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RESEARCH ARTICLE

THE IMPACT OF EDUCATIONAL TECHNOLOGY ON THE STRESS LEVEL OF PARENTS OF AUTISTIC CHILDREN

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Abstract

A recent survey by the American Psychological Association (2020) shows that parents have a stress level of 6.7 out of 10 compared to that of 5.5 for single adults. Also, anxiety among parents of autistic children is nearly twice that of parents of mainstream children (Padden & James, 2017). There have been many suggested antidotes to stress including therapy and medication. However, there has been some preliminary evidence that creative projects can reduce stress-related symptoms (Lewis, 2016). The following study was an attempt to determine if an educational app that has been shown to increase independence with autistic children would reduce stress among parents as compared to group therapy and a control group. The setting was the homes of autistic children with an average of 9.1 years of age. Thirty children (22 males, 8 females) had previously participated in a study involving the iCAN educational app or used a traditional worksheet educational platform. Parents were given a stress survey before and after this study with 46 parents participating (28 female, 18 male) with an average age of 34.2 years. The children and the parents were then randomly assigned to either a traditional worksheet instructional group or an app educational group. Both groups of parents and children received a single one week instruction by certified instructors via the web and parents were guided by behaviorists on how to train their children using the materials.

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Introduction:-

Stress is on the Rise

COVID-19 has added to the stress of parents and other individuals alike. The APA has determined that 84% of Americans feel a sense of prolonged stress due to Corona. The National Institute of Health has determined that parents of autistic children have significantly higher stress than parents of children without disabilities. However, now more stressors are at the doorstep with COVID-19 due to the fear of getting sick, isolation due to social distancing and only 29% of American workers having the ability to work from home (Thompson, 2020). COVID-19 has created not only financial fears and isolation anxiety, but nearly 70% of Americans fear a loved one falling ill (Anderson, 2020).

Before the COVID-19 pandemic, workplace stress has been high. Forbes (2019) reported that stress in corporate America is on the rise. 76% of Americans state that work stress negatively impacts their personal relationships and 66% are losing sleep. Sixteen percent of Americans simply quit their jobs because the pressure becomes too much.

Americans experience more stress than other first world countries. Fortune Magazine reported on a study of 19 countries, and it was discovered that Americans work on average 25% more hours. Also, many countries have mandatory vacation and some countries even make it illegal for supervisors to call employees after work hours. For instance, France has the Right to Disconnect law and laws limiting work hours to 35 per week with 31 paid vacation days per year. Many countries have a higher Better Life Index according to the Organisation for Economic Co-operation and Development (OECD) (2019). For instance, Israel ranks higher due to every Israeli being entitled to healthcare and families living closer together. The World Happiness Report (2019) actually ranked Israel, Costa Rica and Denmark above the United States and gave Finland the number one spot. The United States ranked 15th. This measure takes into account levels of stress among its citizens, economics, well-being and national statistics. For instance, many citizens in Denmark live near or with many family members. Other Danish citizens live in hotel like housing with the residents eating together in a cafeteria area so neighbors get to know and support one another. Furthermore, these countries mostly pay 100% for a college education as well as retirement benefits. These countries also have free childcare.

Another huge stressor has been the mounting debt that Americans are suffering. According the Federal Reserve Bank, housing debt has hit an all-time high with Americans. Personal debt including things like credit cards and medical bills has reached an average of \$38,000 according to the Northwestern Mutual 2018 Planning & Progress Study. Debt.org has determined that the average American owes over \$10,000 in medical bill debt alone and The College Board has determined that the Americans paying off a college loan owes an average of nearly \$30,000. These amounts can go up as much \$150,000 when paying interest over long periods. Now that COVID-19 has been spreading throughout the communities of the U.S., over 10 million citizens have applied for unemployment according to the Washington Post (2020). The monetary stress of the world has now just gotten far more difficult.

How Stress Impacts Health

According the American Psychological Association, higher stress increases cortisol levels which negatively effects the cardiovascular, endocrine, respiratory, nervous and digestive systems. Stress can also greatly hinder a woman's ability to have a child and stress can greatly harm the fetus. Stress also has the following negative effects (Robinson, 2017):

1. 43% of all adults suffer adverse health effects due to stress
2. 75% - 90% of all doctor's office visits are stress related
3. Stress plays a role with headaches, high blood pressure, heart problems, diabetes, skin conditions, asthma, arthritis, depression, and anxiety

The Advantages Of Educational Media For Autism

Educational Apps have particular advantages for individuals on the autism spectrum. Science Direct (2014) determined that such Apps allow autistic people to control their own progress and become more independent. Individuals with autism often find teachers and other people threatening due to overstimulation and flatscreen educational Apps allows them to sooth themselves and digest information more easily. The National Institute of Health cited 17 studies where using an Ipad or Ipod increased the ability to communicate among autistic children.

A great advantage for autistic children and parents to utilize educational media is it can serve as a tool to manage language impairment. Around 80% of children with ASD aged 5 years and younger who are non-verbal (Bondy&Frost, 1994). These language barriers impedes a child's ability to not only communicate but to learn other subjects as well including math and science as well as self-help skills. PECS or Picture Exchange Communication System have been used by behaviorists, teachers and parents for years to help autistic youngsters communicate. They have been quite effective due to the two-dimensional quality of such systems and the lower stimulation demands. The effectiveness of PECS has proven to increase communication and learning significantly with this population (Flippin et al., 2010). Educational Apps are basically the new PECS system. Instead of using paper or actual photos, educators, parents and children can access an App that is consistent, organized and will include positive reinforcers such as points, verbal encouragement and fun colors. Children can also have fun with such Apps as it is often an educational game.

Playing prosocial video games such as Chibi Robo and Super Mario Sunshine can have positive effect. In Gentile et al., (2009) The Effects of Prosocial Video Games on Prosocial Behaviors: International Evidence From Correlational, Longitudinal, and Experimental Studies, fifth grade to college-aged students from three countries (Singapore, Japan, and United States) participated in prosocial video games. The finding was students (across

different ages and cultures) who played more prosocial games behaved more prosocially. (Gentile et al., 2009). iCAN APP

First Media developed an App whereby children with the assistance of their parents can learn sequencing events. First Media states that the mission of iCAN is:

To empower children with special learning differences and their families by facilitating an independent learning process in a safe & self-stimulatory space. We believe in developing cognitive, social, and life skills in a FUN way, providing a large variety of educational games, books, and videos, created by top educational experts. We envision a future in an inclusive society where there are a place and adequate learning tools for all kids!

Autistic children have positively responded to using such Apps and programs according The Journal of Action Research (2016). The results indicated that such programs improved children's abilities in life readiness skills. A previous study showed that iCAN increased independence as well as academic comprehension among autistic children (Eller et al, 2021). The following is a study on the effectiveness of this of educational media impacts the stress level of parents of autistic children.

Method:-

The method of the study included pre-testing 46 parents (28 female, 18 male) with an average age of 34.2 years. The subjects were divided into two groups including: an online group therapy method and a culinary therapy group. Each group had 23 parents each. Subjects were randomly assigned to each group. A pre and post-test design was used to measure the stress levels utilizing the Parent Stress Survey (PSI). The children were previously diagnosed with ASD by a California Regional Center, pediatrician or licensed psychologist. The non-profit organization Best Practices, a state licensed vendor for behavioral training, assisted in the study. This organization has treated hundreds of special needs children and individuals over the last twenty years. Parents and/or guardian gave written permission for their children to participate in the study. Children were randomly assigned to a traditional instruction group or an educational media group (iCAN). All testing and training took place in the homes of the children with parents and/or guardians. Behaviorists from Best Practices trained and guided the parents and/or guardians in their home setting. All participants and researchers were tested and vaccinated for COVID-19. Children in both the treatment and the educational media group were pretested on independence before instruction began. Independent samples t-tests indicated no significant differences in either the traditional group or app group ($p > 0.05$). Children were then randomly assigned to either a traditional instruction group or the iCAN group. Both groups of parents received two hours of instruction on how to use the app or worksheets by a certified behaviorist via online. The App group used the iCAN App developed by First Media. The traditional group used worksheets.

Results:-

The Parenting Stress Survey (PSI) by PariConnect was administered immediately before and after the treatments and time periods for both groups. The survey has a score of up to 100%. Scores above 80% are considered to be "High Stress Percentiles." Scores at 90% or above are considered to be "Clinically Significant Stress Percentiles."

Both groups showed significant improvement in reducing stress among parents.

Pre-Test vs Traditional Group

P value and statistical significance:

The two-tailed P value equals 0.0224

By conventional criteria, this difference is considered to be statistically significant.

Confidence interval:

The mean of Group One minus Group Two equals 3.78

95% confidence interval of this difference: From 0.56 to 7.00

Intermediate values used in calculations:

$t = 2.3668$

$df = 44$

standard error of difference = 1.598

Group	Pre-Test	Traditional
Mean	87.87	84.09

SD	5.31	5.53
SEM	1.11	1.15
N	23	23

Pre-Test vs iCAN Group

P value and statistical significance:

The two-tailed P value is less than 0.0001

By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval:

The mean of Group One minus Group Two equals 8.26

95% confidence interval of this difference: From 4.59 to 11.94

Intermediate values used in calculations:

$t = 4.5302$

$df = 44$

standard error of difference = 1.823

Group	Pre-Test	iCAN
Mean	87.7	79.43
SD	5.22	7.02
SEM	1.09	1.46
N	23	23

Traditional vs iCAN

P value and statistical significance:

The two-tailed P value equals 0.0163

By conventional criteria, this difference is considered to be statistically significant.

Confidence interval:

The mean of Group One minus Group Two equals 4.65

95% confidence interval of this difference: From 0.90 to 8.41

Intermediate values used in calculations:

$t = 2.4977$

$df = 44$

standard error of difference = 1.863

Group	Traditional	iCAN
Mean	84.09	79.43
SD	5.53	7.02
SEM	1.15	1.46
N	23	23

Discussion:-

Both the traditional group and the iCAN showed significant improvement in the reduction of stress. However, iCAN was significantly better than the traditional group. The iCAN App had a 8.27% decrease in stress from the pre-test and 4.66% difference from the Traditional group. Several factors may have contributed to these scores. Behaviorists were communicating with parents and assisting them with the training materials. This did give the parents the opportunity to discuss and vent their stress with another individual. However, this was the case for both groups and the iCAN App was still significantly more effective. Perhaps this is due to the fact that more parents and children actually completed the study. The traditional group had only 47.7% of the participants complete the task. The remaining walked away. However, 73.3% of the iCAN group completed the task. Previous research has shown that autistic children enjoy interactive academic technology according to the Autistic Spectrum Disorder Association (2021).

The children reportedly had more fun and the previous study showed that iCAN App allowed children to become "more independent." When a child is able to do something on their own, this gives a parent a much needed break and a reprieve from the tantrums and attention seeking behavior of their child. Autistic children traditionally have a more difficult time engaging with other human beings and are uncomfortable following verbal directions. The iCAN app

allows a buffer or a tool that autistic children can control which helps them calm down their anxiety which most likely helped reduced the anxiety of the parents. It is hypothesized that the main variable for the significant result is that iCAN was able to keep the attention of infants better than traditional instruction which allowed parents a few more minutes in their day of having a calm and focused child.

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