure; 2) appropriate digital learning resources; 3) suitable learning tools; 4) effective learning methods; 5) organisation of learning in class; 6) effective teacher and student support services; 7) close cooperation between governments, businesses, and schools.

The pandemic brought a change in routines, limited ability to move, challenges of working and learning from home, which is affected by the confined spaces in which all household members reside, and the lack of digital equipment needed for all household members in some families. These circumstances pose an even greater challenge to children with disabilities. Children with developmental disabilities may be at increased risk of deteriorating learning and social skills when changing, reducing or eliminating typical services (Frederick et al., 2020).

In this situation, it can be expected that the symptoms of attention deficit hyperactivity disorder (ADHD), including inattention, hyperactivity, and impulsivity, intensified. Studies from other countries have shown that during the Covid-19 pandemic, children with ADHD had more intense and more frequent behavioural problems than before the pandemic (McGowan et al., 2020; Zhang et al., 2020).

Due to the very nature of difficulties (attention, executive functions, etc.), students with ADHD often need support in learning and doing homework. Problems in doing homework include low motivation and productivity, avoiding and delaying school responsibilities, off-task behaviour, poor time organisation and planning for learning (Habboushe et al., 2001). Experiencing the pandemic

showed that parents of students with ADHD had more challenges and less confidence in managing and supporting remote learning and rarer communication with school (Becker et al., 2020). Since this form of teaching came unplanned and without prior preparation, it is to be expected that students could not have received the necessary teacher support in proper measure. Most parents of children with disabilities, including ADHD, from several European countries report a partial or complete lack of additional support during lockdown homeschooling (Thorell et al., 2020).

Research evidence suggests that switching to remote learning greatly affected daily functioning (Thorell et al., 2021) and increased parental stress (American Psychological Association (APA), 2020) and depression (Lee et al., 2020) among all parents of children with disabilities are expected to be under even greater pressure.

Parents of children with disabilities describe the challenges and impacts of the pandemic on everyday life: closing schools, insufficient access to therapies, remote learning, staying at home, health care due to virus infection, loss of family members and friends due to Covid-19, working from home and simultaneously taking care of children, financial difficulties, mental problems in parents, increased level of unwanted behaviour in children, sleep problems, and other additional stressors (Latzner et al., 2021; Mann et al., 2021; Masi et al., 2020; Neece et al., 2020).

Parents or guardians of children with ADHD list stressors related to remote learning related to distractibility, lack of academic accommodations, and home isolation (Becker et al., 2020). Furthermore, mothers of students with ADHD report that remote learning has not sufficiently enabled their children to receive an adequate level of learning (Tessarollo et al., 2021).

Additional time and effort with mostly no formal education or training to ensure the involvement of children in remote learning and therapy may contribute to increased burdens and poorer quality of life (Pecor et al., 2021; Zhang et al., 2020). Stress is higher in parents of children with ADHD whose behavioural problems have intensified than those of neurotypical children (Iovino et al., 2021).

A Chinese qualitative study (Mo & Chan, 2021) dealing with the involvement of parents of children with ADHD in education in the traditional way of teaching identified five topics in this field, one of which is the father's lack of participation in the care and schooling of children with ADHD. It has been shown that mothers are the most engaged in their children's education (Mo & Chan, 2021). It is to be expected that the participation of mothers of children with ADHD in school matters was even more intense during the lockdown and remote learning, as confirmed by the studies of Tessarollo et al. (2021). Mothers of sons with ADHD report greater difficulties coordinating maternal and work

obligations and teaching children in relation to mothers of neurotypical students. This is contributed to by the fact that children with ADHD before and during lockdown are mostly cared for by their parents, while parents of neurotypical peers have greater support from grandparents and other relatives and friends (Tessarollo et al., 2021). Therefore, it is to be expected that the burden on parents of children with ADHD, especially mothers, was even greater during the time of pandemic and remote learning.

Researching studies that directly address the impact of certain variables related to ADHD students on their parents' stress during the COVID-19 pandemic has resulted in only one work by Yousef et al. (2021). Using correlation analysis, they found, among other things, that greater challenges in structuring activities in managing the child's sleep than before COVID-19 and the gender of a child with ADHD are statistically and significantly related to stress in mothers. No research was found that identifies the specific contribution of gender, the intensity of ADHD symptoms, teaching accommodations, and stress burden in mothers of children with ADHD.

Because of the obvious challenges that lockdown and remote learning brought to children with ADHD and their parents, especially mothers, we were interested in researching the situation in Croatia.

The lockdown and the implementation of remote learning have brought some challenges for children with ADHD and their parents. This research aimed to examine the spatial and technical preconditions and academic accommodations and the methods and quantity of implementation of various forms of teaching for children with ADHD during remote learning. The second aim was to determine the mother's burden with the child's school tasks during the first lockdown. The third aim was to evaluate the degree of academic accommodation of teaching, the mother's burden with the school tasks, and the severity of ADHD symptoms as possible predictive factors of the mother's stress during the COVID-19 lockdown.

Therefore, the following research questions have been set:

- RQ1: From the mothers' point of view, what were the spatial and technical preconditions, academic accommodations and the methods and quantity of implementation of various forms of teaching during remote learning for children with ADHD?
- RQ2: To what extent were mothers of children with ADHD burdened with their child's schoolwork during the lockdown?
- RQ3: Did the academic accommodations to the child's difficulties, the mother's burden regarding schoolwork, and the severity of ADHD symptoms during the lockdown affect the mother's stress?

Method

Participants

The participants were 61 mothers of children with ADHD aged 30 to 53 ($M = 41.95$, $SD = 5.46$). The characteristics of the participants are presented in Table 1.

The criteria for including the participants in the study were that their child had ADHD diagnosed by clinicians and was from 7 to 15 years old (primary school age in Croatia). All pupils with ADHD included in this study attended mainstream schools and had an individualised education plan (IEP) with accommodations.

The study was conducted at the beginning of the pandemic; at that time, two mothers and four of their household members had already contracted COVID-19.

Table 1

Sociodemographic Characteristics of Participants (N = 61)

Characteristics	N	%
<i>Education Level</i>		
Elementary	1	1.6
High School	29	47.5
College, University	25	41
MSc or PhD	6	9.8
<i>Employment Status</i>		
Employed	34	55.7
Employed Part-time	15	24.6
Unemployed	10	16.4
Maternity Leave	1	1.6
Caregiver Status	1	1.6
<i>Place of Residence, Number of Citizens</i>		
Rural	12	19.7
City < 100,000	19	31.1
City > 100,000	30	49.2
<i>Number of Children</i>		
1.00	17	27.9
2.00	27	44.3
3.00	14	23.0
4.00	2	3.3
5.00	1	1.6

Instruments

Socio-demographic data were gathered for all participants, including age, education level, employment status, place of residence, number of children in a family, and the age of a child with ADHD.

Spatial and technical preconditions were measured through dichotomous variables; participants were to indicate whether the space for work and electronic equipment they had was sufficient for conducting classes at home.

Academic accommodations, satisfaction with methods and quantity of implementation of various forms of teaching were measured using four variables on a three-point Likert scale.

Mothers answered a question to assess whether they were equally, more, or less burdened with their child's school assignments during online classes than before the pandemic.

The severity of ADHD symptoms was measured using the shorter version of the Pelham Rating Scale (i.e., the fourth version: SNAP-IV (Swanson et al., 2001)). The shorter form of the scale consists of 26 items that are rated on a four-point scale (not at all, just a little bit, pretty much, a lot). The items are divided into three subscales: inattention (nine items), hyperactivity/impulsivity (nine items), and oppositional/defiance disorder (eight items). The subscales for inattention and hyperactivity/impulsivity were used for this research. A higher score indicates a higher number and more pronounced symptoms of those difficulties. The scale has good metric characteristics that have been confirmed in several studies; it is used for both clinical and research purposes (Swanson et al., 2001).

Stress was measured using the Perceived Stress Scale (PSS-10), developed to determine the current levels of experienced stress and how unpredictable, uncontrollable, and overloaded respondents find their lives (Cohen et al., 1994). It is a ten-item scale on which respondents rate the items using a four-point Likert scale, with zero meaning 'never' and four meaning 'very often'. A higher score on the scale indicates a higher level of stress. The scale was adapted and applied to the Croatian sample (Hudek-Knežević et al., 1999). Cronbach's alpha on that sample was 0.88, and the Screen test revealed one factor that explains 44.1% of the pooled variance.

Research design

An online survey was created and sent to users of the leading centre for diagnosing ADHD in Croatia and shared on social networks among groups of

parents of children with ADHD. A cover letter identifying the purpose of the study was included in the questionnaire's introduction. Responding to the questionnaire was interpreted as giving consent. Data was collected from the end of May until the end of June 2020. A total of 67 respondents completed the questionnaires. When checking for inclusion criteria, some questionnaires had to be excluded, which resulted in 61 questionnaires that were ready for further analysis.

All the analyses were performed using SPSS 25 for Windows (IBM, Chicago, IL, USA). Descriptive analysis included means and standard deviation. The Pearson correlation coefficients determined the bivariate correlation. Linear multiple regression analyses enabled the estimation of the incremental variance explained by predictor variables on stress.

Results

To answer the research questions, a descriptive analysis was first conducted. Descriptive statistics are shown in Tables 2 to 4.

While most mothers (72.1%) stated that their households had satisfactory digital equipment for work and learning, almost a quarter (23%) did not have satisfactory space for work and learning for all household members (Table 2).

Table 2

Conditions of Remote learning – Descriptive Data (N = 61)

		<i>N</i>	<i>%</i>
Satisfactory Workspace for All Household Members	yes	44	72.1
	no	14	23
	missing data	3	4.9
Satisfactory Digital Equipment for All Household Members	yes	54	88.5
	no	6	9.8
	missing data	1	1.6

As shown (Table 3), more than three-quarters (77%) of mothers of children with ADHD said that remote learning materials were not at all adapted to the children's needs.

Likewise, most mothers of students with ADHD (85.2%) said that teachers were sending teaching materials through available online services in proper measure.

More than a third of mothers of children with ADHD (42.6%) said that there was no interactive teaching at all through the available online services, while roughly a third of mothers (34.4%) said that there was enough interactive teaching.

More than a third of mothers of children with ADHD (42.6%) responded that there was no individual contact with teachers.

Most mothers of children with ADHD (77%) responded that they were more burdened with their child's schoolwork than before the pandemic.

Table 3

Method of Remote Learning and the Burden on Mothers with Schoolwork During Lockdown (N = 61)

		<i>F</i>	<i>%</i>
Accommodations of Teaching Materials	not at all	47	77
	insufficient	7	11.5
	sufficient	7	11.5
Interactive Teaching in a Group through Certain Online Services	not at all	26	42.6
	insufficient	14	23
	sufficient	21	34.4
Teaching Materials Sent through Certain Online Services	not at all	1	1.6
	insufficient	8	13.1
	sufficient	52	85.2
Individual Online or Telephone Contact	not at all	26	42.6
	insufficient	15	24.6
	sufficient	20	32.8
The Burden on Mothers with Schoolwork Before Isolation	lower	1	1.6
	equal	13	21.3
	higher	47	77

Table 4

Descriptive Data of Predictor and Criteria Variables (N = 61)

	Mothers ADHD	
	<i>M</i>	<i>SD</i>
Stress	22.77	4.62
Academic accommodations	1.34	0.68
The mother's burden with the child's schoolwork before isolation	2.75	0.47
Attention Symptoms (ADHD Children)	30.66	5.67
Hyperactivity Symptoms (ADHD Children)	15.95	4.50
Impulsivity Symptoms (ADHD Children)	11.49	3.37

The bivariate correlation coefficients between the stress scale and symptoms of ADHD in their children, the degree of academic accommodations of online classes to the child's difficulties, and the burden on mothers with the child's schoolwork compared to the period before the lockdown are shown in Table 5.

Table 5

Correlation Coefficients among Predictors and Criteria Variable – Mothers of Children with ADHD (N = 67)

Variables	1	2	3	4	5	6
1. Attention Symptoms		0.56**	0.51**	0.09	0.22	0.34**
2. Hyperactivity Symptoms			0.83**	0.04	0.08	0.23
3. Impulsivity Symptoms				0.00	0.07	0.18
4. Academic accommodations					-0.10	0.32**
5. The Burden on Mothers with Schoolwork Before Isolation						
6. Stress						

Table 6

Linear Regression Analysis on Stress in Mothers of a Child with ADHD (N = 61)

Variables	Stress		Collinearity Statistics	
	B	T	tolerance	VIF
	1	2		
Gender	0.17	1.43	0.950	1.053
Attention Symptoms	0.31	2.17*	0.638	1.567
Hyperactivity Symptoms	0.17	0.80	0.280	3.572
Impulsivity Symptoms	-0.17	-0.82	.295	3.572
Academic accommodations	-0.35	-3.09**	0.970	1.031
The Burden on Mothers with Schoolwork Before Isolation	0.23	1.96*	0.924	1.083
<i>R</i>	0.55			
<i>R</i> ₂	0.30**			

The overall multiple regression (Table 6) was statistically significant ($R_2 = 0.30$, $F(6.54) = 3.84$, $p < 0.01$), which means that the linear combination of predictor variables accounted for 32% of the variance in stress.

Attention symptoms, academic accommodations, and schoolwork burden have a statistically significant effect on mothers' stress levels.

Discussion

The beginning of the COVID-19 pandemic led to the first lockdown and major changes for the entire society. The way of teaching had to be changed overnight, for which neither teachers, children, nor parents were prepared. Necessary changes caused by movement restrictions affected everyone, and it was to be expected that those changes would affect particularly vulnerable groups, such as children with ADHD and their parents.

This research aimed to examine the spatial and technical preconditions and academic accommodations and the methods and quantity of implementation of various forms of teaching for children with ADHD during remote learning.

The results suggest that not all students with ADHD started remote learning with the same conditions and in the same way. One-fifth of the students did not have satisfactory space for learning. As for the digital equipment necessary for remote learning, most students had the necessary equipment, although almost 10% did not.

Those students are getting their education according to the Decision on the Regular Programme with Individualisation of Teaching Procedures. This means that they have the right to the accommodations of learning and teaching procedures, environments, and materials to suit their needs to achieve learning outcomes.

Despite these guaranteed rights, more than three-quarters of mothers of children with ADHD (77%) said that remote learning materials were not adapted to the children's needs.

More than 40% of mothers said there were no interactive classes and no individual contact with teachers. This means that in the first few months of remote learning, the teaching did not occur synchronously but asynchronously for most students, meaning that teachers mostly sent learning materials and assignments to students. In such conditions, communicating with teachers is even more important, especially for students with disabilities. From the perspective of parents from the USA and Australia (Roy et al., 2022), it was precisely the lack of direct contact with teachers that was one of the biggest challenges during remote learning. If we consider the factors affecting the efficiency of remote learning (Huang et al., 2020), it can be concluded that this research showed that at the beginning of remote learning during the pandemic was not effective, especially in relation to a reliable communication structure, the effectiveness of learning methods, appropriate learning tools for students with ADHD, and the organisation of learning in class.

The second aim was to determine the mother's burden with the child's school tasks during the first lockdown. Most mothers in the study reported

a greater burden with their child's schoolwork during the lockdown. We can assume that mothers' increased engagement in their child's school tasks was partly due to insufficient school support for their children.

The third aim was to evaluate the degree of academic accommodation of teaching, the mother's burden with the school tasks, and the severity of ADHD symptoms as possible predictive factors of the mother's stress during the Covid-19 lockdown.

The regression analysis showed that the symptoms of attention disorder, the mother's burden with school tasks, and the degree of academic accommodations were significant predictors of maternal stress during the first lockdown.

In other studies, parents of children with ADHD stated that there were not enough academic accommodations (Becker et al.; Ellala et al., 2021; Termine et al., 2021). They also reported stress associated with greater engagement during remote learning, insufficient teaching accommodations, and a lack of attention in children (Becker et al., 2021; Yousef et al., 2021).

In this study, the effect of impulsivity and hyperactivity symptoms was insignificant. The symptoms of attention disorders have been shown to intensify in situations of increased demands and stress, and the results of other research also indicate more intense symptoms of attention disorders in children with ADHD during the pandemic (Sasaki et al., 2020).

Since the symptoms of inattention are related to the difficulties of completing school tasks and learning (less so for impulsivity and hyperactivity), it is possible that in a situation of decreased levels of teacher support and adapted materials, most requests of mothers at that time were related to supporting the child in completing the school tasks, which resulted in additional stress. The results of this study indicate that the schoolwork burden on mothers increased significantly during the lockdown, and it is a significant predictor of stress in addition to the child's symptoms of inattention.

This study has limitations. The research was carried out on a pertinent sample of mothers, and it is possible that the results would be different on a larger, representative sample. There is also no data on the impact of the severity of inattention, impulsivity and hyperactivity symptoms on mothers' stress before the Covid-19 lockdown; therefore, comparing the results obtained with results before the pandemic is impossible. The focus of this study was the period of the first lockdown, and it is expected that the quality of support for students would increase during the following years. Limitations imposed by the lockdown were also not the focus of this study, and some research showed that they could impact stress (Becker et al., 2020).

Conclusion

Schools were closed during the lockdown in Croatia, and classes switched to remote learning. Schools and teachers were not prepared for this form of teaching, and this situation caused many challenges for children with ADHD and their parents. This research aimed to examine the spatial and technical preconditions, academic accommodations, and the methods and quantity of implementation of various forms of teaching for children with ADHD during remote learning. The second aim was to determine the mother's burden with the child's school tasks during the first lockdown. The third aim was to evaluate the degree of academic accommodation of teaching, the mother's burden with the school tasks, and the severity of ADHD symptoms as possible predictive factors for mothers' stress during the Covid-19 lockdown.

This research showed that although most children had the spatial and technical preconditions for remote learning, there are still some children for whom this was not the case, which could make it difficult for them to cope with the new situation of remote learning. Support for children with ADHD in school is important in normal conditions but even more so during the stressful time of the first lockdown when no one was prepared for remote learning.

Most mothers reported that their children did not receive enough support during remote learning in the form of academic accommodations or individual contact with teachers. The results also showed that mothers were more burdened with their children's schoolwork than before the pandemic. Those academic accommodations, symptoms of inattention in children and the mother's burden with the child's schoolwork were significant predictors of mothers' stress during lockdown.

This research suggests that more individual contact, academic accommodations of resources, and more synchronous and less asynchronous teaching should be provided when implementing online classes. In addition, this research showed that the level of support during remote learning directly impacted mothers' mental health, which should be considered when supporting children with ADHD and their families.

Despite its limitations, this study could be a starting point for research on the long-term effects of education in Covid-19 conditions for both children with ADHD and their parents.

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