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Application of Gluten and Casein Free Diet Patterns Through Augmented Reality Pop Up Book and Nutri-App Media in SLB Negeri Semarang

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ABSTRACT

Autism is a brain function disorder that causes impaired communication and social interaction. One of the obstacles experienced by autistic children in SLB Negeri Semarang is the difficulty of accepting new foods, because they are picky eaters. This condition results in the prevalence of malnutrition and micronutrient deficiencies in autistic children, because there is little variation in food or only dominant in certain foods. The purpose of this study was to implement a casein and gluten-free diet program (CFGF) with Augmented Reality Pop Up Book and Nutri-App in SLB Negeri Semarang.The method used is an assessment to find out the benefits after the counseling, training, and mentoring that have been carried out. The results obtained are that there is a change in the autistic children of SLB Negeri Semarang which has a rating of 4.67 out of 5 with a description of 67% of respondents giving a rating of 5 and 33% giving a rating of 4. In addition, 75% of respondents gave a score of 5 (excellent) about the importance of a diet program for autistic children conducted by researchers. In conclusion, the program brought by the researcher can increase understanding of the CFGF dietary in SLB Negeri Semarang.

Keywords: Augmented Reality Pop Up Book, Autism, Casein Free Gluten Free, Nutri-App, SLB Negeri Semarang

1. INTRODUCTION

Health is a basic need that is very important for humans, including the health of children. Children's health is considered very important considering that children act as agents of change in the future. In reality, not all children have ideal health, because many children in Indonesia have autism. In fact, according to the Central Bureau of Statistics, the number of people with autism in 2017 reached 2.4 million people with a new addition of 500 people/year (Majidah et al., 2017). Autism itself is a brain function disorder that causes communication disorders, social interactions, difficulties in adapting, and behavioral patterns (Baculu and Andri, 2019). As a result of this behavioral pattern disorder, it is difficult to maximize the fulfillment of balanced nutrition in autistic children.

Problems related to nutrition in autistic children are often found in a number of special schools (SLB), including the Semarang State Special School. The nutritional status of autistic children in SLB Negeri Semarang is very different from normal children, most of which are overweight and obese. In fact, based on the statement of Mr. Aris as the representative of the public relations department, he stated that the percentage of overweight and obesity in autistic children in SLB Negeri Semarang was 21.4% and 22.9%, or almost half, respectively. The high percentage is due to the behavior patterns of autistic children who tend to be picky eaters or only eat certain types of food. The picky eater condition is caused by digestive, sensory, and motor disorders so that autistic children have difficulty eating. This condition results in the prevalence of malnutrition and micronutrient deficiencies in children with autism, because there is little variation in food or only dominant in certain foods. Therefore,

efforts to increase knowledge of eating patterns in autistic children are needed.

Based on the narratives of a number of Semarang State SLB teachers, assistance related to dietary regulation is still not optimal. This is because there is no periodic nutritional status monitoring program. Moreover, due to the Covid-19 pandemic, monitoring from teachers is very difficult because the monitoring method is only limited to telephone with parents, so the information obtained by teachers is not necessarily in accordance with the conditions described. In addition, SLB Negeri Semarang has not implemented a gluten and casein free diet or Gluten Free Casein Free (GFCF) which is the main diet for children with autism. This is because there are no special teachers who handle nutritional conditions for autistic children. In fact, this dietary pattern is very important because gluten and casein can form gluteomorphine and casemorphine which trigger hyperactivity in autistic children (Setyaningsih, 2019).

However, there is a big challenge to implement this diet program in SLB Negeri Semarang. First, based on the narrative of Mr. Aris as the representative for public relations, he stated that the challenge was related to the right method of assistance in regulating and compiling diet patterns for teachers and parents, due to the difficulty of controlling during the Covid-19 pandemic. Second, there is no proper method of introducing healthy food from parents and teachers to children with autism. This is because children with autism have difficulty accepting new foods.

Based on these problems, partners hope that SLB Negeri Semarang can implement a gluten and casein-free diet program to the maximum. Therefore, to facilitate the regulation and preparation of eating patterns, an application will be used which has the main function as a calendar media for preparing eating patterns and a control medium between teachers and parents. In addition, augmented reality pop up books were also introduced as a medium to introduce healthy food menus to autistic children. Augmented reality pop-up books are considered effective to be applied to autistic children because they are able to arouse emotions and feel interactions with visual objects to be more real (Nazaruddin and Efendi, 2018).

2. LITERATURE REVIEW

2.1 Eating Problems in Autism Children

Children with Autism (Autism Spectrum Disorder) have some problems with their nutritional intake, especially with feeding restrictions (like picky eating and food avoidance) and feeding disorders. The children with this disorder were found to have atypical eating behaviors much more likely than children with other disorders and healthy children (Mayes and Zickgraf, 2019). One of the common feeding restrictions is picky eating, where those people who have this problem consume an inadequate variety of food through rejection of foods (by texture, types, and flavor) both familiar and unfamiliar. Some picky eaters viewed their practice as beneficial because of difficulty eating (in this case some of it may be relatable with Autism type of recommended diet) but this practice can be harmful because of difficulty eating (in this case some of it may be relatable with Autism type of recommended diet) but this practice can be harmful because of the links between poor diet and health problems (Thompson et al., 2015). These kinds of eating problems were observed in autistic children rather than typically developed children, as one clinical study stated that autistic children refused to eat foods that need to be chewed more and more aggressively during mealtime (Handayani et al., 2012).

2.2 Gluten Free Casein Free (GFCF) Diet Program for Autism Children

High incidence of gastrointestinal comorbidities was observed in children with autism (fragile gut) such as exhibit low digestive enzyme activity, impaired gut barrier integrity, and presence of antibodies specific for dietary proteins (triggering immune response), resulting in children with ASD is at risk for gastrointestinal symptoms (Sanctuary et al., 2018). This problem is the foundation of current (and popular) dietary therapy by limiting certain types of proteins such as gluten and casein, the Gluten Free and Casein Free diet. The main key of this diet is by having high variants and great food texture for kids, eliminating gluten, casein, and soy (although the side effects are nutritional deficiency), high energy if the bodyweight is low, and limit the synthesized food coloring and artificial preservative.

The diet itself originated from a hypothesis test about schizophrenia is associated with absorption of “exorphins” contained in gluten and casein that made Cade and colleagues conducted a study of children individuals (some of them diagnosed with schizophrenia and some met the criteria for diagnosis of autism) where they were treated with GFCF diet (synthesis of Milk-Free Kitchen by Kidder and Gluten-Free Gourmet by Hagman). The study found that treatment with a GFCF diet was accompanied by a report of improvement on IgA and IgG in 81% of children within 3 months. Some follow-up studies from 2002 by Knivsberg and colleagues (with randomized single-blind study) for children with the autistic syndrome and urinary peptide abnormalities found that GFCF diet on the experimental group made significant improvements on behavior, non-verbal cognitive level, and motor problems (Elder et al., 2006).

3. METHODS

The implementation of service at SLB Negeri Semarang is carried out in a blended manner both online and offline from June 1, 2021-25 August 2021. The stages of service carried out are divided into 4 stages, including: program application planning, guidance for readiness, actualization of activities and programs, and potential development and program sustainability. The entire program will be assessed to find out the benefits and changes to the implemented program.

During the program planning, discussions and socialization were carried out. This discussion is a form of participatory approach from partners facilitated by the team to plan needs, activities, and content in program actualization. Furthermore, in program socialization in the form of socialization and understanding to partners who participate in executing

previously planned activities, this method is carried out online to partners. This stage aims to educate partners about a gluten and casein-free diet program.

At the stage of guidance for readiness, a program implementation guidebook is made that serves as the operational basis for future activities, as well as a reference for partners to find out which programs will be provided in the future. Furthermore, it is addressed to teachers and parents which includes video conferencing training, preparation of a food calendar through an application called Nutri-App, along with introduction, preparation, and training of augmented reality pop up books.

The next stage is the actualization of activities and programs. At this stage, monitoring and assistance is carried out regarding the training that has been carried out to determine the effectiveness of the program. In addition, a national campaign was also carried out which was attended by 14,000 participants with the aim of disseminating the program. The campaign is to commemorate Children's Day and Breastfeeding Week. In addition, it is also implemented to accommodate all the aspirations of teachers and parents as an effort to improve the gluten and casein-free diet program that has been implemented.

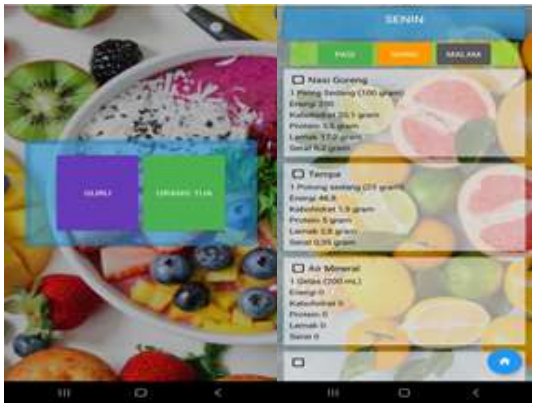
The final stage is in the form of potential development and program sustainability. At this stage the site and social media program are designed. The site is made at the URL pkmnutrizone.com and for social media it is on Youtube, Instagram, and Linkedin. Then, the program was integrated as a potential sustainability program through integration with the Semarang State Special School curriculum. Then, this program has also collaborated with the Komunitas Sahabat Difabel Semarang. It is hoped that this collaboration can help in disseminating the program. Finally, a program evaluation was carried out in the form of an assessment of the program provided and the changes experienced by respondents regarding the fulfillment of nutrition for children with autism.

4. RESULTS

4.1 Nutri-App Utilization in SLB Negeri Semarang

In addition to focusing on providing understanding to partners related to CFGF dit which is highly recommended to be applied to children with autism, monitoring is also important to do. This monitoring aims to be able to monitor the development of nutritional fulfillment in autistic children every day, so that it remains within the guidelines for implementing a good CFGF diet. Monitoring or monitoring can actually be done using several methods, such as filling out food forms every day that can be monitored by nutritionists, and many other methods.

Figure 1. Nutri-App Features



But in pandemic conditions like today, people's mobility is very limited, so it will be difficult for parents if they have to often coordinate and consult nutritionists related to the fulfillment of good nutrition for autistic children. And in the end we together with partners sparked the idea to be able to create a platform that can connect between parents, teachers, and us as application developers and one of the parties who monitor, so that we can still coordinate remotely and monitor intensely related to nutritional fulfillment for autistic children.

Every day parents are required to check what foods have been consumed by their children with autism on that day, and later the data that has been included by the parents can be monitored together, especially by SLB teachers, and us as a monitoring team. From the incoming data we will be able to see how well the fulfillment of nutrition that has been obtained by the child concerned on that day, and if there is still a discrepancy in the food provided with cfgf dietary guidelines, then we will be able to directly contact parents to improve the nutrition provided to their children. In addition, there are consultation features that can be used by parents and teachers if they want to consult with us as a monitoring team, so that we can provide solutions to the various problems faced by each child. From this monitoring system, it is expected that all parties concerned can play an active role in supervising the nutritional fulfillment of children with autism, so that the risk of food triggering hyperactivity behavior can be minimized.

4.2 Augmented Reality Pop Up Book Utilization in SLB Negeri Semarang

Figure 2. Augmented Reality Pop Up Book

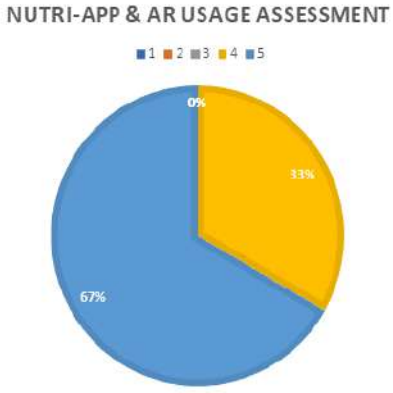
In its use of Augmented Reality Popup Book is getting a positive assessment from partners, the features contained in it can add to the partner's understanding of the fulfillment of good nutrition for children with autism. AR provides visualization of two-dimensional objects into an animation that can be seen more clearly. In several previous studies have been known and can be seen the results, that the use of AR technology is successful in providing more understanding of children with special needs, especially people with autism.

At the beginning of its use there are still obstacles, especially in its optimization. Although this application has been designed as simple as possible, it still needs to adapt to partners, especially parents and teachers. Most new partners know the existence of technology like this, so it requires several times training both online and offline. So the hope is that partners are able to use this application well and get optimal benefits from the existence of this application.

After several training with partners, finally the results we hope can be seen, partners in the sense of teachers and parents of students have begun to be able to introduce this technology and how it is use to their children with autism. The child is very interested in the content we present, because visualization is easily accepted by children, as well as persuasive voice over so that it can attract children to learn the content in the book. The content that we present is in the form of a good food menu cycle consumed by children with autism in accordance with the recommendations of the CFGF diet. So the hope is that this application can make it easier for parents to direct their children to eat good food for them. Because during this time the problems experienced by most parents are, in terms of directing their children to be able to eat foods that can be a trigger for hyperactive behavior in autistic children.

4.3 Service Program Assessment

Figure 3. Nutri-App and Augmented Reality Pop Up Book Assessment



After almost 3 months of this program running, starting from May to August 2021, there is a lot of advice and input from parents, and teachers as our partners. They also give an assessment of the programs we have run with them as their targets. The assessment covers the Nutri-Ready, Nutri-Pandai program. Nutri-Agile, Nutri-Fast. Broadly speaking, the four programs are a series of program application planning, guidance for readiness, actualization of activities and programs, and the development of the potential and sustainability of the program that we have carried out both online and offline.

The assessment we base on google form that has been filled out directly by the partner. In the form we include several assessment indicators including how effective the material we convey, how important the material we provide, whether the assistance we carry out has been intensive and so forth. From some of the indicators of the question we list the assessment value of the range 1-5, the average partner gives an assessment of 4.67. From the existing assessment we can conclude that the partner has been satisfied with the material we provide and the direct assistance we do dor to dor.

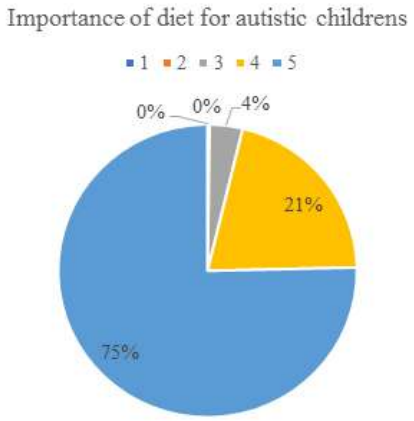
In addition to assessment, partners also provide criticism and advice related to the program that we run during these 3 months. Various criticisms and suggestions come to us, but most of the criticism that comes in is constructive positive criticism. In addition, from the advice form we can find out what exactly is expected by the partner. Most partners provide input so that the scope of the material delivered is further deepened and so that this program can continue, and further expanded the target reach, so that more parties can feel the benefits of the program we run.

5. DISCUSSIONS

5.1 Implementation of the GFCF Diet Program in SLB Negeri Semarang

The GFCF Diet Program is important to maintain nutrition fulfillment while at the same time reducing the risk of the fragile gut and improving children's willingness to eat (reducing picky eater behavior). Implementation of this diet in SLB Negeri Semarang has received positive feedback, especially on the media that accompany it (with Augmented Reality). Augmented Reality usage has been used in recent years for dietary purposes, such as for food awareness on prevention of cardiovascular diseases (Waltner et al., 2015) and healthy diet tool prototype (Norhalim and Ismail, 2020). Using augmented reality also helps children with autism to improve their attention and focus during therapy sessions and bring positive emotions (Escobedo et al., 2014). This approach of using technology was working effectively on the socialization of this diet program during a live demo on the children's house (door to door as stated), as the children and the parents do understand better about diet for autistic children. As for general reception, we conducted several programs such as webinars and volunteering. We also ask the participants on the programs to give the objective scoring for feedback. 7912 respondents are participating in providing feedback via Google Forms with ages between 15 to 38 years, 75,8% were expressed about the importance of diet for autistic children.

Figure 4. The graphical response about importance of diet for autistic childrens



5.2 Improved Understanding of CFGF Diet Patterns through Nutri-App and Augmented Reality Pop Up Book

Based on several programs that we have run, especially in terms of the use of augmented reality pop up books, as well as the use of Nutri-App, we can conclude that the use of Augmented Reality Pop Up Book as a means of understanding for children with autism is considered quite optimal, this is because we can see significant results from before and after the use of augmented reality pop up book. Previously children with autism still do not understand about what foods are good for them to consume, many things behind the problem, but the most dominant factor is because there is no learning sraana that is interesting to them. So after they use this Augmented.

In addition to understanding through augmented reality pop up book, there is also a monitoring program through Nutri-App, before the existence of this monitoring program, teachers in schools can not know the fulfillment of nutrition provided by parents to children with disabilities, so there are still many foods given by parents are not in accordance with the CFGF diet program. After this monitoring program, teachers can also play an active role in supervising the fulfillment of child nutrition, and later parents and teachers can coordinate directly.

6. CONCLUSIONS

1.The GFCF (gluten-free, casein-free) diet is a diet for autism that avoids all gluten (found in wheat, barley, and rye) and casein (found in dairy). In its application, it was recorded that 75.8% of respondents agreed that the diet program carried out at SLB Negeri Semarang was very important to support awareness of eating patterns for autistic children by teachers and parents.

2. The use of Nutri-App and Augmented Reality Pop Up Book is considered good in its application with a percentage of 67% giving a score of 5 and 33% giving a score 4. Nutri-App is used to monitor and provide nutritional information and daily menus for autistic children through teachers and parent. Then Augmented Reality Pop Up Book is used to introduce new foods. The use of Augmented Reality Pop Up Book is considered effective because it can provide real visualization of food.

REFERENCES

Baculu, E. P. H., Andri, M. 2019. Faktor Risiko Autis Untuk Mengurangi Generasi Autis Anak Indonesia. MPPKI (Media Publikasi Promosi Kesehatan Indonesia): The Indonesian Journal of Health Promotion. 2 (1):5-11.

Elder, J.H., Shankar, M., Shuster, J., Theriaque, D., Burns, S. and Sherrill, L. (2006). The Gluten-Free, Casein-Free Diet In Autism: Results of A Preliminary Double Blind Clinical Trial. Journal of Autism and Developmental Disorders, 36(3), pp.413–420.

Escobedo, L., Tentori, M., Quintana, E., Favela, J. and Garcia-Rosas, D. (2014). Using Augmented Reality to Help Children with Autism Stay Focused. IEEE Pervasive Computing, 13(1), pp.38–46.

Handayani, M., Herini, E.S. and Takada, S. (2012). Eating Behavior of Autistic Children. Nurse Media Journal of Nursing, [online] 2(1), pp.281–294. Available at: https://ejournal.undip.ac.id/index.php/medianers/article/view/3962 [Accessed 25 Aug. 2021].

Majidah, U.A., Pradigdo, S.F., Suyatno, S. 2017. Hubungan Pola Makan Dengan Status Gizi Anak Autism Spectrum Disorder (ASD) Kelas I–VI Di SLB Negeri Semarang Tahun 2017. Jurnal Kesehatan Masyarakat (Undip). 5(4):768-777.

Mayes, S.D. and Zickgraf, H. (2019). Atypical eating behaviors in children and adolescents with autism, ADHD, other disorders, and typical development. Research in Autism Spectrum Disorders, 64, pp.76–83.

Nazaruddin, M.A., Efendi, M. 2018. The book of pop up augmented reality to increase focus and object recognition capabilities for children with autism. Journal of ICSAR. 2(1):9-14.

Norhalim, N. and Ismail, A. (2020). An Early Development Process of an Augmented Reality-Based Healthy Diet Tool Prototype. International Journal of Multimedia and Recent Innovation, 2(2), pp.96–101.

Sanctuary, M.R., Kain, J.N., Angkustsiri, K. and German, J.B. (2018). Dietary Considerations in Autism Spectrum Disorders: The Potential Role of Protein Digestion and Microbial Putrefaction in the Gut-Brain Axis. Frontiers in Nutrition, 5.

Setyaningsih, R. 2019. Faktor-faktor yang Mempengaruhi Status Gizi pada Anak Berkebutuhan Khusus. Jurnal Kesehatan Holistic. 3(2):1-16

Thompson, C., Cummins, S., Brown, T. and Kyle, R. (2015). What does it mean to be a “picky eater”? A qualitative study of food related identities and practices. Appetite, 84, pp.235–239.

Waltner, G., Schwarz, M., Ladstätter, S., Weber, A., Luley, P., Bischof, H., Lindschinger, M., Schmid, I. and Paletta, L. (2015). MANGO - Mobile Augmented Reality with Functional Eating Guidance and Food Awareness. New Trends in Image Analysis and Processing -- ICIAP 2015 Workshops, pp.425–432.